

Threadlocking User's Guide

What you need to know to ensure
a reliable threaded assembly



Loctite® – Finding a Better Way

Since the design of threaded fasteners, engineers have been searching for the solutions to vibrational loosening. Vibration loosening of fasteners creates reliability issues, unscheduled shutdown of equipment and additional costs.

Old Way

Mechanical Locking Devices

Mechanical locking devices (e.g. split washers, nylon nuts) were invented to solve the common problem of loosening that occurs in most threaded assemblies. Although they were made for this purpose, they have several shortcomings.

Shortcomings of Mechanical Locking Devices

- Loosen under vibration, thermal expansion and/or improper torque
- Do not seal threads
- Require extensive inventory of several shapes and sizes
- Prone to rust



Better Way

Loctite® Threadlockers

Invented fifty years ago by Loctite Corporation, now Henkel Corporation, this revolutionary method to lock and seal threaded fasteners with liquid anaerobic adhesives has found worldwide acceptance. Suited for a wide range of applications, from delicate electronic components to heavy industrial equipment, Loctite® threadlockers have dramatically increased the reliability of threaded assemblies.

Benefits of Loctite® Threadlockers

- Lock nuts and bolts against vibration and thermal expansion
- Seal against corrosion and leakage
- Reduce inventory costs
- Suitable for all shapes and sizes of fasteners
- Act as a thread lubricant
- Maintain critical adjustments of the assembly
- No on-torque adjustments needed
- High chemical resistance

Loctite® Threadlocking Guide

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Threaded Fasteners

Functions of a threaded assembly

1. Create clamp force
2. Maintain clamp force
3. Allow disassembly



Why do threaded assemblies fail?

Clamp force is not maintained

Threaded assemblies loosen because of:

A. Gaps: In order to make the assembly possible, nuts and bolts must have some tolerance, which creates gaps between the threads.



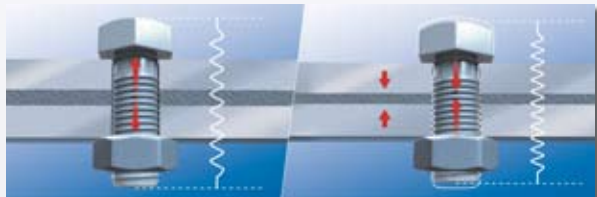
Parts tolerance

B. Vibration & side-to-side movement: These gaps allow the parts to move from side-to-side when exposed to vibration.



Vibration and loosening

C. Expansion/contraction & loosening: Expansion and contraction can also cause side-by-side movement. This, in addition to vibration, leads to loosening and ultimately disassembly of parts.



Stretching of the bolt beyond its yield point and thermal expansion/contraction of parts leads to lack of structural rigidity and relaxation of parts

Disassembly is not always possible

This failure happens because, in certain conditions, a nut and a bolt can seize together. This seizing effect is caused by:

- **Corrosion**, rust, when dealing with:
 - ✓ Humidity
 - ✓ High temperatures
 - ✓ Assembly of different metals (galvanic corrosion)
- **Galling** (friction welding)



Corroded assemblies can be difficult to take apart...



...which can lead to broken bolts.

Loctite® Threadlocking Solutions

How does a Loctite® threadlocker work?

Fill Gaps

Loctite® threadlockers are single-component adhesives that cure in the absence of air and in contact with active metal to form a tough thermoset plastic. They completely fill all voids between the interfacing threads, which makes the assembly an unitized component, prevents any movement between threads, and ultimately prevents loosening.



Loctite® threadlocker between the interfacing threads

Seal Threads

Another property of Loctite® threadlockers is thread sealing. This property is especially important when assembling through-bolts in an oil reservoir or cooling jacket in order to keep the fluids sealed in and corrosion out. Examples of this application are common but not limited, to gearboxes and internal combustion engines.



Engagement area of rusty bolt that did NOT have Loctite® threadlocker applied



Engagement area of rusty bolt that DID have Loctite® threadlocker applied

How do I use a Loctite® threadlocker?

Application Options



For through holes



For blind holes



For post assembly
(using Loctite® 290)



For overhead applications

IMPORTANT: To achieve optimum performance all parts must be clean and free of contaminants (e.g. oil, grease).

Dispensing Options



250 ml and 50 ml
Loctite® hand pumps







Loctite® integrated semiautomatic dispenser,
dispense valve, and stationary dispense valve

For maximum convenience and productivity, Loctite® threadlockers can be dispensed through Loctite® dispensing systems.

Loctite® Threadlocking Solutions

Why use Loctite® threadlockers?

Conventional Method	 LOCKNUTS	 SPRING WASHERS	 NYLON INSERTS	 TAB WASHERS / SPLIT PINS
Problems	<ul style="list-style-type: none"> • Double cost • Extra space • Re-torquing required • Seizing 	<ul style="list-style-type: none"> • Ineffective locking • Can damage contact faces • Large inventory 	<ul style="list-style-type: none"> • On-torque needed • Ineffective under severe vibration • Require good access • Should not be re-used • Expensive 	<ul style="list-style-type: none"> • Difficult production use • Expensive • Designed mainly to prevent loss of loosened nuts & bolts
Loctite® Solutions	<ul style="list-style-type: none"> • Lower cost • Space saving • Seal against corrosion • 100% contact, no loosening 	<ul style="list-style-type: none"> • Positive locking • No damage, no corrosion • One bottle fits many sizes 	<ul style="list-style-type: none"> • Low on-torque • Effective even under severe conditions • Easy to apply • Allow parts to be re-used • Lower cost 	<ul style="list-style-type: none"> • Easy application • Lower cost • Use standard parts

Loctite® Benefits

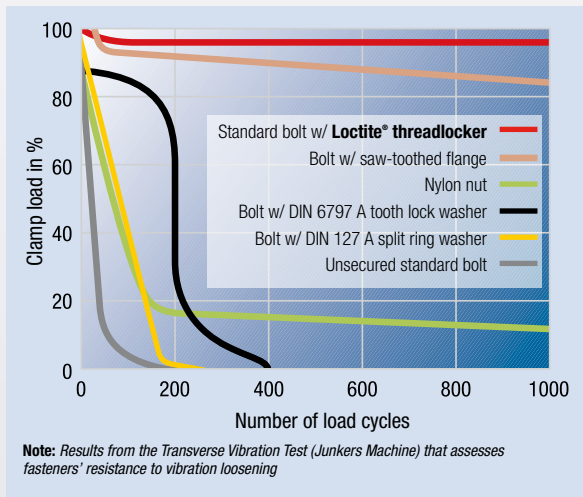
Better Performance

- **Reliable assembly:** Not only locks against vibration, shock and thermal cycling but also seals against corrosion and galling
- **Easy disassembly** using hand tools when low or medium grade formula is selected
- **Outperform locking devices:** better clamp load retention compared to all mechanical locking devices

Cost Savings

- **Failure:** Reliable threaded assemblies reduces costly downtimes
- **Inventory:** “One size fits all”, universally applicable for a wide range of fastener sizes
- **Processing:** Ease of automation reduces assembly costs and increases throughput
- **Material Cost:** Lower cost per unit compared to most locking devices

Vibration loosening test



Cost per locking application

Comparative Locking Costs				
Typical Locking Device	Relative Cost per part on M10 Bolt & Nut	Locks	Seals	Lubricates
Flanged Bolt (DIN6921 - M10 x 80)	12 X	NO	NO	NO
Nylon Insert Lock Nut (DIN985)	6 X	NO	NO	NO
Flanged Nut (DIN6926)	5 X	NO	NO	NO
Additional Lock Nut (DIN934)	3 X	NO	NO	NO
Spring Lock Washer (DIN127A)	1 X	NO	NO	NO
Loctite® Threadlocker	1 X	YES	YES	YES

Note: Estimated costs based on purchase of 1000 pcs. from a fastener distributor.

Loctite® threadlocker key selection factors

Strength

- **Low strength:** Ideal for fasteners <M6. Easy disassembly using hand tools
- **Medium strength:** Designed to be removable with standard hand tools on M6 to M20 fasteners
- **High strength:** Designed to deliver high strength on M6 to M20 fasteners. For removal, it may require localized heat (>260°C), hand tools, and disassembly while hot



Easy disassembly with hand tools when using Low & Medium Strength formulas

Application Methods

- **Pre-Dispensed:** Loctite® sticks semisolid formula can be applied beforehand on bolts that are waiting to be assembled
- **Pre-Assembly:** Most Loctite® liquid threadlockers are designed to be applied at the moment that parts will be assembled
- **Post-Assembly:** Wicking grade formula can be applied on parts that are already assembled

Materials Being Assembled

- **All Loctite® Threadlockers:** Metal-to-metal applications
- **Loctite® 425 Assure™:** Plastic-to-plastic, plastic-to-metal applications

Loctite® threadlockers are available in many grades to satisfy a wide range of applications. To make grade selection easy, the grades are now color-coded to help you identify one threadlocker from the other.

LOW STRENGTH THREADLOCKERS



- Removable with hand tools
- Adjustment screws
- Calibration screws
- Meters and gauges
- Up to M6

MEDIUM STRENGTH THREADLOCKERS



- Removable with hand tools
- Machine tools and presses
- Pumps and compressors
- Mounting bolts
- Gear boxes
- Up to M20

HIGH STRENGTH THREADLOCKERS



- Permanently assembly
- Heavy equipment
- Suspension bolts
- Motor and pump mounts
- Bearing cap bolts and studs
- Up to M27 and larger diameters

PENETRATING THREADLOCKERS



- Removable with heat and hand tools
- Preassembled fasteners
- Instrumentation screws
- Electrical connectors
- Carburetors
- Up to M14

Loctite® Threadlocking Solutions

Selectors chart

	Criteria	Product	Colour	Thread size upto	Operating temperature
Core liquid line:	Low strength	Loctite® 222	purple fluorescent	M14	-55°C to + 150°C
	Medium strength	Loctite® 243	blue fluorescent	M20	-55°C to + 150°C
	High-medium strength	Loctite® 262	red fluorescent	M27	-55°C to + 150°C
	High strength	Loctite® 270	green fluorescent	M27	-55°C to + 150°C
Specialty liquid line:	Passive surfaces	Loctite® 2701	green fluorescent	M27	-55°C to + 150°C
	High temperature	Loctite® 272	red-orange	M27+	-55°C to + 230°C
	Wicking/Capillarity	Loctite® 290	green fluorescent	M14	-55°C to + 150°C
Semi-solid line:	Medium strength	Loctite® 248	blue fluorescent	M20	-55°C to + 150°C
	High Strength	Loctite® 268	red fluorescent	M20	-55°C to + 150°C



When should I use a Loctite® primer?

Speed up cure

Significantly speed up the cure time of Loctite® threadlockers when assembling metal parts that are cold, have large gaps or deep threads.



Loctite® 7088 Primer

Inactive metal assemblies*

When assembling metal parts with inactive surfaces, Loctite® primers are recommended to ensure proper performance of Loctite® threadlockers.

*Inactive Metals (Primers Recommended)			Active Metals (Primers Optional)	
Plated Parts	Zinc	Magnetite Steel	Iron	Bronze
Anodized Aluminum	Pure Aluminum	Inconel®	Plain Steel	Nickel
Titanium	Cadmium	Silver	Copper	Manganese
Stainless Steel	Magnesium	Gold	Brass	Monel®
Galvanized Steel	Natural or Chemical Black Oxide			Kovar®

Loctite® threadlockers cure in the absence of air and presence of metal ions. When assembling inactive metal parts, which are low in metal ions, the use of Loctite® primers are recommended to ensure proper performance of Loctite® threadlockers.

Application Cases



König + Neurath AG

Assemblies in seating furniture are subject to enormous forces of motion. König + Neurath AG uses threadlocking adhesives on various threaded joints in their products (seating furniture and workplace systems). Threadlockers Loctite® 242 and 270 are applied to ensure improved strength, to enhance stability and extend the service life of the furniture.



LEMKEN GmbH & Co. KG

Agricultural machinery for soil cultivation is exposed to severe vibrational loading. The notched hollow disc on the left is attached to the frame and secured with a nut. The bearing mounted disc is used for loosening and mixing of soil. As the disc rotates at a high peripheral speed, Loctite® threadlocker is applied to the locknut for additional protection to permanently resist self-loosening of the nut.



Stuttgarter Straßenbahnen AG

Thousands of passengers trust in the safety of SSB, the Stuttgart urban light rail transportation they use on a daily basis. SSB workshops are responsible for repair and maintenance of all vehicle components. To ensure reliable assemblies of axles, bogies, transmission and motor, numerous threaded fasteners are locked with Loctite® 243 or 262.



Gottwald Port Technology GmbH

Gottwald Port Technology GmbH builds a wide range of different cranes from railway and harbour cranes to fully automated stacking cranes. Particularly high loads are encountered during loading and unloading, and the hoisting gear of a crane must be capable of withstanding these loads. For reliable, permanent operational readiness the threaded fasteners used to assemble the electric motor to the transmission are secured with Loctite® 243.



SCHOTTEL GmbH

Threaded assemblies in ship propellers operate under severely adverse conditions, exposed to vibrations, water currents and corrosion processes. SCHOTTEL's product line includes rudder propellers in the megawatt range. Such enormous dynamic loads require the use of Loctite® threadlockers to resist self-loosening. In addition, the assemblies are sealed for permanent corrosion protection. Loctite® products therefore contribute significantly to operational safety and extend the service life of underwater components.



Application Cases



Ehlebracht Slowakei s.r.o.

A large portion of LCD and plasma monitors are mounted on rotating holders before being fixed to the wall. Ehlebracht Slowakei s.r.o. manufactures these mounting devices for the electronics industry. As these holders are often subject to numerous load cycles there is a high risk of self-loosening of the nuts and bolts. To counteract this problem, wicking grade threadlocker Loctite® 290 is applied to the galvanized screw after assembly.



Professional Barrier Systems Ltd.

Professional Barrier Systems Ltd. manufactures the highly respected Extendor range of physical security devices for the protection of window and door openings. The systems feature retractable grilles which blend into door and window surrounds when they are not in use. From a security standpoint, preventing the barrier's threaded locking mechanism from moving is a necessity. For this crucial task Loctite® 268 threadlocking stick is applied before assembling the parts.



Hiller GmbH

The decanter centrifuge has become a major processing tool in a wide range of applications, e.g. for the separation of waste water and rape seed. The environment is harsh and chemical resistance is needed for all parts of the centrifuge. For components such as the bowl, conveyor, base frame, housing and most of all the centrifuge drive it is very important to prevent loosening and corrosion of the fasteners to ensure reliability of the components. As a result, manufacturer Hiller GmbH uses Loctite® threadlockers in many of their assembly applications.



We trust in Loctite® Threadlocking Solutions

BOMAG
FAYAT GROUP



moventas

CLAAS



DEMAG
Cranes & Component



SAME

DYNAPAC

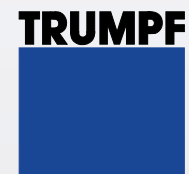


FESTO

LIEBHERR



StatoilHvdro



Loctite® Solutions

When you choose the Loctite® brand, you receive much more than a reliable assembly, you obtain a comprehensive solutions package:

- Wide product range
- Advanced training programs
- Engineering services
- Research and development
- Agency certification and approvals
- Local application assistance
- Global availability



Henkel Asia-Pacific & China
Headquarters
Henkel (China) Co., Ltd.
No. 928 Zhangheng Road
Zhangjiang High-Tech Park, Pudong
Shanghai, 201203, P.R.China
Tel: +86-21-2891 8000
Fax: +86-21-2891 8971

Henkel Australia Pty Ltd.
135-141 Canterbury Road
Kilsyth, Victoria 3137, Melbourne
Australia
Tel: +61-3-9724 7200
Fax: +61-3-9761 3986

Henkel Adhesives
Technologies India Pvt. Ltd.
1, Airport Service Road
Domlur Layout
Bangalore 560071
Karnataka, India
Tel: +91-80-2535 7771
Fax: +91-80-2535 7770

Henkel Hong Kong Ltd.
Units 807-810, 8/F Island Place Tower
510 King's Road, North Point
Hong Kong
Tel: +852-2233 0000
Fax: +852-2802 9995

PT Henkel Indonesien
Jalan Raya Jakarta Bogor Km 31.2
Cimanggis Depok 16953
Indonesia
Tel: +62-21-8775 2196
Fax: +62-21-870 1823

Henkel Japan Ltd.
Henkel Technology Center -
Asia-Pacific
27-7 Shin Isogo-cho
Isogo-ku, Yokohama
235-0017 Japan
Tel: +81-45-758 1800
Fax: +81-45-758 1851

Henkel (Malaysia) Sdn Bhd
46/F, Menara Telekom (South Wing)
Jalan Pantai Baharu
59200 Kuala Lumpur
Malaysia
Tel: +60-3-2246 1000
Fax: +60-3-2246 1188

Henkel Korea Ltd.
11/F, Mapo Tower
418 Mapo-dong, Mapo-gu
Seoul, 121-734 Korea
Tel: +82-2-3279 1700
Fax: +82-2-3273 4663

Henkel Philippines Inc.
21/F, Asian Star Building
2402-2404 Asean Drive
Filinvest Corporate City
Alabang Muntinlupa City 1781 Philippines
Tel: +63-2-807 6992
Fax: +63-2-850 4763

Henkel New Zealand Ltd.
2 Allens Road, East Tamaki
PO Box 58 493, Greenmount 1730
Auckland, New Zealand
Tel: +64-9-272 6710
Fax: +64-9-272 6735

Henkel Taiwan Ltd.
10/F, No. 866 Chung Cheng Road
Chung Ho City, Taipei County 235
Taiwan (R.O.C)
Tel: +886-2-2227 1988
Fax: +886-2-2226 8699

Henkel (Thailand) Ltd.
35/F, Central World Tower
999/9 Rama I Road
Khwaeng Patumwan
Khet Patumwan
Bangkok 10330, Thailand
Tel: +66-2-209 8000
Fax: +66-2-209 8008

Henkel Singapore Pte Ltd.
#03-01/02, Haw Par Technocentre
401 Commonwealth Drive
Singapore 149598
Tel: +65-6266 0100
Fax: +65-6266 1161

Henkel Vietnam Co., Ltd.
Room 1011, 10/F Giay Viet Plaza
180-182 Ly Chinh Thang Street
Ward 9, District 3, Ho Chi Minh City
Tel: +84-290 5489
Fax: +84-290 5490

Henkel KGaA (Headquarters)
Henkelstraße 67
40589 Düsseldorf
Germany
Tel: +49-211 7970
Fax: +49-211 7980

