

LOCTITE®

Threadlocking Capability Guide



Henkel

Threadlocking Technology

Introduction to threaded assemblies

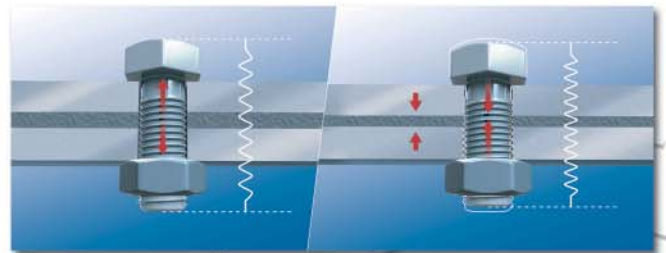
Every day we use products that contain numerous threaded fasteners. Screw joints are still the most common way of establishing a dismountable, yet secure fixing between two parts. Although they come in various shapes and sizes, all threaded fasteners are used to accomplish the same goal: achieve durable assembly. Hence, it is vital that bolt tension and clamping forces are maintained.

Why do threaded assemblies fail?

Threaded assemblies generally fail because of a loss in bolt tension. The main causes for this are **relaxation** and **self-loosening**.

Relaxation results in a change in bolt tension which leads to a reduced clamping force. This effect is triggered by:

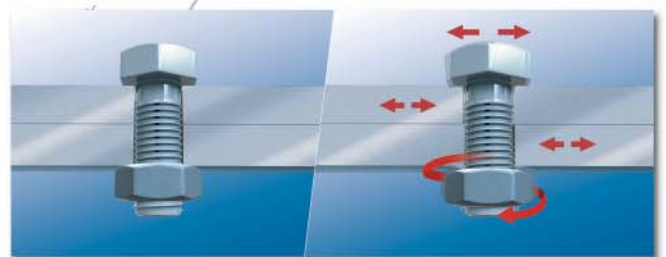
- Settling – pressure-induced smoothing of the surface roughness
- Creeping – time-dependent yielding of substrates when loads exceed the compressive strength of the material e.g. when clamping gaskets.



Relaxation in detail

If the elastic capacity of the assembly is inadequate, e.g. if bolts are too stiff or the wrong length to diameter ratio is selected, the loss of bolt tension cannot be compensated.

Self-loosening is caused by any type of dynamic load, such as vibration or changes in temperature. Insufficient clamp load and poorly fitting parts allow relative movements which increase the risk of **self-loosening**. These load changes lead to short-term frictionless situations where the bolt unwinds from the nut. The sum of these very small movements ultimately results in the loosening of the threaded assembly.



Self-loosening in detail

While **relaxation** can only be reduced by changes in parts design (e.g. length to diameter ratio) or the use of elastic elements, **self-loosening** can only be avoided by using the appropriate threadlocking devices.

Threadlocking Technology

How to secure a threaded assembly?

Examples of threadlocking methods:



Mechanical devices
(e.g. tab washers, split pins)
Only used to prevent the loss of nuts and bolts



Locking devices
(e.g. tooth or ribbed flanged bolts)
Prevent self-loosening, but are expensive; need larger flange-bearing surfaces and damage the surfaces



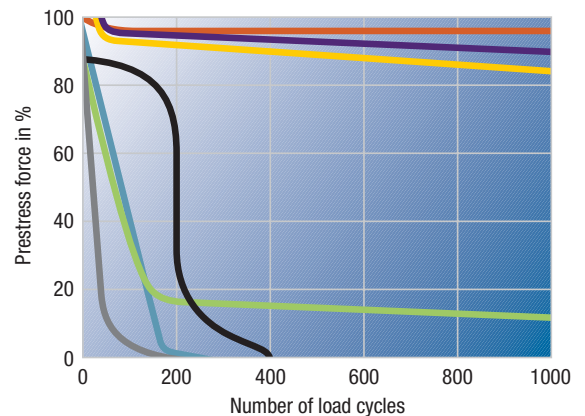
Friction devices
(e.g. split ring or spring washers)
Add to absolute elasticity and/or increase friction; will not ensure permanent threadlocking under dynamic loads



Loctite® threadlockers
(e.g. Loctite® 243 or Loctite® 2701)
Permanently secure threaded assemblies

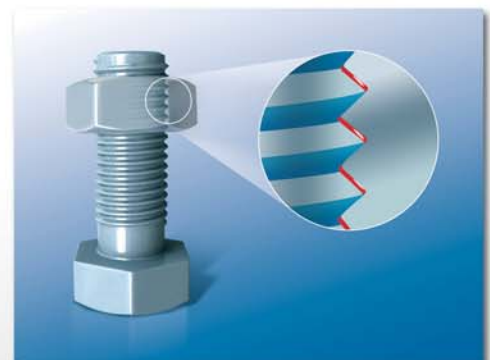
The results of the transverse shock test clearly show the different success levels of the various threadlocking methods. Loctite® threadlockers achieve the best clamp-load retention.

- Standard bolt with Loctite® threadlocking system
- Adhesive bolt (ribbed flange bolt)
- Bolt with saw-toothed flange
- Nut with polyamide washer
- Bolt with DIN 6797 A tooth lock washer
- Bolt with DIN 127 A spring washer
- Unsecured standard bolt



How does a Loctite® threadlocker work?

Loctite® threadlockers are single component adhesives that completely fill all voids between the interfacing threads. They cure in the absence of air and in contact with metal to form a tough thermoset plastic, thus creating an interfacial connection that maintains the friction between the threads by adhesion to both flanges and by cohesion within the adhesive layer. This prevents any movement between the threads.



Loctite® threadlocker between the interfacing threads

LOCTITE® Threadlocker Range

How to use a Loctite® threadlocker?

To achieve optimum performance all parts have to be clean and free of oil/grease. Loctite® threadlockers should be applied as follows:

Note:

Passive materials like stainless steel, aluminium or coated metals may require the use of activators to initiate/speed up cure.



For through holes

For blind holes

For post assembly

Classification

There are several factors to consider when choosing a threadlocker, a key criterion being the required strength. Loctite® threadlockers are divided into three different classes:

- **Low strength:** Easy disassembly using hand tools
- **Medium strength:** Disassembly possible with standard hand tools
- **High strength:** Disassembly difficult with standard tools; localized heat (>250°C) and disassembly while hot may be necessary

Besides strength, there are various performance criteria to be considered for choosing the correct Loctite® threadlocker for specific applications. The table below shows a selection of the major Loctite® threadlockers. Various other grades with special performances are available.



Selectors Chart

| | Criteria | Product | Colour | Max. thread size | Operating temperature |
|-------------------------------|---------------------|---------------|--------------------|------------------|-----------------------|
| Core liquid line: | Low strength | Loctite® 222 | purple fluorescent | M36 | -55°C to +150°C |
| | Medium strength | Loctite® 243 | blue fluorescent | M36 | -55°C to +150°C |
| | High strength | Loctite® 270 | green fluorescent | M20 | -55°C to +150°C |
| Specialty liquid line: | Passive surfaces | Loctite® 2701 | green fluorescent | M20 | -55°C to +150°C |
| | High temperature | Loctite® 272 | red-orange | M80 | -55°C to +230°C |
| | Oil tolerant | Loctite® 278 | green fluorescent | M36 | -55°C to +200°C |
| | Wicking/Capillarity | Loctite® 290 | green fluorescent | M8 | -55°C to +150°C |
| Semi-solid line: | Medium strength | Loctite® 248 | blue fluorescent | M50 | -55°C to +150°C |
| | High strength | Loctite® 268 | red fluorescent | M50 | -55°C to +150°C |

LOCTITE® Threadlocker Range

Multiple Functionalities

Vibration resistance

- One solution for locking and sealing in any position
- Resists vibration and torque down to zero bolt tension
- Superior to all mechanical locking devices

Prevention of galling and corrosion

- Liquid film prevents friction welding or galling
- Sealing effect prevents corrosion
- Permits disassembly

Excellent durability

- Withstands most industrial gases and fluids
- Thermal resistance up to 150°C and higher
- Field-proven for decades

Secured bolt tension and clamp force

- Prevents unwinding
- Controlled clamp load

Your Benefits

Increased reliability

- Joints withstand vibration, shock and thermal cycling
- Threads are sealed to prevent corrosion
- Clamp load is maintained

Longer end product life

- Assembly remains locked and leak-proof for its full service life
- Clamp load retention and higher off-torque provide additional safety

Cost savings

- Lower cost per unit compared to mechanical locking devices
- Lower costs for storage, purchasing, maintenance and repair
- Ease of automation reduces assembly costs and increases throughput

Low investment

- Universally applicable for a wide range of thread sizes
- Easy to integrate into production with low equipment needs

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 und 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

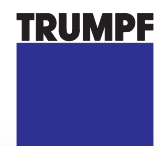
The decanter centrifuge has become a major processing tool in a wide range of applications, e.g. for the separation of waste water and rape seed. The environment is harsh and chemical resistance is needed for all parts of the centrifuge. For components such as the bowl, conveyor, base frame, housing 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.



Loctite® Equipment

For automated/semi-automated operation proper Loctite® equipment is available through your local customer support.

We trust in Loctite® Threadlocking Solutions



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