Introduction

This guide has been designed to provide quick and easy assistance to the professionals who service industrial gearboxes and look for reliability, longevity and cost reduction. With the help of this guide, you can:

- Easily select the right Loctite® products to help you service the wide variety of gearbox assemblies
- Prevent wear proactively
- Pinpoint the most suitable solution for servicing worn parts, or
- Determine the best product for your particular service or repair problem

Industrial gearboxes play an important role in processing and manufacturing facilities. Performance must be tailored to an endless diversity of demands, and reliable operation over a long service life with minimum maintenance is a key requirement. For plant professionals, the ultimate goal is to maximise machinery output, reliability and efficiency. That’s why a gearbox failure can be a costly setback to overall plant operations. Proactive maintenance will minimise expensive downtime, enhance reliability and dramatically cut costs.

Loctite® products are used in gearbox manufacturing worldwide to enhance quality and extend end-product life. The same high quality Loctite® technologies and products are also available to the people who maintain, repair and service gearboxes.

There is a comprehensive range of Loctite® products to

- Repair and prevent gearbox failures – on site, to minimise downtime
- Reclaim worn or damaged assemblies to avoid scrap and replacement costs
- Assist in assembly, installation and disassembly
- Ensure reliability and smooth running by restoring performance to "as new" condition

GEARBOX SERVICE MANUAL SOLVES REAL PROBLEMS

The applications described in the Gearbox Service Manual are based on a bevel helical gearbox configuration. They apply equally for helical gearboxes, worm gear units and geared motors. Applications on planetary gearboxes, due to their different construction, are shown in a separate illustration.

The Gearbox Service Manual is designed as a practical guide to provide essential information in a logical and systematic manner. It is structured in major sections covering key gearbox assembly groups, coupling and mounting, as well as general maintenance aids. The manual is based on the real world, and on solving real problems: you’re bound to find service and repair solutions you can use every day – quickly and conveniently.

FEASIBILITY CONFIRMED

The recommendations given in this Gearbox Service Manual are based on collaboration with customers, institutes and universities to establish their validity and confirm that these methods are operable, practicable and indeed the best solutions for servicing and repairing gearbox assemblies.

PROFIT FROM RELIABILITY

At Henkel, we understand the problems you face in ensuring reliability, safety and durability. We provide products for cost-efficient, easy and effective gearbox maintenance and repair.

Gears and gearboxes are generally robust and reliable devices. However, problems do occur, and need to be corrected. When gearboxes and ancillary equipment fails, the greatest concern is getting it running again, but spare parts may not always be readily available. Loctite® products not only provide reliable on-site repair capability, but emergency repair and service solutions that last or even extend the life time of equipment.

Contact your local Henkel representative for help to meet your specific product application needs.
Gearbox Service and Proactive Maintenance

- **Gearbox Service and Proactive Maintenance**
  - Prevent corrosion and seizure of dowel pins with Loctite® 8009 Heavy Duty Anti-seize.
  - See page 14
  - Repair housing cracks, porosities and defects with Loctite® Hysol 3471 Metal filled Epoxy.
  - See page 8
  - Rebuild and repair the bearing housing seat with Loctite® Hysol 3478 Superior Metal.
  - See page 12
  - Prevent bearing spin and fretting with Loctite® 603 or Loctite® 641 Retaining Compound.
  - See page 30
  - Secure and prevent leakage between oil seal and housing with Loctite® 248 Threadlocker, Loctite® 480 or Loctite® 435 Instant Adhesive.
  - See page 28
  - Prevent corrosion, seizure and boltloosening with Loctite® 243 or Loctite® 248 Medium Strength Threadlocker.
  - See page 14 and 18
  - Seal rigid parts without gasket shimming using Loctite® 518 or Loctite® 128068.
  - See page 16
  - Seal and lock fittings at any angle with Loctite® 577 or Loctite® 572 Thread Sealants.
  - See page 26
  - Prevent the mounting bolts loosening with Loctite® 2701 High Strength Threadlocker.
  - See page 52
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CHALLENGE

- Repair housing and cover defects
- Seal oil leaks due to damaged housing

Cause
- Gearbox housings may be porous
- Service or repair work may cause damage to gearbox housings and covers

SOLUTION #1

Sealing porosity (up to 0.05 mm) using wicking grade adhesive Loctite® 290

Steps
1. Thoroughly clean and dry the components with Loctite® 7063 Cleaner & Degreaser, insuring the porosity is oil free
2. Brush Loctite® 290 into the porosities
3. Allow to cure, typically for 3 hours
4. Clean of excess product

SOLUTION #2

Filling damaged areas with Loctite® Hysol 3471 Metal filled Epoxy

Steps
1. Thoroughly clean and dry the components with Loctite® 7063 Cleaner & Degreaser, insuring the repair area is oil free
2. Mix and apply Loctite® Hysol 3471 onto the area to be repaired
3. Allow to cure, typically for 12 hours to achieve functional strength
4. Machine to original size if required

For further technical details refer to selection chart on page 69.

YOUR ADVANTAGE

- Quick return to service
- Reduce scrap by salvaging and extending the life of gearbox housing and cover

For further technical details refer to selection chart on page XX.
**SOLUTION**

- Apply a film of Loctite® 641 Retaining Compound to the outside diameter of the bearing
- Loctite® 641 Retaining Compound is a medium strength, allowing for easy disassembly during future overhauls
- Alternatively use Loctite® 603 for a high strength joint or Loctite® 640 for longer assembly time

**Steps**

1. Clean the mating surfaces with Loctite® 7063 Cleaner & Degreaser
   - Note: Loctite® 603 is oil tolerant and cleaning is less critical
2. Apply a film of Loctite® Retaining Compound to the outside diameter of the bearing
3. Assemble using normal techniques
4. Functional cure in 6 hours at room temperature

For further technical details refer to selection chart on page 68.

**YOUR ADVANTAGE**

- Bearing movement is eliminated
- Bearing can be easily removed with standard tools
- Corrosion is eliminated because the air space between the bearing and the housing is sealed

**CHALLENGE**

- Prevent bearing spin, corrosion and housing damage

**Cause**

- Bearing outer races are prone to spinning within their housings, resulting in damage to the housing (regardless of whether or not they have been pressed or shrink fitted in place)
- The air space between a bearing and housing is an area susceptible to rust and fretting corrosion, thus causing damage to the parts
**CHALLENGE**

Repair and rebuild worn bearing housing

**Cause**
- Worn components lead to micro movement and additional wear
- Load produces axial forces that are higher than original calculations
- Spun bearing caused by seizure or inappropriate loads

**SOLUTION**

Rebuilding of the worn surface of the housing with Loctite® Hysol 3478 Superior Metal

**Steps**
1. Using a machining centre, undercut the housing bore by 1.5 mm in the worn area, leaving the surface rough
2. Clean parts with Loctite® 7063 Cleaner and Degreaser
3. Mix and apply a layer of Loctite® Hysol 3478 Superior Metal and force it into the rough surface finish. Build the surface above the final desired level
4. Allow the adhesive to cure for 12 hours at room temperature
5. Machine the repair to the required dimensions (in general press fit) using diamond cutting inserts
6. Clean the rebuilt surface and the outer bearing ring with Loctite® 7063
7. Retain the joint between the housing and the outer bearing race with Loctite® 2701

Assembly is restored, unitised, and ready for service without a major overhaul
- Easy and fast repair method, compared to alternative repair methods
- Joint between housing and bearing outer race is strengthened by using Loctite® Anaerobic Adhesive

For further technical details refer to selection chart on page 68 and 69.
**CHALLENGE**

- Prevent loosening and corrosion of split gearbox housing fasteners to ensure reliability of the gasket between the upper housing and the base
- Prevent corrosion and seizure of split gearbox alignment pins

**Cause**

- Fasteners can work loose when subjected to torque, vibration, thermal expansion and shock loads
  - Once the fasteners become loose, the preload for the gasket will be lost and the gasket will fail
  - Dowel pins can rust and seize into component, making disassembly very difficult

**SOLUTION**

- Apply Loctite® 243 or 248 Medium Strength Threadlocker to the housing fastener
- Use Loctite® 2701 for high strength or on stainless steel and plated fasteners
- Before assembly, apply a thin film of Loctite® 8009 Heavy Duty Anti Seize to the dowel pins

**Steps**

1. Clean the threads and pins with Loctite® 7063 Cleaner and Degreaser
2. Apply Loctite® 8009 Heavy Duty Anti Seize onto the dowel pin
   - Note: If a liquid gasket is in use, ensure only a very thin layer of Anti Seize is applied
3. Apply Loctite® 243 Medium Strength Threadlocker into lower third of the blind hole
   - Apply Loctite® 2701 High Strength Threadlocker if stainless steel fasteners are in use
4. Assemble and tighten

**YOUR ADVANTAGE**

- Prevention of rust and seizure of these close fitting parts
- Easy and consistent disassembly
- Prevents fasteners from loosening

For further technical details refer to selection chart on page 67.
**SOLUTION**

- Use Loctite® 518 Flange Sealant for standard gearbox size or Loctite® 128068 Flange Sealant for large gearboxes
- Optimum stiffness between mating parts means movement is minimized

**Steps**
1. Remove old gasketing material and other heavy contaminants with Loctite® 7200 Gasket Remover
2. Clean both flange surfaces with Loctite® 7063 Cleaner and Degreaser
3. Apply a continuous bead of Loctite® 518 Flange Sealant. Circle bolt holes with sealant if appropriate
   - Note: Use Loctite® 128068 Flange Sealant for large gearbox flanges. Loctite® 128068 is designed to cure slowly to allow extra time for assembly
4. Assemble parts and tighten as required
5. Allow to cure

**YOUR ADVANTAGE**
- High shear strength transmits forces from one part to the other
- Reliable seal

**CHALLENGE**

- Prevent gasket failure between the upper and lower housing of a split gearbox
- Ensure close tolerance control of the assembly
- Sealing of damaged surfaces

**Cause**
- Leaks occur because liquids migrate out of the joint
- Damaged flanges can result in a leak path
- Incomplete sealing of T-joints, where three parts come together (upper and lower housing and cover)

For further technical details refer to selection chart on page 68.
Housing and Cover Assembly

**SOLUTION**

- Apply Loctite® 243 or 248 Medium Strength Threadlocker to the housing fasteners
- Use Loctite® 2701 for high strength or on stainless steel and plated fasteners
- If locking of the fasteners is not required use Loctite® 8009 Anti-Seize

**Steps**
1. Clean the threads and pins with Loctite® 7063 Cleaner and Degreaser
2. Apply Loctite® 243 or 248 Medium Strength Threadlocker to the housing fasteners
   - Use Loctite® 2701 High Strength Threadlocker if stainless steel or plated fasteners are in use
3. Assemble and tighten

**YOUR ADVANTAGE**

- Correct clamp load is maintained
- Elimination of rust and seizure
- Easy disassembly with normal hand tools

**CHALLENGE**

- Prevent loosening and corrosion of the cover fasteners to ensure the reliability of the gasket between the housing and covers
- Typical applications are fasteners for inspection cover, bearing cover and input/output flanges

**Cause**
- Cover fasteners that are rusted and seized make gearbox maintenance difficult and create additional labour associated with drilling and tapping the fastener hole
- Fasteners can work loose when subjected to torque, vibration, thermal expansion and shock loads

For further technical details refer to selection chart on page 67.
Prevent leaks between the inspection cover / bearing cover / input – output flange and housing
Eliminate cut gaskets
Optimize sealing performance of cut gaskets

Cause
- The use of cut gaskets is associated with several inherent problems, such as gasket relaxation, shrinkage, extrusion, and breakage which can lead to leaks

SOLUTION #1
Replacing cut gaskets
- Sealing of rigid flanges
  Replace the cut gasket and apply Loctite® 518 Flange Sealant to the flange surface of the housing
- Sealing of flexible flanges
  Replace the cut gasket and apply Loctite® 5910 Flange Sealant to the flange surface of the housing

Rigid flanges are designed:
- To achieve optimum stiffness between
- To minimize movement between two parts
- To transmit forces from one part or another

Flexible flanges are normally used:
- To cover an opening in a housing two mating parts
- To cover moving parts
- To encapsulate components to reduce noise

Steps
1. Remove old gasket material with Loctite® 7200 Gasket Remover
2. Clean both flanges with Loctite® 7063 Cleaner & Degreaser
3. Apply a continuous bead of Loctite® Flange Sealant onto the housing, circle holes if appropriate
4. Assemble and tighten as required
   Note: If you are using Loctite® 5910, assemble parts within the skin over time (10 min)
5. Allow to cure

For further technical details refer to selection chart on page 68.
When the existing gasket needs to be used as a shim:

For increasing the sealing reliability and accurate positioning of the pre-cut gasket, use one of following products:

- Loctite® 5922 Flange Sealant, non hardening pre-cut gasket dressing
- Loctite® 534, hardening pre-cut Gasket Positioner

Steps
1. Remove old gasket material with Loctite® 7200 Gasket Remover
2. Clean both flanges with Loctite® 7063 Cleaner & Degreaser
3. Coat flange face on both sides (cover and housing) with Loctite® 5922 non hardening Flange Sealant or Loctite® 534 hardening Flange Sealant. Note: Although Loctite® 534 is a hardening Flange Sealant, the product allows a pre-cut gasket to be positioned on a gasket surface. It holds aggressively yet still allows for repositioning of the pre-cut gasket
4. Position the pre-cut gasket
5. Assemble and tighten as required
   Note: Accurate re-positioning, component assembly and tightening should be handled in a continuous workflow without interruptions
6. Assembly is operational after 6 hours

For further technical details refer to selection chart on page 68.
Use Loctite® 7200 Gasket Remover to soften the gasket material on the flanges, reducing need for scraping and avoiding possible damage to the machine surfaces.

Steps:
1. Protect painted surfaces thoroughly from over-spray, as Loctite® 7200 will attack the paint.
2. For best results, spray a heavy coat onto the flange or surface.
   - Note: Remove any surface oil using Loctite® 7063 prior applying Loctite® 7200.
3. Allow 10 to 15 minutes to soften the gasket.
4. Remove gasket with soft scraper and wipe flange or surface clean.
5. Repeat procedure if necessary.
6. Before application of new gasketing material, it is essential to clean the flange or surface with Loctite® 7063 Cleaner & Degreaser.

- Components are well prepared for assembly and flange sealing.
- Ideal surface preparation for chemical gaskets is ensured.
**Lubrication and Cooling System**

**SOLUTION**

- Seal threaded assemblies with Loctite® 577, 572 or 561 Thread Sealants
- When cured, Loctite® Thread Sealants are resistant to oil and water/glycol and ensure zero leakage
- Thread sealants prevent fittings from loosening, yet allow easy disassembly with normal hand tools

**Steps**
1. Clean parts with Loctite® 7063 Cleaner & Degreaser
2. Apply a bead of Loctite® Thread Sealant to the leading threads of the male fitting
3. Assemble parts and allow to cure

For further technical details refer to selection chart on page 67.

**YOUR ADVANTAGE**

- Elimination of all leaks
- No hazards and clean up associated with oil leaks
- No loss of coolant

**CHALLENGE**

- Prevent leaks from threaded fittings of lubrication and cooling systems

**Lubrication System**
- Prevent oil leaks on oil drain plug, oil inlet, housing ventilation, oil pump, oil filter and gauge glass

**Cooling System**
- Prevent leakage on the coolant pump, pressure and temperature control unit and all pipe work

**Cause**
- Traditional thread sealants a susceptible to weeping
- Constant pressure and temperature changes within a gearbox system can aggravate any leakage
- Vibration between the gearbox and lubrication/cooling system leads to stress on the pipe work
**Challenge**

- Prevent leaks between the gearbox housing and oil seal
- Prevent movement of oil seal in housing

**Cause**

- As with any press fit, there are small air spaces between the housing and the oil seal. This air space can create a leak path.
- In the case of a split gearbox housing, T-joints are potential leakage points.

**Solution #1**

- For oil seals with elastomer press fit:
  - Fill the air spaces by applying Loctite® 435 Instant Adhesive to the outside diameter of the oil seal.
  - For longer positioning time and oil seal diameter larger than 60 mm use Loctite® 480.
  - In the case of a cassette seal, also bond the inside diameter to the shaft using Loctite® 435 Instant Adhesive.

**Steps**

1. Clean the bonding surfaces of the oil seal and the gearbox with Loctite® 7063 Cleaner & Degreaser.
2. Apply the adhesive recommended for the different kinds of oil seals to the outside diameter of the oil seal.
   - Note: In the case of a cassette seal apply adhesive onto the cleaned shaft as well.
3. Press the oil seal into position using normal techniques and wipe off any excess.

**Solution #2**

- For oil seal with metallic clamping part:
  - Fill the air spaces by applying Loctite® 243 or 248 Medium Strength Threadlocker to the outside diameter of the oil seal.

**Your Advantage**

- A sealed assembly eliminates leaks, contamination and corrosion.
- Movement of oil seal during running is eliminated.
- The oil seal can still be easily removed with a screwdriver during the next overhaul.

For further technical details refer to selection chart on page 69.
**CHALLENGE**

- Prevent bearing spin
- Repair worn cylindrical shafts
- Prevent downtime and scrap costs

**Cause**
- Bearings are prone to spinning on their shaft, this results in damage
- Load produces axial forces that are higher than original calculations
- Spun bearing caused by insufficient interference or inappropriate loads

Depending on the extent of wear, the following adhesives are recommended:

**SOLUTION #1**

For gaps up to 0.05 mm:
- Retain joint using Loctite® 603 (oil tolerant, high strength)
  or Loctite® 641 (medium strength, easy to dismantle)
- Retaining Compound

**Steps**
1. Clean parts with Loctite® 7063 Cleaner and Degreaser
2. Apply a bead of Loctite® 603 or Loctite® 641 to the circumference of the shaft
3. Mount the bearing onto the shaft using normal techniques
4. Wipe off excess material
5. Allow adhesive to cure for 6 hours

For further technical details refer to selection chart on page 68.
SOLUTION #3

Shaft Mounted Components: Bearings

For gaps which exceed 0.25 mm:
- Rebuild with Metal filled Epoxy Loctite® Hysol 3478 Superior Metal to the original diameter + bond the bearing onto the rebuilt shaft with Loctite® 2701

Steps
1. Using a lathe, undercut the shaft in the worn area 1.5 mm deep
2. Dovetail the ends of the worn area to lock the application into place and leave a rough surface
3. Clean parts with Loctite® 7063 Cleaner and Degreaser
4. Apply a layer of Loctite® Hysol 3478 Superior Metal, build the surface above the final desired level
5. Allow the adhesive to cure for 12 hours at room temperature
6. Machine the repair with a diamond tipped tool to the required dimensions
7. Apply Loctite® 7649 Activator to the rebuilt area of the shaft
8. Apply Loctite® 2701 to the inner bearing race

Note: In the case of a shrink fit between the shaft and the bearing, apply Loctite® 638 Retaining Compound

For further technical details refer to selection chart on page 68 and 69.

YOUR ADVANTAGE

- Cylindrical joint is strengthened by using a Loctite® Retaining Compound
- Shaft is repaired to provide full surface contact
**CHALLENGE**

- Repair of axial score marks on cylindrical shafts
- Strengthen the retaining joint on worn shafts

**Cause**

- Disassembly of bearings and gear wheels frequently causes damage to shafts by scoring
- Bearings and gear wheels are mounted with a shrink fit. If they are dismantled without application of heat, friction results in axial score marks

**SOLUTION #1**

**Moderate scoring**

- Strengthen the joint between the damaged shaft and the bearing with Retaining Compound Loctite® 603

**Steps**

1. Remove any raised burs
2. Clean the parts with Loctite® 7063 Cleaner and Degreaser
3. Apply a bead of Loctite® 603 Retaining Compound to the circumference of the shaft
4. Press the bearing onto the shaft using normal techniques
5. Wipe off excess material

**SOLUTION #2**

**Heavy scoring**

- Fill the grooves with Loctite® Hysol 3478 Superior Metal to rebuild a uniform surface and ensure that the bearing will be mounted on a smooth shaft surface

**Steps**

1. Remove any raised burs
2. Clean parts with Loctite® 7063 Cleaner and Degreaser
3. Apply Loctite® Hysol 3478 Superior Metal into the groove. Build the surface slightly above the desired diameter
4. Allow the adhesive to cure for 12 hours at room temperature.
5. Grind the excess material with abrasive paper
6. Apply Loctite® 7649 Activator to the rebuild area of the shaft
7. Apply Loctite® 603 to the inner bearing race and assemble

For further technical details refer to selection chart on page 68 and 69.

**YOUR ADVANTAGE**

- Cylindrical joint is strengthened by using a Loctite® Retaining Compound
- Shaft is repaired to provide full surface contact
**SOLUTION #1**

**Shaft Mounted Components: Gear Sets**

**Bonding of gear wheels directly onto the shaft with high strength Retaining Compound Loctite® 648**

**Steps**
1. Clean parts with Loctite® 7063 Cleaner and Degreaser
2. Apply a bead of Loctite® 648 to the circumference of the shaft
3. Press the gear onto the shaft using normal techniques
4. Wipe off excess material
5. Allow adhesive to cure for 6 hours

For further technical details refer to selection chart on page 68.

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**CHALLENGE**

- Increase reliability and strength of a gear mounted on a shaft
- Repair worn taper joints

**Cause**

- Incorrect reassembly during maintenance leading to micro movements
- Overload conditions and elevated operating temperatures
Shaft Mounted Components: Gear Sets

SOLUTION #3

YOUR ADVANTAGE

- Taper joint is strengthened by using a Retaining Compound
- Assembly is restored and ready for service without a major overhaul

Shaft Mounted Components: Gear Sets

SOLUTION #2

Bonding a sleeve on the worn shaft with Loctite® 648

Steps
- Determine an appropriate size of sleeve and machine the shaft to match
- Clean parts with Loctite® 7063 Cleaner & Degreaser
- Apply a bead of Loctite® 648 to the circumference of the shaft
- Assemble sleeve on to the shaft
- Wipe off excess
- Allow adhesive to cure for 6 hours
- Apply the same product between the sleeve and the gear wheel

Steps
1. Using a lathe, undercut the shaft in the worn area 1.5 mm deep and leave a rough surface over the entire machined surface
2. Dovetail the ends of the worn area to lock the application into place
3. Clean parts with Loctite® 7063 Cleaner and Degreaser
4. Apply a layer of Loctite® Hysol 3478 Superior Metal, building the surface above the final desired level
5. Allow the adhesive to cure for 12 hours at room temperature
6. Machine the repair with a diamond tipped tool to the original dimensions
7. Apply Loctite® 638 Retaining Compound to the components
8. Assemble using normal procedures

For further technical details refer to selection chart on page 68 and 69.
Secure the key in the keyway on new equipment
Prevent micro movements that lead to wear
Repair worn keyways

Cause
- Alternating loads and combined loading result in micro movement wear and loose parts
- Over time, wear can cause keys to loosen – leading to damage of the keyway

SOLUTION #1

New components
- Apply a Loctite® Medium Strength Threadlocker to eliminate any future wear of the key or keyway

Steps
1. Clean the keyway and key with Loctite® 7063 Cleaner and Degreaser
2. Apply several drops of Loctite® 243 Threadlocker into the keyway, or Loctite® 248 Threadlocker onto the key
3. Insert the key into the keyway
4. Wipe off any excess adhesive
5. Allow the adhesive 6 hours to cure before assembling the gear wheel

For further technical details refer to selection chart on page 67.
**SOLUTION #3**

**Shaft Mounted Components: Gear Sets**

**New keyway in existing shaft and gear**

- If parts are badly worn it may be necessary to cut new keyways. In this case the old keyway should be filled with metal filled epoxy.

**Steps**

1. Clean parts with Loctite® 7063 Cleaner & Degreaser.
2. Mix and apply Loctite® Hysol 3478 Superior Metal into the keyway of both the shaft and gear.
3. Allow 12 hours curing time.
4. Machine the cured adhesive to the original dimensions of the shaft and bore of the gear.
5. Cut a new keyway in the shaft and gear.
6. Use solution No.1 above to refit the key.

**Note:** For gear sets mounted on a shafts use the same technique as mentioned in the bearing section of Shaft Mounted Component (see page 30-33).

For further technical details refer to selection chart on page 69.
### Couplings

#### Challenge
- Secure the key in the keyway on new equipment
- Prevent micro movements that lead to wear
- Repair worn keyways

#### Solution
- Please also refer to section “Prevent and repair keyway wear” on page 42-43.

#### Your Advantage
- Reduce the cost of replacement parts by salvaging and extending the life of the original components

### Challenge
- Protecting the spline assembly to prevent unnecessary fretting

#### Cause
- Wear will occur where there is friction and movement in the spline

#### Solution
- Use Loctite® 8012 Moly Paste proactively
- Moly Paste reduces friction and wear

#### Steps
1. Clean mating surface with Loctite® 7063 Cleaner & Degreaser
2. Coat mating surface with Loctite® 8012 Moly Paste
3. Assemble parts

#### Your Advantage
- Prevention of wear caused by friction
- Prevention of corrosion
SOLUTION #1
Bonding of a non sliding spline with backlash of up to 0.25 mm
• Bonding with Retaining Compound Loctite® 660 and Loctite® 7649 Activator

Steps
1. If possible abrasive blast the surface of the spline shaft and socket
2. Clean parts with Loctite® 7063 Cleaner & Degreaser
3. Check the spline area for uniformity
4. Apply Loctite® Hysol 3478 Superior Metal to the spline shaft and disperse the product uniformly over the spline circumference
Note: For wear between socket and shaft below 0.25 mm use Loctite® 660 Retaining Compound in combination with Loctite® 7649 Activator
5. Immediately push the spline shaft into the socket and remove excess adhesive
6. Allow the adhesive to cure before putting the equipment back into service

YOUR ADVANTAGE
• Assembly is restored and ready for service without major overhaul

SOLUTION #2
Rebuilding of a non sliding spline with backlash greater than 0.25 mm
• Rebuilding with metal filled Epoxy Loctite® Hysol 3478 Superior Metal

Steps
1. If possible abrasive blast the surface of the spline shaft and socket
2. Clean parts with Loctite® 7063 Cleaner & Degreaser
3. Check the spline area for uniformity
4. Apply Loctite® Hysol 3478 Superior Metal to the spline shaft and disperse the product uniformly over the spline circumference
Note: For wear between socket and shaft below 0.25 mm use Loctite® 660 Retaining Compound in combination with Loctite® 7649 Activator
5. Immediately push the spline shaft into the socket and remove excess adhesive
6. Allow the adhesive to cure before putting the equipment back into service

YOUR ADVANTAGE
• Assembly is restored and ready for service without major overhaul
Couplings

**CHALLENGE**

- Prevent couplings from moving due to loose set screws
- Secure coupling assembly screws against working loose
- Ensure optimum assembly life in “on site” conditions

**Cause**
- Couplings are commonly held in place by a key and a set screw
- Coupling assemblies are subjected to vibration and high loads which can cause threaded fasteners to loosen
- Typically, couplings are assembled on site; for this reason it is difficult to ensure that tightening specifications are followed

**SOLUTION**

Secure all threaded fasteners on couplings using Loctite® 243 or 248 Medium Strength Threadlocker

**Steps**
1. Clean the components with Loctite® 7063 Cleaner & Degreaser
2. Apply Loctite® 243 or 248 Medium Strength Threadlocker to all threaded fasteners
3. Align the coupling and assemble
4. Tighten each fastener within 5 minutes of assembly

**YOUR ADVANTAGE**

- All fasteners are secured in place
- Prevention of misalignment and coupling failure

For further technical details refer to selection chart on page 67.
**SOLUTION**

- Use Loctite® 638 High Strength Retaining Compound on the flange face to increase the torque capacity
- Increase torque capacity without any mechanical changes

**Steps**

1. Clean the surfaces with Loctite® 7063 Cleaner & Degreaser
2. Apply a thin film of Loctite® 638 on the entire surface of the coupling flange
3. Once you start to assemble, torque bolts within 10 minutes
4. Allow to cure for 6 hours before applying full load

**YOUR ADVANTAGE**

- Improved torque capacity without mechanical changes
- Eliminates micro movement and loss of joint tension
- Eliminates corrosion

---

**CHALLENGE**

- Upgrade the load capacity of existing flange drive couplings
- Reuse worn flange couplings

**Cause**

- The transmittable torque of a flange drive coupling is limited by the friction of the surfaces
- Overloading causes slippage and wear of the coupling surface
Mounting Gearbox to Motor

YOUR ADVANTAGE
- Mounting bolts and fasteners are secured in place
- Eliminate vibration loosening
- Eliminate bolt corrosion
- Prevent misalignment

CHALLENGE
- Secure all the components of the motor – gearbox – bedplate system
- Prevent loosening under high loads and vibration
- Select the correct threadlocking grade given the different load requirements and the need for dismantling

Cause
- Vibration and shock load can loosen fasteners and mounting bolts
- Loose bolts result in movement, which in turn allows the gearbox system to lose its alignment

For further technical details refer to selection chart on page 67.

SOLUTION #1
- Apply Loctite® 243 or 248 Medium Strength Threadlocker for applications such as engine flange and bell housing
- Use Loctite® 2701 for high strength needs such as gearbox and drive motor to bedplate fasteners

Steps
1. Clean parts with Loctite® 7063 Cleaner & Degreaser
2. Apply sufficient Loctite® Threadlocker to all fasteners
3. Assemble and tighten as usual

Where parts need to be aligned, tightened and adjusted, use Loctite® 290 Wicking Grade Threadlocker after final adjustment and tightening

SOLUTION #2
- Use Loctite® 2701 for high strength needs such as gearbox and drive motor to bedplate fasteners

Steps
1. Clean parts with Loctite® 7063 Cleaner & Degreaser
2. Align the assembly and tighten as usual
3. Apply Loctite® 290 Wicking Grade Threadlocker to surface of assembled fastener, it will penetrate into the gap between the assembled threads
**CHALLENGE**

- Light lubrication of metals during assembly and dismantling
- Assembly aid – aerosol – for all parts of the gearbox
- Protect machined components against corrosion

**SOLUTION**

Apply Loctite® 8201 Five Way Spray during dismantling and assembling

- Loctite® 8201 is a universal penetrating liquid which frees, lubricates, cleans, displaces moisture and prevents corrosion on all parts of the gearbox
- Loctite® 8201 does not contain silicone
- Loctite® 8201 provides light lubrication of mechanisms
- Loctite® 8201 displaces moisture and leaves a protective anti-corrosive film

**CHALLENGE**

- To free rusted, corroded and seized fasteners during dismantling

**SOLUTION**

Apply Loctite® 8040 Freeze & Release to seized parts

- The shock–freezing effect will cool parts down to – 43 °C and cause microscopic cracks in the layer of rust
- The freezing effect allows the lubricating ingredients to wick directly into the rust by capillary action
- Released fasteners remain lubricated and protected from corrosion

**Steps**

1. Remove dirt and loose rust from parts
2. Shake can thoroughly. Spray onto the fastener at a distance of about 10 to 15 cm for 5 to 10 seconds
3. Allow the product to react for 1 to 2 minutes before attempting to release the seized parts
4. Repeat application if necessary
**SOLUTION**

Apply Loctite® 8106 Multi Purpose Grease or Loctite® 8102 High Performance Grease onto any parts that need lubricating during assembly.

Loctite® 8012 Moly Paste ensures maximum lubricity, gives good resistance to extremely high loads and is ideal for protection of parts during running in or cold start.

**CHALLENGE**

Ensure easy assembly of all close fitting parts by using assembly paste.

**SOLUTION**

Apply Loctite® 8065 Copper Anti-Seize to non stainless external fasteners and dowel pins.

Use Loctite® 8009 Heavy Duty Anti-Seize on all metal fittings or in aggressive chemical environments.

• Prevent wear and cold welding during assembly and operation
• Anti-Seize products are used to lubricate and to permit easy disassembly
• Inhibit corrosion and oxidation in chemically and thermally hostile environments

**CHALLENGE**

Ensure easy future maintenance.

Protect fasteners and alignment pins against seizing and galling.

**SOLUTION**

Apply Loctite® 8065 Copper Anti-Seize to non stainless external fasteners and dowel pins.

Use Loctite® 8009 Heavy Duty Anti-Seize on all metal fittings or in aggressive chemical environments.

• Prevent wear and cold welding during assembly and operation
• Anti-Seize products are used to lubricate and to permit easy disassembly
• Inhibit corrosion and oxidation in chemically and thermally hostile environments
**SOLUTION #1–3**

**SOLUTION #1**
Use Loctite® 7840 Cleaner and Degreaser for general cleaning of large surfaces
- Loctite® 7840 is a water-based, concentrated, biodegradable cleaner & degreaser; it can be diluted to meet a wide range of industrial cleaning applications
- Loctite® 7840 is used for removing general surface dirt and contamination

**SOLUTION #2**
Use Loctite® 7070 Cleaner & Degreaser for machined components
- Loctite® 7070 Cleaner & Degreaser is a solvent-based general parts cleaner which leaves no residue
- Loctite® 7070 Cleaner & Degreaser has slow evaporation and can be used in dip tanks
- The product is used as a final pre-assembly cleaning treatment to remove most greases, oils, lubrication fluids, metal swarf from all surfaces to be bonded

**SOLUTION #3**
Use Loctite® 7063 Cleaner & Degreaser for small components and small surfaces
- Loctite® 7063 Cleaner & Degreaser is ideal for use prior to bonding as it leaves no residue
- Loctite® 7063 Cleaner and Degreaser is compatible with metal, glass, rubber, most plastics and painted surfaces
- The product is a non-CFC solvent-based formulation

**CHALLENGE**
- General cleaning of gearbox housing, covers and external surfaces
- General cleaning and degreasing of small surfaces like gear wheels and gearbox components
- Cleaning and degreasing of surfaces prior to bonding with Loctite® adhesives
CHALLENGE

- Converting existing rust on external components into a stable surface
- Protect surfaces from future corrosion

SOLUTION

Use Loctite® 7500 Rust Treatment for external components that are corroded

- Loctite® 7500 Rust Treatment is a non-toxic, aqueous liquid which dries at room temperature
- Converts existing rust and forms a primed surface ready for painting
- Protects surfaces from rusting

Steps
1. Shake container thoroughly before use
2. Ensure that all surfaces are free of any dirt, oil and loose corrosion
3. Sanding is not required
4. Apply liberally by brush, roller or sponge or airless spray gun
5. Application of 2 coats is recommended for maximum durability
6. Recoat time is 60 – 120 minutes. Allow 24 hours minimum to dry before painting

CHALLENGE

- Long term protection of ferrous metals against corrosion
- Surface treatment for external surfaces

SOLUTION

- Loctite® 7800 Zinc Spray provides cathodic protection
- Can be used for long term protection or as a primer
- Gives an aesthetically pleasing appearance
## Gearbox Application Product Table

### Gearbox Assembly Group – Product Index

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<td>Medium strength, oil tolerant</td>
<td>50 ml</td>
<td>135278</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Loctite® 248 Medium Strength Threadlocker</td>
<td>Semi-solid stick, medium strength</td>
<td>19 g stick</td>
<td>540491</td>
<td>48</td>
</tr>
<tr>
<td>Increase torque capacity: Flange couplings</td>
<td>Loctite® 638 Retaining Compound</td>
<td>High strength</td>
<td>50 ml</td>
<td>234795</td>
<td>50</td>
</tr>
<tr>
<td>Mounting fastener</td>
<td>Loctite® 243 Threadlocker</td>
<td>Medium strength, oil tolerant</td>
<td>50 ml</td>
<td>135278</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Loctite® 248 Medium Strength Threadlocker</td>
<td>Semi-solid stick, medium strength</td>
<td>19 g stick</td>
<td>540491</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Loctite® 290 Threadlocker</td>
<td>Wicking for post-assembly</td>
<td>50 ml</td>
<td>233733</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Loctite® 2701 Threadlocker</td>
<td>High strength</td>
<td>50 ml</td>
<td>234853</td>
<td>52</td>
</tr>
</tbody>
</table>
### Thread Locking

#### Are parts assembled?

<table>
<thead>
<tr>
<th>Wicking grade</th>
<th>Low strength</th>
<th>Medium strength</th>
<th>High strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>280</td>
<td>222</td>
<td>248</td>
</tr>
<tr>
<td></td>
<td>248</td>
<td>248</td>
<td>278</td>
</tr>
<tr>
<td></td>
<td>279</td>
<td>278</td>
<td>288</td>
</tr>
</tbody>
</table>

**Thread grade**
- up to M6: up to M8
- up to M8: up to M10
- up to M10: up to M12
- up to M12: up to M16

**Thread temperature**
- + 50 °C
- + 120 °C
- + 150 °C
- + 180 °C

**Fastening strength**
- 16 ft-lb
- 10 ft-lb
- 8 ft-lb
- 7 ft-lb

**Thread size**
- Low
- Medium
- Semi-solid
- Tread

**Temperature resistance**
- Up to 150 °C
- Up to 200 °C
- Up to 250 °C
- Up to 300 °C

**Threadlock strength**
- Medium
- Low

**Type of thread**
- Fine pitch
- Coarse pitch

### Field Sealing

#### Does the existing gasket need to be used as a shim?

<table>
<thead>
<tr>
<th>Type of gasket</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cap size up to 2.5 mm</td>
<td>Rubber - Metal &amp; Plastic couplings</td>
<td>Flexible - Metal - Plastic or combined plastic metal parts</td>
</tr>
<tr>
<td>Cap size larger than 2.5 mm</td>
<td>Flexible - Metal - Plastic or combined plastic metal parts</td>
<td>Positioning - Assisting of pre-gasketed parts</td>
</tr>
</tbody>
</table>

**Type of gasket**
- Fast curing
- Fast acting
- Fast curing
- Slow curing

**Temperature resistance**
- + 50 °C
- + 100 °C
- + 150 °C
- + 200 °C

**Applications**
- Anaerobic
- Aerobic
- Moisture
- Moisture

**Type of application**
- Flexible
- Combined

**Cure mechanism**
- Fast curing
- Slow curing
- Anaerobic
- Anaerobic

**Take free time/cure speed**
- 3 hrs
- 6 hrs
- 24 hrs
- 30 min
- 5 min

**Gap:**
- Up to 0.25 mm
- Bigger than 0.25 mm

**Tack-free time**
- < 0.15 mm
- < 0.25 mm
- < 0.5 mm
- < 1 mm

**Diametrical clearance**
- < 0.15 mm
- < 0.25 mm
- < 0.5 mm
- > 1 mm

**Plastic/Metal**
- Combined plastic/metal parts
- Flexible flanges – Plastic or metal

**Positioning**
- Assisting of pre-gasketed parts

### Flange Sealing

#### Need to be able to disassemble?

<table>
<thead>
<tr>
<th>Type of thread</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread lock</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

**Thread lock**
- With temperatures below 0°C please use Loctite® 7649 Activator

**Disassembly strength**
- Yes
- No

**Temperature resistance**
- + 50 °C
- + 100 °C
- + 150 °C
- + 200 °C

**Applications**
- Anaerobic
- Aerobic

**Type of application**
- Flexible
- Combined

**Cure mechanism**
- Fast curing
- Slow curing

**Take free time/cure speed**
- 3 hrs
- 6 hrs
- 24 hrs
- 30 min
- 5 min

**Gap:**
- Up to 0.25 mm
- Bigger than 0.25 mm

**Tack-free time**
- < 0.15 mm
- < 0.25 mm
- < 0.5 mm
- > 1 mm

**Diametrical clearance**
- < 0.15 mm
- < 0.25 mm
- < 0.5 mm
- > 1 mm

**Plastic/Metal**
- Combined plastic/metal parts
- Flexible flanges – Plastic or metal

**Positioning**
- Assisting of pre-gasketed parts

### General Maintenance Aids

#### Applications
- Rust treatment
- Bonding of surfaces prior to cleaning
- Cleaning and degreasing of machined parts
- General cleaning of external surfaces
- Cleaning and degreasing of machined parts
- Cleaning and degreasing of internal parts
- General cleaning of internal surfaces
- Bonding prior to painting

#### Surface Protection
- Rust treatment
- Corrosion protection

#### Maintenance Cleaners
- Loctite® 7500 Rust Treatment
- Loctite® 7063 Cleaner & Degreaser
- Loctite® 8009 Metal free Anti Seize
- Loctite® 8060 Aluminium Anti Seize
- Loctite® 8012 Moly Paste
- Loctite® 8102 High Performance Grease
- Loctite® 8040 Freeze & Release
- Loctite® 8201 Five Way Spray

**Pack size / IDH no.**
- 400 ml
- 20 g stick
- 750 ml
- 50 ml
- 135 g
- 80 ml
### Metal filled Epoxy

**Which material will be repaired?**

<table>
<thead>
<tr>
<th>STEEL</th>
<th>ALUMINIUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working life:</td>
<td></td>
</tr>
<tr>
<td>3 min</td>
<td>45 min</td>
</tr>
<tr>
<td>45 min</td>
<td>45 min</td>
</tr>
<tr>
<td>6 min</td>
<td>6 min</td>
</tr>
<tr>
<td>45 min</td>
<td>20 min</td>
</tr>
<tr>
<td>20 min</td>
<td>45 min</td>
</tr>
<tr>
<td>45 min</td>
<td>45 min</td>
</tr>
<tr>
<td>Fixation time:</td>
<td></td>
</tr>
<tr>
<td>10 min</td>
<td>180 min</td>
</tr>
<tr>
<td>180 min</td>
<td>180 min</td>
</tr>
<tr>
<td>15 min</td>
<td>180 min</td>
</tr>
<tr>
<td>180 min</td>
<td>90 min</td>
</tr>
<tr>
<td>90 min</td>
<td>180 min</td>
</tr>
<tr>
<td>180 min</td>
<td>150 min</td>
</tr>
<tr>
<td>Compressive strength:</td>
<td></td>
</tr>
<tr>
<td>70 N/mm²</td>
<td>70 N/mm²</td>
</tr>
<tr>
<td>70 N/mm²</td>
<td>124 N/mm²</td>
</tr>
<tr>
<td>60 N/mm²</td>
<td>70 N/mm²</td>
</tr>
<tr>
<td>60 N/mm²</td>
<td>90 N/mm²</td>
</tr>
<tr>
<td>Operating temperature:</td>
<td></td>
</tr>
<tr>
<td>Up to +120 °C</td>
<td>Up to +120 °C</td>
</tr>
<tr>
<td>Up to +120 °C</td>
<td>Up to +120 °C</td>
</tr>
<tr>
<td>Up to +120 °C</td>
<td>Up to +120 °C</td>
</tr>
<tr>
<td>Up to +120 °C</td>
<td>Up to +120 °C</td>
</tr>
<tr>
<td>Pack size / IDH no.:</td>
<td></td>
</tr>
<tr>
<td>114 g</td>
<td>266666</td>
</tr>
<tr>
<td>500 g</td>
<td>229176</td>
</tr>
<tr>
<td>500 g</td>
<td>229175</td>
</tr>
<tr>
<td>500 g</td>
<td>229174</td>
</tr>
<tr>
<td>500 g</td>
<td>155891</td>
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<tr>
<td>452 g</td>
<td>886366</td>
</tr>
<tr>
<td>500 g</td>
<td>229175</td>
</tr>
<tr>
<td>500 g</td>
<td>155891</td>
</tr>
</tbody>
</table>

### Instant Bonding

**Dissimilar materials needs to be bonded?**

<table>
<thead>
<tr>
<th>EXCLUSIVELY FOR:</th>
<th>PLASTIC/RUBBER/</th>
<th>PLASTIC/RUBBER/</th>
<th>PLASTIC/RUBBER/</th>
<th>METAL/PLASTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature:</td>
<td>Up to +80 °C</td>
<td>Up to +100 °C</td>
<td>Up to +100 °C</td>
<td></td>
</tr>
<tr>
<td>Fixture time (at room temp):</td>
<td>5-20 sec</td>
<td>5-20 sec</td>
<td>5-20 sec</td>
<td>60-120 sec</td>
</tr>
<tr>
<td>Compressive strength:</td>
<td>110</td>
<td>Gel</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>Colour:</td>
<td>Clear</td>
<td>Clear</td>
<td>Clear</td>
<td>Black</td>
</tr>
<tr>
<td>Pack size / IDH nos:</td>
<td>20 g</td>
<td>150 ml aerosol</td>
<td>195 ml spray</td>
<td>&gt; 24 h</td>
</tr>
<tr>
<td>130428</td>
<td>3471</td>
<td>142479</td>
<td>7240</td>
<td></td>
</tr>
</tbody>
</table>

### Surface Preparation

**Do you need an activator?**

| RECOMMENDED FOR BONDING ON REBUILT SURFACES WITH LECTIT® HYSO 3478 SUPERIOR METAL |
|---------------------------------|---------------------------------|
| SOLVENT BASED                   | SOLVENT FREE                    |
| Recommended | 7648 | 7240 |
| Appearance: | Transparent, green liquid | Blue-green liquid |
| Evaporation time: | Min. 60 sec | Not applicable |
| On part life | > 24 h | 6 h |
| Pack size / IDH nos: | 150 ml aerosol | 90 ml pump |
| 142479 | 7240 | 333369 |