Threadlocking
User’s Guide

What you need to know to ensure a reliable threaded assembly

www.useloctite.com
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 50 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

Table of Contents

THREADED FASTENERS

- Functions of a threaded assembly .......................................................... 2
- Why do threaded assemblies fail? .......................................................... 2

LOCKING METHODS

- Shortcomings of locking devices .......................................................... 3
- Why use Loctite® threadlockers? .......................................................... 3

LOCTITE® THREADLOCKING SOLUTIONS

- How does a Loctite® threadlocker work? ................................................. 4
- How do I use a Loctite® threadlocker? .................................................. 4
- When should I use a primer? ................................................................. 5
- Loctite® threadlocker key selection factors ........................................... 5

HOW TO SELECT THE RIGHT LOCTITE® THREADLOCKER

- Decision tree ....................................................................................... 6, 7

LOCTITE® INNOVATIONS ................................................................... 8

LOCTITE® THREADLOCKER PROPERTIES CHART .................. 9
Functions of a threaded assembly

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

Why 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.

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

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

Why use Loctite® threadlockers?

Loctite® Benefits

Better Performance
- Reliable assembly: Lock against vibration, shock and thermal cycling – plus seal 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 reduce 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

Note: Results from the Transverse Vibration Test (Junkers Machine) that assesses fasteners’ resistance to vibration loosening.

Cost per locking application

<table>
<thead>
<tr>
<th>Fastener Size</th>
<th>Split Ring Washer</th>
<th>Loctite® Threadlocker</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot;</td>
<td>2¢</td>
<td>2¢</td>
</tr>
<tr>
<td>5/8&quot;</td>
<td>9¢</td>
<td>5¢</td>
</tr>
<tr>
<td>7/8&quot;</td>
<td>25¢</td>
<td>7¢</td>
</tr>
</tbody>
</table>

Note: Washer pricing based on 100 units purchased at an industrial distributor; Loctite pricing based on 50 ml bottle price and number of drops required per application.
**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 a unitized component and ultimately prevents loosening.

**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.

How do I use a Loctite® threadlocker?

**Application Options**
- **For through-holes**
- **For blind holes**
- **For push-assembly**
- **For overhead applications**
- **For pre-applied applications**

**Dispensing Options**
- 250 ml and 50 ml push-pull bottle
- 250 ml and 50 ml Loctite® hand pump
- Loctite® integrated semiautomatic dispenser, dispensing valve and stationary dispensing valve

For maximum convenience and productivity, Loctite® threadlockers can be dispensed through Loctite® dispensing systems. For more information, visit www.equipment.loctite.com.

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. Not required for primerless products.

**Inactive metal assemblies**
When assembling metal parts with inactive surfaces, Loctite® primers are recommended to ensure proper performance of Loctite® threadlockers. Not required for primerless products.

**Loctite® threadlocker key selection factors**

**Strength**
- **Low Strength**: Ideal for fasteners < ¼” (6 mm). Easy disassembly using hand tools.
- **Medium Strength**: Designed to be removable with standard hand tools on ¼” to ¼” fasteners.
- **High Strength**: Designed to deliver high strength on ¼” to ¾” (6 mm to 22 mm) fasteners. For removal, it may require localized heat (>550°F/260°C), hand tools, and disassembly while hot.

**Viscosity**
- **Liquid Formulas**: Everyday assembly; ideal for fine threads and blind holes
- **Semisolid Formulas**: Pocket-friendly, ideal for overhead applications
- **Tape Formula**: Pocket-friendly; controlled application; can be pre-applied several days before assembly

**Application Methods**
- **Pre-Applied**: QuickTape™ threadlocker 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® Threadlocker Selection

### Are the parts being assembled metal or plastic?

- **Plastic Assembly**
- **Metal Assembly**

### Are the parts already assembled?
- No
- Yes

### Is the assembly exposed to extreme temperatures?
- No
- Yes

### Are you assembling large fasteners?
- No
- Yes

### What strength do you require?
- **Low Strength**
  - Solution
    - **Loctite® Assure**
      - Instant Adhesive
        - Perfect for fasteners up to ¼" (6 mm) diameter.
    - **Loctite® 220™ Threadlocker**
      - Medium Strength / Wicking / Blue
      - A low viscosity threading adhesive that allows the product to stick along the thread of preassembled fasteners. Perfect for fasteners up to ¼" (6 mm).
    - **Loctite® 290™ Threadlocker**
      - High Strength / Medium Strength
      - Recommended for locking fasteners that are exposed to temperatures up to 650°F (340°C). Recommended for locking fasteners permanently.
  - **Medium Strength – Blue Paste**
    - **Loctite® 2422™ Threadlocker**
      - High Temp / Medium Strength
      - Recommended for locking fasteners that are exposed to temperatures up to 650°F (340°C). Recommended for locking fasteners permanently.
    - **Loctite® 2680™ Threadlocker**
      - High Temp / High Strength
      - Recommended for fasteners over ¼" (22 mm). Formulated with increased lubricity to reduce friction and allow proper clamping force to be achieved. Ideal for locking fasteners permanently.
  - **High Strength – Liquid**
    - **Loctite® 3047™ Threadlocker**
      - High Strength / High Strength
      - Recommended for fasteners that require high strength. Formulated for use on a variety of metals, including stainless steel and most plated fasteners. Commercially available in a variety of sizes and quantities. Ideal for high-strength applications.

### Are you assembling large fasteners?
- No
- Yes

### What strength do you require?
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  - **Liquid Product**
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### What do you need to know?
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### Helpful Hints:
- **Clean part with Loctite® ODC-Free Cleaner & Degreaser before applying the adhesive.**
- **If the threadlocker will be applied below 40°F (4°C), pre-treat with Loctite® 7649™ Primer N™.**
- **Aqueous washing solutions and cutting fluids can leave a protective layer on the surface. Wash with hot water before use or use compatible contaminant 243™ or 263™ Threadlocker.**

### Product Details
- **Solution**
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    - Formulated for use on a variety of metals, including stainless steel and most plated fasteners. Commercially available in a variety of sizes and quantities. Ideal for high-strength applications.
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Loctite® Innovations

Tape and Semisolids Products – Versatility and Cleanliness

Loctite® QuickTape™ 249° Threadlocking Tape
The first threadlocker in a convenient, tape form. Easy to use with no mess and no waste. Loctite® QuickTape™ 249° provides the same reliable performance as traditional Loctite® medium-strength threadlocking liquids and sticks. It can even be pre-applied for future assemblies. It’s a MUST HAVE for every toolbox!

Loctite® QuickStix™ 248° Medium Strength Loctite® QuickStix™ 268° High Strength Loctite® QuickStix™ 7088® Primer
No mess, easy to apply and pocket-sized. Ideal for overhead and pre-dispensed applications.

Rendered Strength

Loctite® 424° Medium Strength and Loctite® 263° High Strength Threadlockers
The NEW Loctite® 424° Medium Strength and 263° High Strength Threadlockers offer all of the performance properties of the original Loctite® 242° and 262° products, plus more, to meet the ever-changing, ever-demanding industrial environments of today and tomorrow. The new formulas offer:

- High temperature performance to withstand temperatures up to 360°F (182°C)
- Improved cure performance on oil-contaminated surfaces
- Cure without primer, even on inactive surfaces such as stainless steel

High Temperature Products – Performance and Convenience

Loctite® 242° Threadlocker, High Temp, Medium Strength Loctite® 262° Threadlocker, High Temp, High Strength
New paste formula does not run or migrate, and withstands continuous exposure to temperatures up to 650°F (340°C). These products are conveniently packaged in syringes for easy dispensing. Disassemble Loctite® 2620° Threadlocker, High Temp, High Strength requires heating to above 650°F (340°C) and disassembling while hot.

Large Fastener Product – High Lubricity and High Strength

Loctite® 204° Threadlocker, High Lubricity and High Strength
Designed for applications on fasteners over ¾" in diameter, this threadlocker and its formula with increased lubricity allow proper clamp load to be achieved by reducing friction. In addition, its high strength property will ensure that clamp load is maintained when exposed to vibration. Standard threadlockers may not have sufficient lubricity on large fasteners to achieve ultimate clamp load.

Low Odor Product – Sensitive Areas and Confined Spaces

Loctite® 242° Threadlocker, Low Odor, Medium Strength
Designed for applications in sensitive areas and confined spaces. Suits for fasteners between ⅛" and ¾".

Loctite® Primer Properties Chart

Loctite® Threadlocker Properties Chart
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

For your local Loctite® Adhesives and Sealants Specialist, the nearest authorized Loctite® products distributor, to place an order, to arrange an in-plant seminar or for technical product assistance, call 1.800.LOCTITE (562.8483) in the U.S.A, or call 1.800.263.5043 within Canada.