LOCTITE®

Retaining Compound Design Guide

Securing Cylindrical Assemblies

Henkel Excellence is our Passion

Contents

What Is a Retaining Compound?

Retaining Compounds are adhesives used to secure bearings, bushings, gears and cylindrical parts onto housings or shafts. The first retaining compound was introduced in 1963. Throughout the years, as technical advancements were made, manufacturing and maintenance engineers discovered and adopted LOCTITE® anaerobic retaining technology to replace conventional mechanical retaining methods.

Why Use a LOCTITE® Retaining Compound?

LOCTITE® Retaining Compounds, when cured, fill the inner space between components to provide a physical and chemical barrier that enables the elimination of fretting corrosion, oxidation and galvanic corrosion. By filling surface irregularities and clearance gaps with a very hard resin, the area of surface contact is increased while the distribution of stress is improved.

LOCTITE® Retaining Compounds also increase the reliability of the joint regardless of the machining tolerances and cure to form a strong precision assembly. They help achieve maximum load transmission capability and uniform stress distribution. In addition, equipment downtime is reduced and part life is increased.

Applied as a liquid or paste, they form 100% contact between mating metal surfaces, eliminating the need for time- consuming machining, the use of mechanical fastening methods or expensive replacement parts.

Comparing Methods

Retaining Compounds vs. Mechanical Retainers

LOCTITE® Retaining Compounds offer many distinct advantages over conventional assembly methods:

- High-strength products can carry high loads.
- Because there is 100% contact, load and stress is distributed evenly over the joint.
- All voids are filled, which prevents corrosion and fretting.

When used in combination with interference fits LOCTITE® Retaining Compounds allow:

- Higher load transmission and better performance with existing designs and geometry.
- Equal performance with relaxed tolerances.
- Reductions in the size and weight of an assembly.

LOCTITE® Retaining Compounds are Superior to Conventional Assembly Methods, including:

Interference fits (press fits or shrink fits) and taper fits

These rely on friction alone to transmit torque; therefore, they are limited by material, surfaces and design. Close tolerances are needed to obtain specific load capacities, leading to higher production costs. Interference fitting creates stresses in the components that can lead to failure, particularly when combined with operational stresses.

Keyway and spline assemblies

These cause high stresses due to the "notch effect" that occurs. Splines can also result in high machining costs and backlash between drive and overrun.

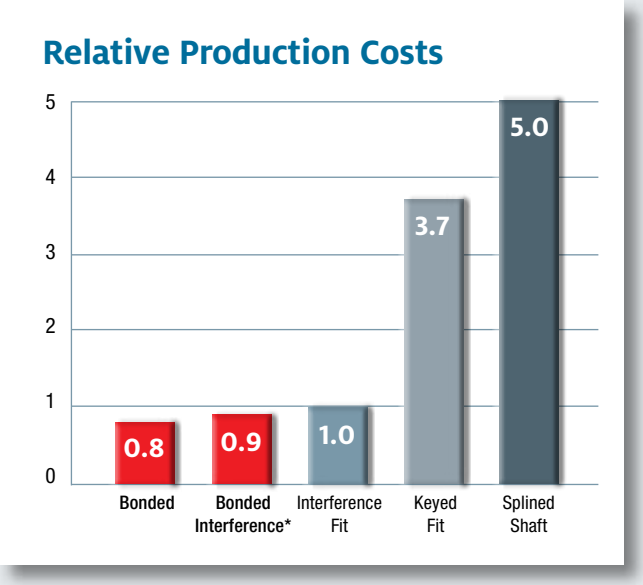
Welding and soldering

Only compatible metals can be joined, and the parts can be distorted by the high temperatures required. Heating of the material can lead to residual stresses and structural degradation and distortion. Disassembly can also be difficult or impossible.

Cost Benefits

LOCTITE® Retaining Compounds:

- Reduce or eliminate expensive machining operations.
- Eliminate some surface finishing requirements.
- Prolong equipment life through better fatigue and corrosion resistance.
- Fill gaps so machining tolerances can be widened.
- Help lower overall assembly and maintenance costs.
- Simplify assemblies by reducing use of circlips, keys, dowels or threads.
- Can eliminate the need for mechanical retainers.
- Minimize machine downtime ensuring an earlier return to service.



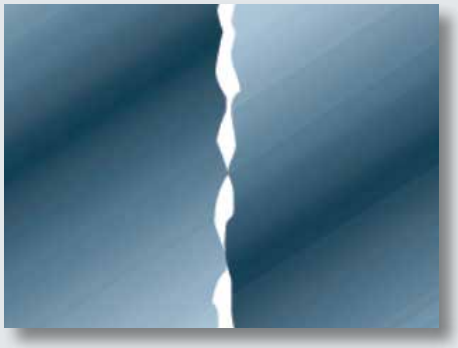
Cost is always an essential part of the selection process. When LOCTITE® Retaining Compounds are used, considerable cost benefits result.

* Bonded Interference takes advantage of wider tolerances and relaxed surface roughness.

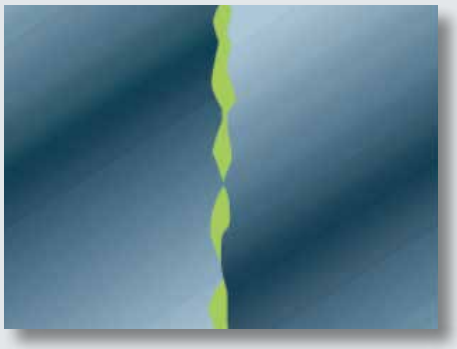
Performance Benefits

LOCTITE® Retaining Compounds:

- Increase assembly reliability.
- Produce more accurate, rigid assemblies.
- Eliminate backlash in keys and splines.
- Prevent small diameter shaft distortion.
- Increase strength of heavy press fits.
- Eliminate fretting corrosion.
- Seal against environmental corrosion.
- Eliminate high assembly stresses.
- Reduce variations in load transmission.
- Allow dissimilar materials to be assembled more easily.



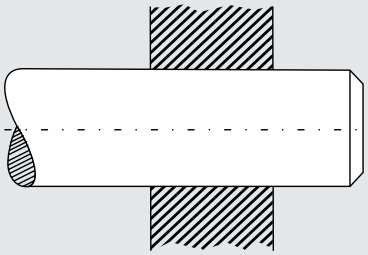
Typical interference fit has 30% metal-to-metal contact.



LOCTITE® Retaining Compounds fill air voids, resulting in unitized, more reliable assembly.

Comparing Assembly Methods

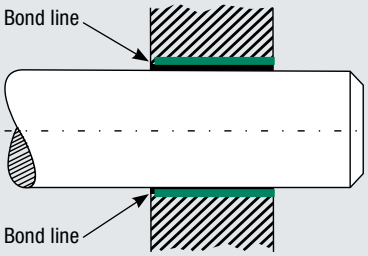
Interference fit (press fit or shrink fit)



Limitations:

- Requires finely finished surfaces.
- Closer tolerances.
- Stronger and more resistant material.
- Oversize ring.
- Heating – press fitting.

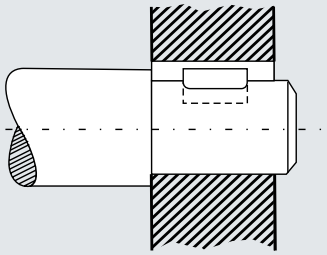
Bonded with LOCTITE® Retaining Compound



Limitations:

- Clearance fit does not guarantee alignment.
- Temperature limits may apply.

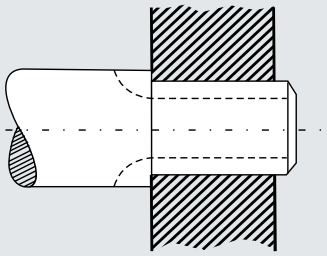
Keyway



Limitations:

- Requires finely finished surfaces.
- Closer tolerances.
- Axial connection.
- Keyway in shaft and key.
- Oversized shaft.

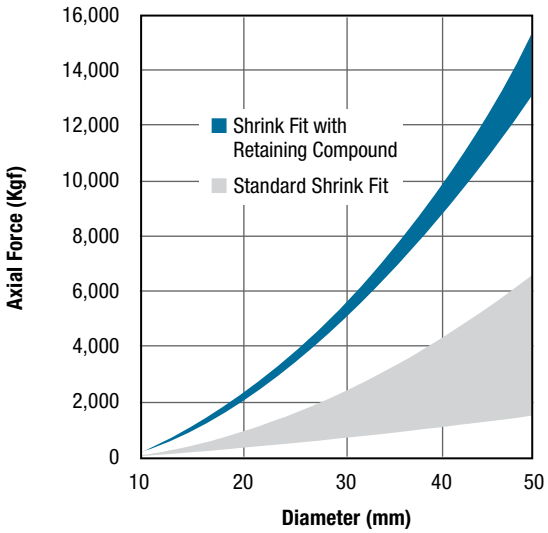
Splined Assembly



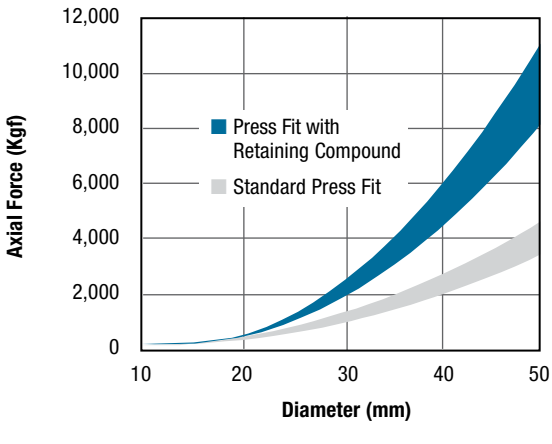
Limitations:

- Requires finely finished surfaces.
- Closer tolerances.
- Axial connection.
- Surface heat treatment (case hardening).
- Machining of multiple splines.

Performance Improvements

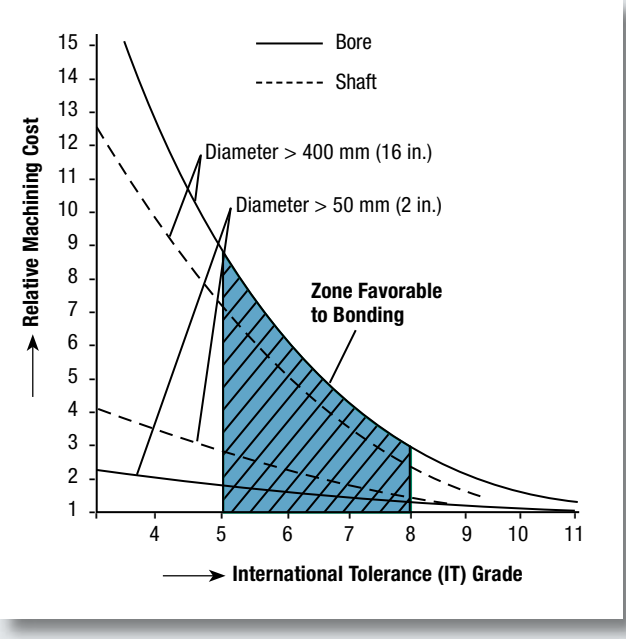


Shrink fit improvement.



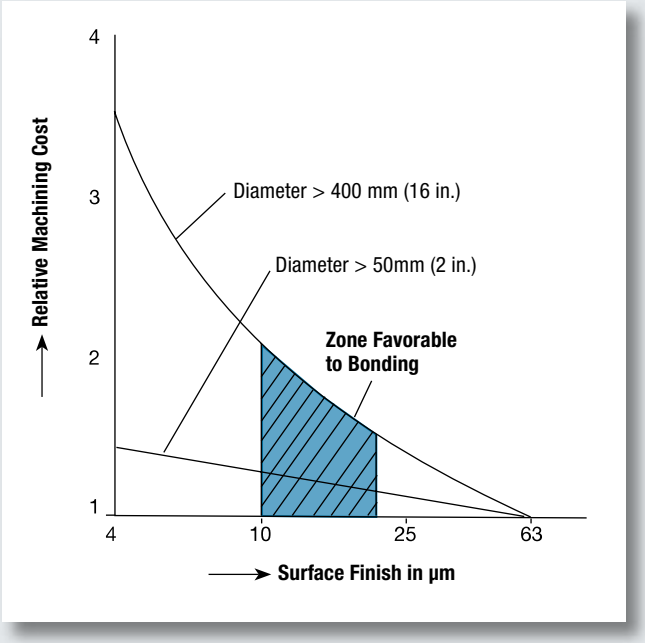
Press fit improvement.

Cost-Tolerances Relationship



The cost of machining decreases rapidly when tolerances are widened; these examples refer to a shaft and its bore. LOCTITE® products are effective over a very wide range of fits.

Cost-Surface Finish Relationship



Surface finish is an important cost factor in time and material (grinding). LOCTITE® products do not need a highly finished surface as they wet and fill irregularities.

A bonded slip fit replaced an interference fit of a brushless motor. The new design enhances overall strength of the assembly, while allowing relaxed tolerances, reducing part costs, simplifying alignment and reducing stress.

Calculation of Bonded Slip Fits and Press or Shrink Fits Augmented with Adhesive Bonding.

Henkel has developed an extensive library of data on the adhesive performance of retaining compounds. This data has been consolidated to provide predictive tools that can be used to estimate the load capacity of bonded slip fit and press or shrink-fit joints augmented with adhesive bonding.

These calculations can be performed by trained Henkel staff using our proprietary RetCalc+ software, created specifically for retaining applications. The following explains these calculations and applies them to a practical example.

The strength of a bonded joint and the torque that can be transmitted are calculated with the following equations. The strength of a press or shrink fit, augmented with adhesive bonding, is the sum of the strength calculated for the bonded joint plus the strength value of the press or shrink-fit joint without adhesive bonding.

Axial Load (in N) $= \dfrac{\pi \times \text{diameter} \times \text{length} \times \text{RC strength} \times f_{total}}{1000}$

Torque (in N-m) $= \dfrac{\pi \times \text{diameter}^2 \times \text{length} \times \text{RC strength} \times f_{total}}{2000}$

Key

RC strength is the compressive shear strength of the retaining compound in N/mm^2 measured in accordance with ISO 10123. This value is reported on the Technical Data Sheet for each retaining compound.

f_{total} represents the sum of these Joint Design and Retaining Compound factors.

Joint Design Factors

f1 = Type of joint

f2 = Materials

f3 = Clearance

f4 = Surface finish

f5 = Engagement ratio

f6 = Load

Retaining Compound Factors

f7 = Cure method

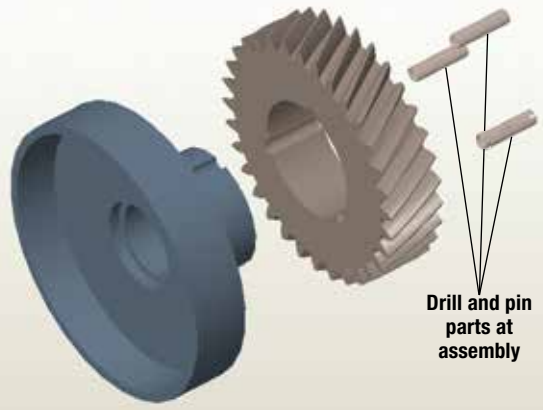
f8 = Operating temperature

f9 = Operating environment

Fitting a Gear to a Clutch Plate

This assembly is made in two parts in order to permit cutting of the gear teeth. The original design required positioning three dowels equally spaced on the joint between the two contacting surfaces to transmit the torque, since the wall thickness was too small to accommodate a keyway. The gear wheel has helicoidal teeth, and is subjected to different tangential and axial loads, depending on the direction of rotation, but the torque load never exceeds 18 N·m (159 in.-lb.). As torque transmission was the driving design factor, calculations only concern this load.

Clutch Plate/Gear Mounting



The dowels used present many disadvantages, causing distortion and rejected assemblies due to the thinness of the parts. LOCTITE® 648™ was suggested to replace the dowel pins, to simplify the assembly process and improve quality.

Dimensions of the bonded surface between the steel gear and the cast iron clutch:

Component Factors

Diameter = 32 mm

Engagement length = 15 mm

RC Strength = LOCTITE® 648™ has a strength of 29 N/mm^2

Joint Design Factors

f1 = 1.0 for bonded slip fit

f2 = 0.8 for cast iron

f3 = 1.0 for a clearance of 0.025 mm

f4 = 1.0 for surface finish

f5 = 0.7 for a L/D ratio of 0.5 and a shaft diameter of 32 mm

f6 = 0.5 for alternating movement

Adhesive Design Factors

f7 = 1.0 for room temperature cure (no activator)

f8 = 1.3 for 150°C operating temperature

f9 = 1.0 for ambient air operating environment

The sum of the joint design and adhesive design factors is

$$f_{total} = f1 \times f2 \times f3 \times f4 \times f5 \times f6 \times f7 \times f8 \times f9 = 0.36$$

Substituting these values in the formula:

$$T = \frac{\pi \times \text{diameter}^2 \times \text{length} \times \text{RC strength} \times f_{total}}{2000}$$

$$T = \frac{\pi \times (32)^2 \times 15 \times 29 \times 0.36}{2000} = 252 \text{ N-m } (2230 \text{ in.-lbs.})$$

Type of Joint
FACTOR 1

This factor accounts for the joint configuration. The RC strength reported on the Technical Data Sheet is representive of a bonded slip-fit joint. This factor accounts for the effective strength contribution for press and shrink-fit joints.

Type of Joint	Factor
Bonded slip fit	1.0
Press fit	0.5
Shrink fit	1.2

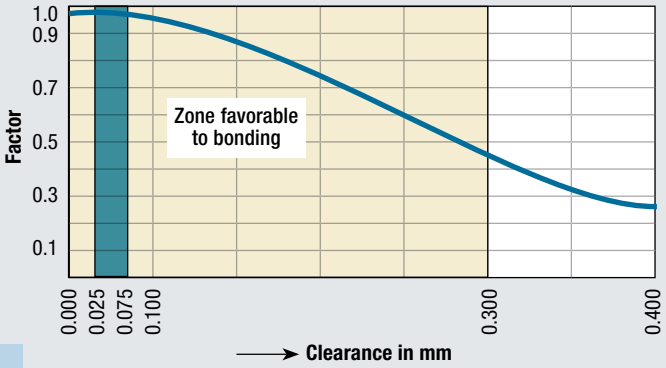
Materials
FACTOR 2

The shear strength given for LOCTITE® Retaining Compounds are measured using steel pins and collars. The *f*2 factor varies with other metals, alloys and coatings as shown in this table. When dissimilar materials are joined, use the lower number in the equation.

Material	Factor
Mild Steel	1.0
Alloy Steels	0.9
Cast Iron	0.8
Aluminum	0.6
Stainless Steel	1.0
Copper and Alloys	0.4
Zinc, Cadmium Plated, Galvanised Steel	0.4
Thermoset Plastic	0.3

Clearance
FACTOR 3

The best performance for slip fits is achieved using clearances between 0.025 mm and 0.075 mm (0.001 in. and 0.003 in.), or with interference fits. Performance is reduced as the clearance is increased.

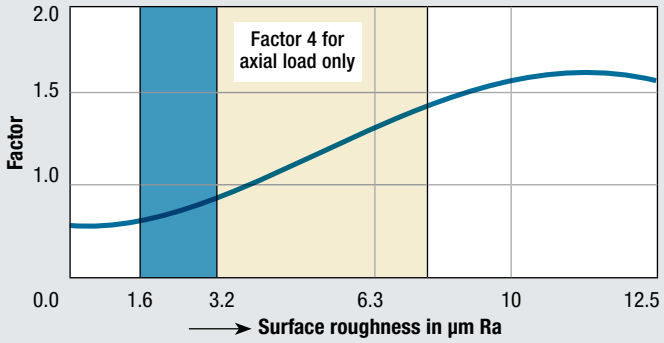


Bonded slip fit replaces the costly, time-consuming, brazing process on industrial radiator heat exchanger tubes. Once the tubes are inserted using a slip fit, LOCTITE® Retaining Compound is applied to their outer diameter, and they are expanded into the tube sheet. The new process is more reliable, faster, and does not require specialized labor.

Surface Finish

FACTOR 4

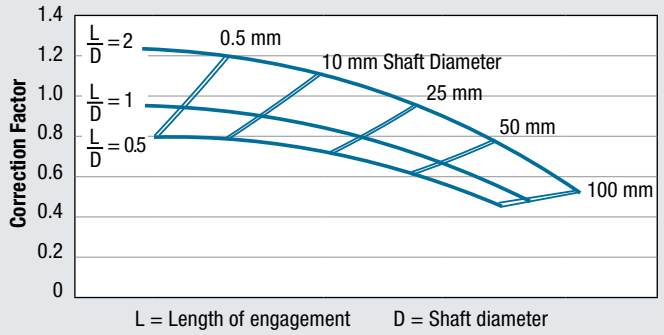
Retaining compounds benefit from a certain degree of surface roughness 1.6 to 3.2 µm Ra. Smoother surfaces will lower adhesive performance and rougher surfaces have the risk of misalignment when assembled. Note that the *f*4 factor only applies to axial loads and not torque. Use 1.0 for torque calculation.



Ratio of Engagement

FACTOR 5

The adhesive strength of a retaining compound gains limited benefit from increases in engagement length. As illustrated in the adjacent chart, this correction factor is more pronounced in smaller shafts and becomes negligible in shafts greater than 100 mm (4 in.) in diameter.



Load

FACTOR 6

As with any cylindrical assembly, the retaining compounds are affected by the magnitude and severity of alternating loads. The adjacent table illustrates the effect that different reversing loads can have on the adhesive strength.

Type of Load	Factor
Static	1.0
Unidirectional Movement	0.6
Alternating Movement	0.5

To offer unquestionable safety and reliability, the bearings and bushings on the Prosthetic Moto Knee and Versa Foot must stay in place. With no seats or shoulders to stop bushings from sliding in and out, LOCTITE® Retaining Compound secures the bushings and keeps the stainless steel bearings in place, while evenly distributing load and stress. Retaining compound seals the bearing seats, prevents corrosion and erosion of the fit and locks the components in place.

Adhesive Design Factors

Cure Method

FACTOR 7

The compressive shear strength reported for each retaining compound is determined from test specimens cured at room temperature (22°C). Activators can be used to accelerate the adhesive cure. The effect of the activator on cure speed and ultimate strength is reported on the Technical Data Sheet (TDS) for each retaining compound. For illustration, the factor in this chart relates to the TDS for LOCTITE® Retaining Compound 648™.

Cure Method	Factor
Room Temperature Cure (no activator)	1.0
LOCTITE® 7649™ Activator	0.4
LOCTITE® 7471™ Activator	0.8
LOCTITE® 7091™ Activator	0.8

Operating Temperature

FACTOR 8

Anaerobic adhesives cure to form a thermoset polymer. Increases in temperature will have a measureable effect on the strength of the polymer. It is important to select a product that is suitable for the service temperature of the application. These "Heat Aging" effects are reported on the TDS for each retaining compound. For illustration, this chart is an extract of Heat Aging values reported on the TDS for several products.

Operating Temperature (in °C)	22	120	150	180
LOCTITE® 620™	1.0	2.0	1.6	1.0
LOCTITE® 638™	1.0	1.7	1.2	0.4
LOCTITE® 641™	1.0	0.7	0.4	
LOCTITE® 648™	1.0	1.4	1.3	1.0
LOCTITE® 660™	1.0	1.5	1.6	
LOCTITE® 680™	1.0	1.6	1.5	1.4

Operating Environment

FACTOR 9

The compressive shear strength reported for each retaining compound is determined from test specimens exposed to ambient air. The effect of chemical and solvent immersion on strength is reported on the TDS for each retaining compound. For illustration, the "Chemical/Solvent Resistance" values in this chart were extracted from the TDS for LOCTITE® Retaining Compound 648™.

Operating Environment	Factor
Acetone	1.0
Ambient Air	1.0
B100 Bio-Diesel	1.0
Brake fluid	1.2
DEF	1.0
Ethanol	1.2
Motor Oil	1.4
Phosporic Acid 10%	0.3
Sodium Hydroxide 20%	0.9
Unleaded fuel	1.0
Water 50%/glycol 50%	0.8

Fitting Bearings, Bushings & Non-Metallic Parts

Fitting Bearings

The performance provided by LOCTITE® Retaining Compounds makes them particularly suitable for fitting bearings. LOCTITE® Retaining Compounds have very high compression strength, and prevent fretting corrosion. Retaining compounds are available in removable strengths for easier assembly.

- Locking rings and circlips can be removed, eliminating costly shaft grooving and difficult assembly.
- Stepped diameters can be reduced by eliminating the need for shoulders to locate bearings.
- Improved bearing alignment can be achieved by compensating for surface imperfections.
- The assembly is sealed against the environment, eliminating fretting and galvanic corrosion.
- Assembly can be simplified by the easing of tolerances.

Wear Parts, Self-Lubricating Bushings and Inserts

Wear rings, liners, shrink rings (of any thickness), tubular connectors, inserts, plugs and self-lubricating sintered bushings can be assembled using retaining compounds such as LOCTITE® 638™ or LOCTITE® 648™. Choice of retaining compound will depend upon operating conditions and whether the assembly must be dismantled.

In many cases — engine cylinder liners, pump, drill and bronze bushings — a press is used to fit bushings, a procedure that requires additional machining due to the elastic deformation of the parts. In addition to increasing costs, if too much rework is done, there is a risk of weakening the quality of the fit. Also, by reducing wall thickness, stress and the risk of potential assembly failure is increased. These problems can be eliminated by assembling bushings and liners using a bonded slip-fit.

Fitting Non-Metallic Parts

Many parts made from molded materials are now used in assemblies for various reasons: cost reduction, appearance, improved resistance to wear or to achieve increased flexibility. Examples include: handles, hand-wheels, control buttons, nylon rings and bushings, gears and friction washers. LOCTITE® Retaining Compounds can be used to assemble these items to metal parts or to strengthen assemblies which are often weak due to their flexibility or fragility. LOCTITE® Retaining Compounds can also be used where it may be difficult to obtain a sufficiently accurate fit.

LOCTITE® Retaining Compounds cure in the absence of air and by the catalytic effect of the metal. To improve cure time with non-metallic parts, LOCTITE® Activator may be used to treat the surfaces before applying the adhesive. Plastic components need to be tested to ensure retaining compound or activator does not stress crack the component.

Get the most from LOCTITE® Retaining Compounds

From single repairs to daily production line use, these guidelines will help you maximize the benefits of using LOCTITE® Retaining Compounds:

Surface Cleanliness: Optimal performance is achieved when parts are clean and free of grease, oil, rust preventative or other contaminants. LOCTITE® ODC Free Cleaner & Degreaser is one of the recommended cleaners that will effectively remove contaminants without leaving a residue. LOCTITE® Retaining Compounds 638™, 648™ and 680™ are oil tolerant. They are robust enough to bond through contaminants including oils, and cutting and corrosion protecting fluids.

Surface Finish: One component of joint strength is dependent on a mechanical interlock with the roughness of the metal surfaces. A surface roughness of 1.6 to 3.2 µmRa, equivalent to a steel surface abraded with emery cloth, is recommended. A smoother finish will reduce mechanical interlock and correspondingly reduce the maximum achievable strength of the bonded joint.

Materials: LOCTITE® Retaining Compounds are designed for bonding cylindrical metal components. They are also used to assemble cylindrical metal and plastic component combinations. Plastic components need to be tested to ensure retaining compound or activator does not stress crack the component.

Joint Gap: LOCTITE® Retaining Compounds are versatile. They are recommended for gaps ranging from zero (interference fit) to 0.5 mm (0.02 in.) diametrical. Optimal bond strength is typically achieved at a diametrical bond gap of 0.075 mm (0.003 in.) or less. Total strength decreases as diametrical gap is increased.

Application Process: Use an application method that ensures the bond-line is filled. Excess material should be avoided because it could migrate. Several proven methods to control the amount applied, ranging from manual to automated:

- Roll bearing on a synthetic sponge saturated with LOCTITE® Retaining Compound to apply a consistent thin film.
- Manually apply LOCTITE® Retaining Compound with a LOCTITE® Hand Pump. Each squeeze of the trigger dispenses a metered amount of adhesive to the parts prior to assembly.
- Use the LOCTITE® Semiautomatic applicator to dispense a metered amount of adhesive to a predefined dispoint point.
- Use the LOCTITE® RotoSpray™ applicator to automatically dispense a precise band of adhesive to the bore of a circular component.

The LOCTITE® RotoSpray™ applicator automatically dispenses a perfect bead of retaining compound within the bore of circular components.

Cure Process: LOCTITE® Retaining Compounds have an anaerobic cure system. Anaerobic means it cures in the absence of air and in the presence of metal ions. This is why the resin remains liquid until it is confined between metal parts. Cure speed is influenced by:

- **Gap:** The thinner the gap the faster the cure.
- **Temperature:** Lower temperature slows cure speed. Higher temperature accelerates cure speed.
- **Materials:** Cure is faster when one or both metals oxidize, like steel and copper, and slower on metal surfaces that don't oxidize, like chrome plate or stainless steel.
- **Product history:** Older products cure slower than newer products. Consult the Product's Technical Data Sheet for detailed speed of cure curves.

Bond Strength: Cure speed can be accelerated with the application of LOCTITE® Activator before parts are assembled, or by applying heat up to 120°C (248°F). Heat will usually increase the ultimate bond strength. Activator will usually decrease the ultimate bond strength.

On large air bearings, steel inserts are bonded to the steel bearing surface using LOCTITE® Retaining Compound. Bonding eliminates spot welding and the extra cleaning step to remove oxides from the surface, making the assembly process simpler, faster, and safer, lowering overall production costs.

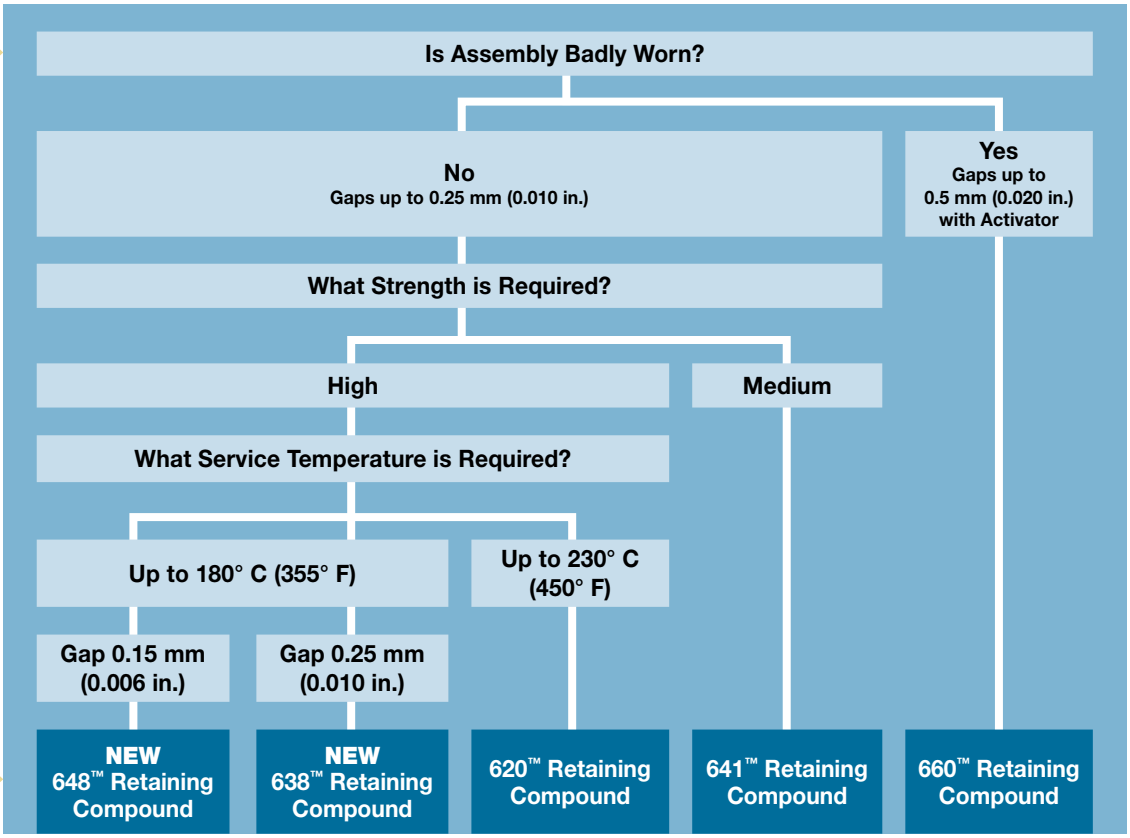
Disassembly: Bearings assembled with LOCTITE® Retaining Compound can be disassembled with industry standard bearing disassembly tools and techniques, including bearing pullers and hydraulic presses. Another technique is to heat the parts well above the service temperature [to 250°C (482°F) for most products] and disassemble while the parts are hot.

Using a bearing puller to remove old bearings helps prevent shaft damage, e.g. gouging. Retaining compounds, however, will fill any scratches or gaps between mating surfaces.

Choosing a LOCTITE® Retaining Compound

Your Application

- Increase the shear strength of cylindrical, non-threaded assemblies
- An industry standard for assembling press- and slip-fitted parts
- Fill the "inner space" between components and cure to form a strong precision assembly
- Formulated in a variety of viscosities, gap fills, flexibility and strength characteristics
- Can be applied with automated process equipment or dispensed manually



Solution

	NEW 648™ Retaining Compound	NEW 638™ Retaining Compound	620™ Retaining Compound	641™ Retaining Compound	660™ Retaining Compound
Strength Required	High	High	High	Medium	High
Shear Strength	3,900 psi	4,500 psi	3,800 psi	1,700 psi	3,335 psi
Clearance	Up to 0.15 mm (0.006 in.)	Up to 0.25 mm (0.010 in.)	Up to 0.2 mm (0.008 in.)	Up to 0.15 mm (0.006 in.)	Up to 0.5 mm (0.020 in.)
Temperature Resistance	180°C (355°F)	180°C (355°F)	230°C (450°F)	150°C (300°F)	150°C (300°F)
Cure Time (Setup/Full Strength)	3 min. / 24 hrs.	4 min. / 24 hrs.	60 min. / 24 hrs.	20 min. / 24 hrs.	20 min. / 24 hrs.
Recommended Activator	Not required	Not required	7088™, 7649™,7471™	7088™, 7649™,7471™	7088™, 7649™,7471™

Product Description

NEW LOCTITE® 648™ Retaining Compound

General Purpose/High Strength/Rapid Cure

Best performance for clearance or interference fit parts. Excellent performance for dynamic, axial and radial loads. Bonds through contaminants including oils, cutting and corrosion protection fluids. Cures on metals without an activator. Globally available product.

NSF/ANSI 61-Certified

P/N	Package Size
1844659	0.5 ml capsule
1835922	10 ml bottle
1835920	50 ml bottle
1835918	250 ml bottle
1865917	1 liter bottle

NEW LOCTITE® 638™ Retaining Compound

Slip Fit/High Strength

Recommended for slip fit parts with larger gaps. Excellent performance for dynamic, axial and radial loads. Bonds through contaminants including oils, cutting and corrosion protection fluids. Cures on metals without an activator. Globally available product.

NSF P1-Certified

P/N	Package Size
1835937	10 ml bottle
1835936	50 ml bottle
1835925	250 ml bottle
1835924	1 liter bottle

LOCTITE® 620™ Retaining Compound

Slip Fit/High Temperature

Recommended for high temperature retaining of parts with a clearance or interference fit, i.e., retaining bushings, bearings, seals, fans and liners. Requires heat cure to achieve temperature resistance.

ABS-Approved.

P/N	Package Size
62005	0.5 ml bottle
62015	10 ml bottle
62040	50 ml bottle
62070	250 ml bottle
62085	1 liter bottle

LOCTITE® 641™ Retaining Compound

A controlled-strength retaining compound that is ideal for cylindrical parts that require disassembly.

CFIA-Approved.

P/N	Package Size
28802	10 ml tube
21458	50 ml tube

LOCTITE® 660™ Retaining Compound

Used for repairing worn coaxial parts without remachining; enables reuse of worn bearing seats, keys, splines, tapers or for retaining shims.

CFIA-Approved.

P/N	Package Size
66010	6 ml tube
66040	50 ml tube

Retaining Compounds

	LOCTITE® PRODUCT	Item Number	Package Type & Size	Typical Use	Color	Maximum Gap Fill Diameter	Viscosity (cP)	Shear Strength Steel/Steel* (psi)	Temperature Range	Cure Speed*	Recommended Activator	Agency Approvals
CLOSE-FITTING PARTS	609™	60905 60921 60931 60941 60943	0.5 ml capsule 10 ml bottle 50 ml bottle 250 ml bottle 1 liter bottle	Augments press fit parts	Green	0.15 mm (0.006")	125	2,300 (minimum)	-54ºC to 150ºC (-65°F to 300°F)	Fixture – 10 min. Full – 24 hrs.	7088™, 7649™ or 7471™	MIL-R-46082B for existing designs, ASTM D-5363**, CFIA
	NEW 648™	1844659 1835922 1835920 1835918 1865917	0.5 ml capsule 10 ml bottle 50 ml bottle 250 ml bottle 1 liter bottle	High strength, primerless, oil tolerant, general purpose	Green	0.15 mm (0.006")	500	3,900	-54ºC to 180ºC (-65°F to 355°F)	Fixture – 3 min. Full – 24 hrs.	Not required	NSF/ANSI 61, CFIA
LOOSE-FITTING PARTS	NEW 638™	1835937 1835936 1835925 1835924	10 ml bottle 50 ml bottle 250 ml bottle 1 liter bottle	High strength, primerless, oil tolerant, for slip-fitted parts	Green	0.25 mm (0.010")	2,500	4,500	-54ºC to 180ºC (-65°F to 355°F)	Fixture – 4 min. Full – 24 hrs.	Not required	NSF P1, CFIA
	NEW 680™	1835212 1835205 1835201 1835196 1835206	0.5 ml capsule 10 ml bottle 50 ml bottle 250 ml bottle 1 liter bottle	High strength, primerless, oil tolerant, for slip-fitted parts	Green	0.38 mm (0.015")	1,250	4,000	-54ºC to 180ºC (-65°F to 355°F)	Fixture – 4 min. Full – 24 hrs.	Not required	NSF/ANSI 61, ABS, CFIA
HIGH TEMPERATURE	620™	62005 62015 62040 62070 62085	0.5 ml capsule 10 ml bottle 50 ml bottle 250 ml bottle 1 liter bottle	For high temperature applications	Green	0.2 mm (0.008")	8,500	3,800	-54ºC to 230ºC (-65°F to 450°F)	Fixture – 1 hr. Full – 24 hrs.	7088™, 7649™ or 7471™	CFIA, ABS
MEDIUM STRENGTH	641™	28802 21458	10 ml bottle 50 ml bottle	Medium strength for easier disassembly	Yellow	0.2 mm (0.008")	525/1,950 Thixotropic	1,700	-54ºC to 150ºC (-65°F to 300°F)	Fixture – 20 min. Full – 24 hrs.	7088™, 7649™ or 7471™	CFIA
MACHINERY REPAIR	660™	66010 66040	6 ml tube 50 ml tube	For repair of worn machinery parts	Silver	0.5 mm (0.020")	250,000/ 1,500,000 Thixotropic	3,335	-54ºC to 150ºC (-65°F to 300°F)	Fixture – 20 min. Full – 24 hrs.	7088™, 7649™ or 7471™	CFIA
SLOW OR UV CURE	232™	18607 27863	1 liter bottle 250 ml bottle	Slow cure for heavy press fit	Brown	0.38 mm (0.015")	5,000	1,350* (2 hrs. heat cure)	-54ºC to 150ºC (-65°F to 300°F)	Fixture – 1 hr. Full – 24 hrs.	7088™, 7649™ or 7471™	N/A
	640™	135520 135521 209764	50 ml bottle 250 ml bottle 1 liter bottle	Slow cure for long assembly time	Green	0.1 mm (0.004")	600	3,200	-54ºC to 175ºC (-65°F to 350°F)	Fixture – 1 hr. Full – 24 hrs.	7649™ or 7471™	Mil-R-46082B, ASTM D-5363
	661™	234921 234925	250 ml bottle 1 liter bottle	UV light cures exposed adhesive	Yellow	0.15 mm (0.006")	500	2,175	-54ºC to 175ºC (-65°F to 350°F)	Fixture – 4 min. Full – 24 hrs.	7649™ or 7471™	N/A

Activators

	LOCTITE® PRODUCT	Item Number	Package Type & Size	Color	Viscosity (cP)	Base	On-Part Life	Dry Time	Application	Agency Approvals
ACTIVATORS	7088™ PRIMER	1069258	17 g stick	Teal	Semisolid	No solvent	30 days	None	Anaerobics	N/A
	7090™ PRIMER	19368 12695	1 fl. oz. bottle 1 liter bottle	Dark Blue	17.5	No solvent	1 hour	<10 minutes	Anaerobics	N/A
	7471™ PRIMER T	19267 22477 19268	1.75 fl. oz. bottle 4.5 oz. net wt. aerosol can 1 gallon can	Amber	2	Acetone/ Isopropanol	7 days	30 to 70 seconds	Anaerobics	MIL-S-22473E for existing designs, ASTM D-5363 for new designs
	7649™ PRIMER N	19269 21347 21348 19266	1.75 fl. oz. glass bottle 25 g net wt. aerosol can 4.5 oz. net wt. aerosol can 1 gallon can	Clear/ Green	2	Acetone	30 days	30 to 70 seconds	Anaerobics	MIL-S-22473E for existing designs, ASTM D-5363 for new designs, NSF/ANSI 61, NSF P1, CFIA

Cleaner & Degreaser

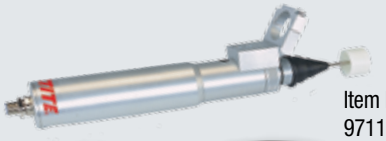
	LOCTITE® PRODUCT	Item Number	Package Type & Size	Drying Time	Residue/Tinsability	Odor	Agency Approvals
	ODC-FREE CLEANER & DEGREASER	22355 20162	15 oz. net wt. aerosol 16 fl. oz. pump spray	Equivalent to the evaporation rate of water. Wiping or blowers will accelerate dry time.	No rinse and no residue	Mild Citrus	NSF K1

Items in Red = Top Pick = Indicates Worldwide Availability * Varies with substrates. ** For new designs.

LOCTITE® Dispensing Equipment

Dispensing Equipment*

Dispensing equipment for retaining compounds includes applicators, controllers, reservoirs, pumps, valves, tips and monitoring devices. Contact your Henkel sales representative, authorized distributor, call 1.800.LOCTITE (562.8483), or visit www.equipment.loctite.com for help optimizing your dispense system.



Item Number:
97115

Item Number:
983330

Item Number:
97152

PRECISION BORE COATING APPLICATOR

LOCTITE® RotoSpray™ Applicator

The LOCTITE® RotoSpray™ Applicator is electro-pneumatically powered to apply 360° beads of retaining compound on bore IDs. LOCTITE® RotoSpray™ applicators are used in conjunction with the LOCTITE® Positive Displacement Pump and LOCTITE® Dual-Channel Automatic Controller.

Item Number:
97001 (50 ml)

Item Number:
98414 (250 ml)

HANDHELD MANUAL APPLICATORS

LOCTITE® Hand Pumps

Handheld manual applicators allow retaining compounds to be dispensed directly from the original package. Applicators thread directly onto bottle tops and accept a variety of dispense tips.

Item Number:
982719 (0 to 3,000 cP),
982722 (>3,000 cP)

HANDHELD PNEUMATIC DISPENSING

LOCTITE® Bond-A-Matic® 3000 Dispenser

A reliable, low-cost pneumatic dispenser with an adjustable pressure regulator. The system is “ready to go, right out of the box” and includes a LOCTITE® Vari-Drop™ Applicator Kit and dispensing-tip assortment. Available with low-level sensing for automated process lines.

* All system components and accessories are sold separately. For more information check with your Henkel representative or visit www.equipment.loctite.com

LOCTITE® Dispensing Equipment

Item Number:
1390321 (0 to 3,000 cP),
1390322 (>3,000 cP)

Item Number:
98013

DUAL CHANNEL DISPENSING

LOCTITE® Dual Channel Integrated Semiautomatic Dispenser

A superior dispensing system for cost-effective operation in high-volume applications. It controls two manual or two automatic dispense valves, or one dispense-valve and one advancing slide. Includes integrated fluid reservoir and dispense valve timing controls. Interface with PLC reservoir allows "low level" sensing and "cycle complete" signaling.

Item Number:
1406023

Item Number:
98520

EQUIPMENT FOR PRIMERS

LOCTITE® Spray Valve/Spray Valve Controller

The LOCTITE® Spray Valve and LOCTITE® Spray Valve Controller provide an effective solution for automatic spraying of low-viscosity primers up to 1,200 cP.

Item Number:
97211 (Monitor),
8965008 (Sensor)

DISPENSE MONITORING

LOCTITE® High Precision Monitoring System

This advanced dispense monitoring system is designed for integration with other LOCTITE® dispensing systems and controllers. Pressure changes due to air entrapment, broken or blocked nozzles or substrate contact can be monitored. Out-of-tolerance dispense cycles are displayed as error messages.

Contact Henkel
for item numbers.

DISPENSE ACCESSORIES

Needles and Tips

Henkel offers a complete line of LOCTITE® dispense needles and tips from 1/4" to 1 1/4", including 45°- and 90°-angled tips in a variety of gauges.

LOCTITE®

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