Threadlocking
User’s Guide

What you need to know to ensure a reliable threaded assembly

www.useloctite.com
Loctite® — Finding a Better Way

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

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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.

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.

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>
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</tbody>
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Note: Washer pricing based on 100 units purchased; no industrial discount. 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 nozzles
- 250 ml and 50 ml Loctite® hand pumps
- Loctite® integrated pneumo-electric dispense valve
- Loctite® integrated automonumatic dispense 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.

<table>
<thead>
<tr>
<th>Inactive Metals</th>
<th>Active Metals</th>
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</thead>
<tbody>
<tr>
<td>Primekote™</td>
<td>QuickStix™ 425™</td>
</tr>
<tr>
<td>Primerless</td>
<td>Primerless</td>
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</tbody>
</table>

**Loctite® threadlocker key selection factors**

**Strength**
- **Low Strength:** Ideal for fasteners <1/4” (6 mm). Easy disassembly using hand tools.
- **Medium Strength:** Designed to be removable with standard hand tools on 1/4” to 1/2” fasteners.
- **High Strength:** Designed to deliver high strength on 1/4” to 3/4” (6 mm to 22 mm) fasteners. For removal, it may require localized heat (>550°F/280°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.
- **Post-Assembly:** Most Loctite® liquid threadlockers are designed to be applied at the moment that parts will be assembled.

**Materials Being Assembled**
- **All Loctite® Threadlockers:** Metal-to-metal applications.
- **Loctite® 425® Assure®:** Plastic-to-plastic, plastic-to-metal applications.

**Pre-Assembly:**
- **Pre-Applied:** Can be applied on parts that are waiting to be assembled.
- **Tape Formula:** Can be pre-applied several days before assembly.

**Active Metals**
- **Iron**
- **Manganese**
- **Plated Parts**

**Inactive Metals**
- **Primers Recommended**
- **Primers Optional**

**Galvanized Steel**
- **Natural or Chemical Black Oxide**
- **Black Oxide**

**Magnesium**
- **Cadmium**
- **Pure Aluminum**

**Titanium**
- **Anodized Aluminum**

**Stainless Steel**
- **Inconel®**
- **Titanium**

<table>
<thead>
<tr>
<th><strong>Galvanized Steel</strong></th>
<th><strong>Stainless Steel</strong></th>
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<tbody>
<tr>
<td><strong>Anodized Aluminum</strong></td>
<td><strong>Inconel®</strong></td>
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</table>
**Loctite® Threadlocker Selection**

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

<table>
<thead>
<tr>
<th>Plastic Assembly</th>
<th>Metal Assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wicking Paste</strong></td>
<td></td>
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###Loctite® 425® Assure

**Instant Adhesive**

Low strength, best surface-curing threadlocker for plastic fasteners. Can be used as a temporary locking agent for the head of screws. Can be applied before or after assembly.

###Loctite® 222® Threadlocker

- **Medium Strength / Wicking / Blue**
- **High Strength / Red Paste**

###Loctite® 262® Threadlocker

- **High Temp / Medium Strength**
- **High Temp / High Strength**

###Loctite® 242® Threadlocker

- **Medium Strength / Wicking / Green**
- **High Temp / Medium Strength**
- **High Temp / High Strength**

###Loctite® 268® QuickStix® Threadlocker

- **High Lubricity – Black**

###Loctite® 2620® Threadlocker – Low Strength

Recommended for low strength threadlocking of adjacent joint surfaces, countersunk head screws and set screws, on collars, pulleys, brackets and connectors. Also for low strength metal such as aluminum or brass.

Also available in Loctite 222MS® aerosol which can be used as a spray. Can be applied before or after assembly.

### Are the parts already assembled?

- **Yes**
- **No**

### Is the assembly exposed to extreme temperatures?

- **Yes**
- **No**

### Are you assembling large fasteners?

- **Yes**
- **No**

### What strength do you require?

#### Low Strength

- **Liquid Product**
  - **Medium – Blue**
  - **Medium / High Strength – Blue Paste**
  - **High Strength – Red Paste**

#### High Lubricity – Black

- **High Strength – Liquid**

### Product Details

- **Solution**
  - **Fastener Size**
    - **Small fasteners**
    - **Medium fasteners**
    - **Large fasteners**
- **Cure Time**
  - 4 / 2
  - 6 / 24 hrs.
  - 20 min. / 24 hrs.
  - 90 / 24 hrs.
  - 102 / 12
  - 161 / 10
  - 204 / 35
  - 309 / 150
- **Torque**
  - 10 / 40 in-lbs.
  - 30 / 200 in-lbs.
  - 50 / 1000 in-lbs.
- **Temp.**
  - 150°F (66°C)
  - 300°F (150°C)
  - 360°F (180°C)

### Helpful Hints:

- **Clean part with Loctite® D2C-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 contaminant tolerant 243™ or 263™ Threadlocker.**

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**IMPORTANT!** See page 5 for more information on:

- **Primers and inactivator metals**
- **Strength**
- **Application methods**
Loctite® Innovations

Tape and Semisolid 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-friendly. Ideal for overhead and pre-dispensed applications.

Primeless Products – Speed and Performance

Loctite® 243® Medium Strength and Loctite® 263® High Strength Threadlockers
The NEW Loctite® 243™ 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 able to withstand temperatures up to 360°F (182°C)
• Improved cure performance on oil-contaminated surfaces
• Cure without primer, even on in-active surfaces such as stainless steel

Loctite® 2422® Threadlocker, High Temp, Medium Strength
Loctite® 2620® 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.

Loctite® 2407® Threadlocker, High Lubricity and High Strength
Designed for applications on fasteners over ½" 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® 2423® Threadlocker, Low Odor, Medium Strength
Designed for applications in sensitive areas and confined spaces. Suited for fasteners between ¼" and ½".
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.