TFO wheel end maintenance

A complete guide to trouble-free operation of heavy duty bearings, seals, hubcaps, lubricants and more

The Power of Knowledge Engineering

A systems approach to total wheel end maintenance

SKF's Trouble-Free Operation (TFO) Program is a proven systems approach to heavy duty maintenance. By providing fleets with detailed instructional materials, and making hands-on training available to your technicians, this program has made a significant contribution to many fleets' overall productivity.

This wheel end maintenance guide, central to the TFO program, is based on our core experience with bearings and seals over several decades and literally billions of over-the-road truck miles.

Through our investigation of thousands of premature seal leaks and/or bearing failures, we've learned that improper removal and installation are by far the leading causes of these premature failures. Armed with the right information and tools, and using the step-by-step procedures in this manual, you can extend the service life of bearings and seals, protect your trucks from costly damage, and make your fleet safer in the process.

SKF TFO training overview

Providing access to SKF knowledge

SKF's Trouble-Free Operation (TFO) Program offers a proven systems approach to heavy duty maintenance. By providing detailed instructional materials and hands-on training to fleets and distributors alike, the TFO program has helped improve the overall productivity of both.

The TFO program recognizes that there are many ways to develop skills, learn about new products and procedures, and determine best practices for safe, efficient maintenance. While eLearning and technical manuals are important, nothing complements them better than a face-to-face training session with a technical expert.

With the TFO program, SKF provides such on-site technical training for counterpeople as well as technicians and installers. These hands-on training sessions offer an invaluable resource for learning about SKF heavy duty products and services.

To request an on-site training session, contact your local SKF sales representative.

Counterperson training

- Specifically designed for sales and counter personnel
- Provides insights to help address customer needs and challenges
- Outlines SKF apps and Internet resources available to find part numbers and applications fast
- Includes a Sales Pro certificate for session participants

TFO Clinics for technicians/ installers

- Specifically designed for wheel end maintenance personnel
- Offers hands-on training for wheel end inspection, removal, installation, and bearing adjustment
- Outlines SKF apps and Internet resources available to find part numbers and applications fast
- Includes a training certificate for session participants

Warranties under the TFO program

In addition to helping your fleet reduce wheel end maintenance and its associated costs, you can also benefit from special extended warranties on selected products when certain requirements are met. The following Aftermarket warranties are provided for the SKF line of Scotseals purchased under the TFO program.

	Scotseal *Classic*	Scotseal *Longlife*	Scotseal *PlusXL*
Tractor	1 year or 100,000 miles	2 years or 150,000 miles	3 years or 300,000 miles
Trailer	1 year Unlimited	2 years Unlimited	3 years Unlimited
Severe Service	1 year or 50,000 miles	1 year or 100,000 miles	1 year or 150,000 miles

The following conditions are required for Aftermarket warranty coverage under the TFO program:

- SKF hubcaps must be used
- Coverage applies to genuine SKF Scotseals and hubcaps only
- User must follow current TMC maintenance procedures
- SKF representative to conduct training at each fleet maintenance facility
- Wheel end maintenance records are to be monitored by SKF and fleet

NOTE: For further details on the warranty program, including extended OE warranties, contact your local SKF representative.

Caution: Beware of counterfeit seals

Unscrupulous manufacturers are flooding the global market with poorly engineered and cheaply manufactured seals that have deliberately been made to resemble premium quality SKF Scotseals. Most obvious is the use of green paint (not Bore-Tite) that can flake off and enter the hub, actually causing bearing damage. The warranties detailed above apply only to genuine SKF brand Scotseals.

A few words of caution:

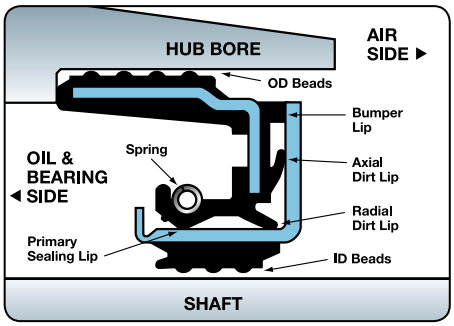
- A seal's running surfaces are critical to performance. Historically, the running surfaces of counterfeit seals have been demonstrated to be well below SAE standards.
- Testing has shown these counterfeit seals to be of substantially inferior quality and highly questionable reliability.
- Premature seal failure can lead to unexpected wheel end failures that can cause vehicle downtime and damage, serious personal injury and even fatalities.

SKF Scotseal wheel seals – the right sealing solution for every application

Scotseal *PlusXL*

The Scotseal PlusXL, a rubber unitized, one-piece design, offers maximum sealing life under virtually all driving conditions. The high-temperature, synthetic lubricant- friendly material of the Scotseal PlusXL provides heat resistance up to 300º F and is an excellent choice for frequent braking applications.

- "Fat footprint" with adhesive type properties locks onto spindle making a perfect seal even on worn spindles.
- No tools. Just lube ID and OD and press into hub. Avoids costly "do-overs".
- Specially formulated material and robust design.
- Longer life in contaminated conditions
- High temperature capabilities to 300°F
- Tested and compatible with all popular synthetic lubricants
- Unitized design provides fresh running surface for sealing lips and keeps out road contaminants extending service intervals.

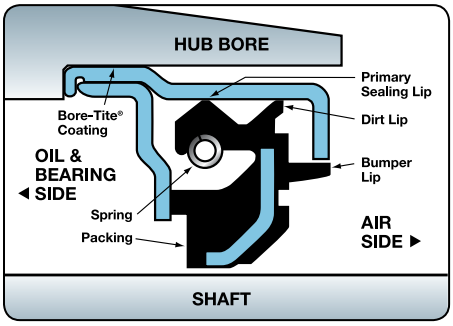


The Scotseal PlusXL consists of four sealing lips; a spring loaded primary sealing lip with patented Waveseal® design that is factory pre-lubed, a radial and axial dirt lip, plus an outer bumper lip that acts as a preliminary dirt excluder.

Scotseal *Classic*

With literally trillions of road miles to its credit, Scotseal Classic has proven to be a solid choice for dependable, long lasting service. When properly installed using SKF tools and procedures, Scotseal Classic is a reliable performer for meeting the sealing requirements between brake maintenance intervals.

- Coated with Bore Tite®, which provides a better seal than a simple metal-to-metal press fit.
- Unitized design provides a perfect running surface for the three sealing lips, preventing oil leaks and contamination ingress.
- Reliable seal designed to provide long lasting service and dependability.

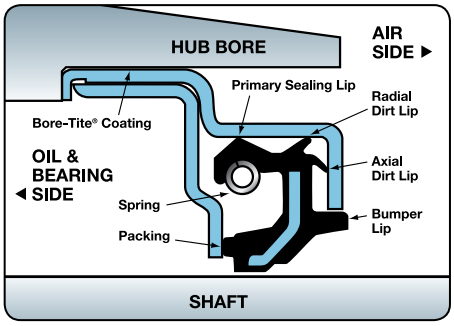


SKF Scotseal Classic is a unitized, one piece design consisting of a sealing element (packing) that is assembled between a metal outer and inner case. The packing consists of three sealing lips; a spring-loaded primary sealing lip that is factory pre-lubed, a dirt exclusion lip, and an outer bumper lip that acts as a preliminary dirt excluder.

Scotseal *Longlife*

Building upon the successful one-piece, multi-lip design of the Scotseal Classic, the Scotseal Longlife is designed to meet the increasingly harsh conditions of today's heavy duty environments.

- Newly formulated material has superior tolerance and resistance to high temperatures.
- Specially formulated polymer is compatible with all known synthetic lubricants.
- Advanced seal design provides excellent performance in harsh environments and high braking conditions.



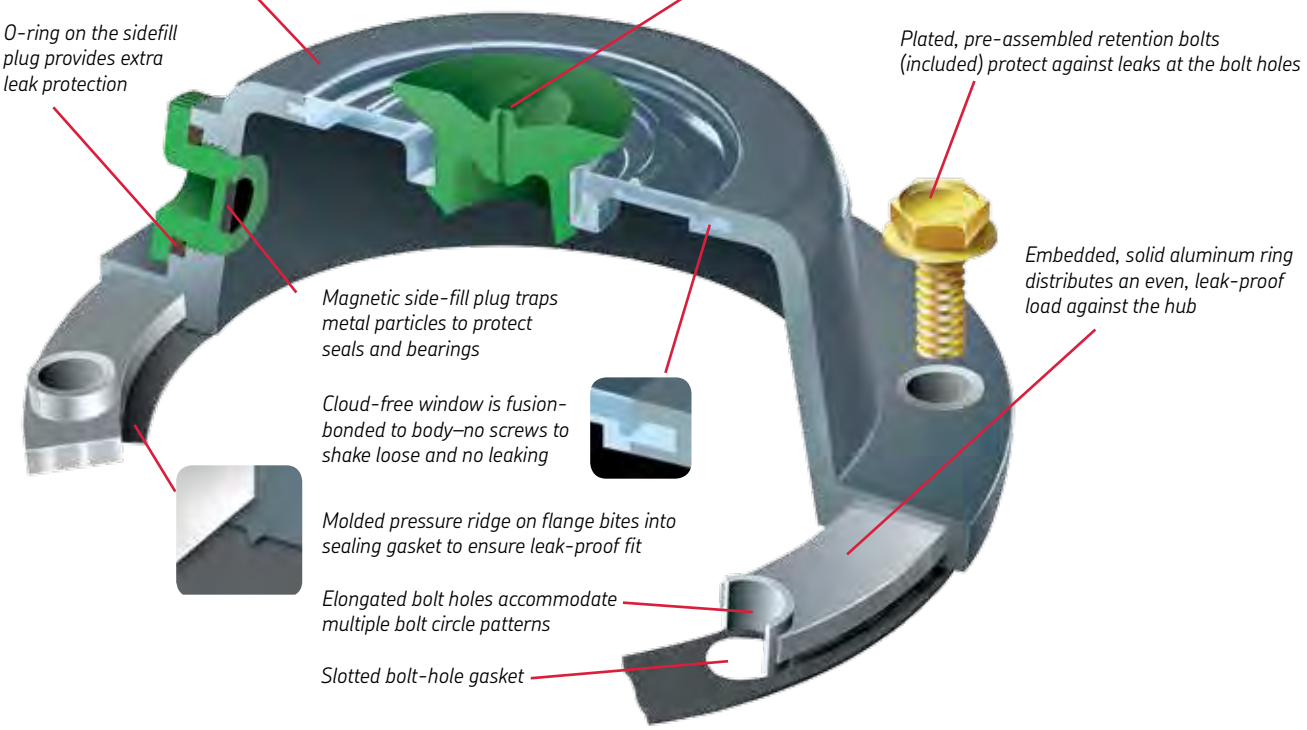
The Scotseal Longlife's packing consists of four sealing lips; a spring-loaded primary sealing lip that is factory pre-lubed, a radial and axial dirt lip, plus an outer bumper lip that acts as a preliminary dirt excluder. The Scotseal Longlife is pressfit into the hub bore using Scotseal Installation Tools.

See the complete Scotseal interchange chart on page 54.

Scotseal TF hubcaps

Lighter than steel. Tougher than aluminum.

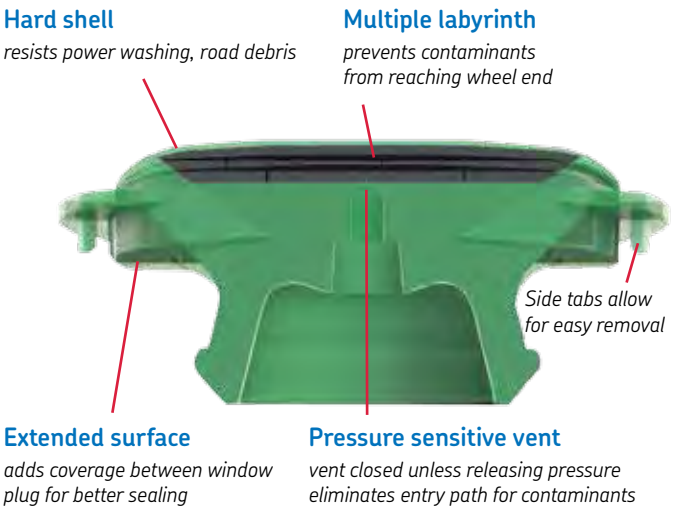
Oil bath design

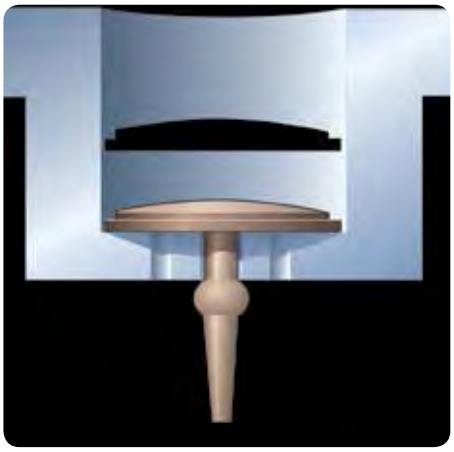


SKF Splashguard

Upgraded vent system and protection

SKF Splashguard technology is a contaminant exclusion system that provides extra splash protection. The Splashguard protects the wheel end from water ingestion caused by high pressure washer spray and submersion.





"Umbrella" valve vents pressure even when covered with 1/4 inch grease; splash plate provides extra protection against power washers.

Tamper-Proof Scotseal TF for grease-packed applications

Designed for today's grease-packed systems, the Tamper-Proof Scotseal TF Hubcap features a patented "umbrella" style valve that seals contamination out, yet vents internal pressure as low as 2 P.S.I. The addition of a splash plate to the hubcap design helps protect against the harsh conditions created by road spray, power washers and flooded docks.

SKF Scotseal Stamped Steel

Zinc-plated and protected with weather-resistant armor to resist rust and rough wear. Available in 3- to 8-bolt designs.

SKF Scotseal Lexan®

Lightweight, molded design using GE's Lexan handles harsh conditions; sealed models offered for grease-packed systems. Available for oil and grease pro-par applications.

SKF Scotseal TF hubcaps equipped for P.S.I.

Four SKF hubcaps are compatible with the Meritor® Tire Inflation System (MTIS) by P.S.I., an automatic tire inflation system (ATIS™). The system increases tire life, fuel efficiency and vehicle productivity.

See the complete Scotseal TF hubcap part listing and interchange chart on page 55.

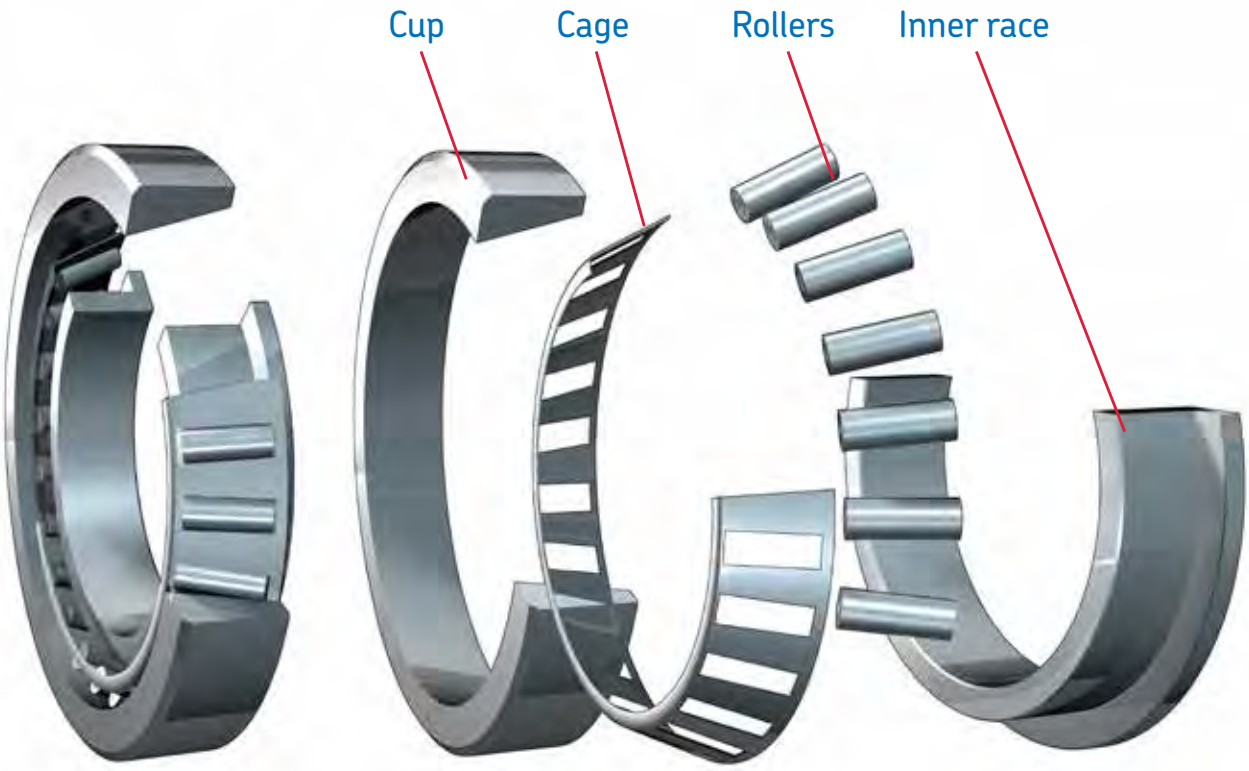
SKF tapered bearing sets

SKF tapered bearings are engineered and manufactured to the highest quality standards. Their design and superior materials provide a significant increase in operational reliability under heavy loads and misaligned conditions.

Made from the highest quality steel and engineered for longer service intervals, the construction of the SKF tapered bearings handle a combination of radial and thrust loads. Each tapered bearing set contains a precision matched cup and cone that are specifically designed to maximize bearing performance and life. Additionally, the SKF part numbers follow industry-established numbers, allowing for easy look-up and identification for specific applications.

SKF tapered bearing sets:

- Help the installer do the job right
- Ensure longer bearing life
- Help prevent premature failure
- Increase truck and trailer uptime
- Available for all popular applications



Half stand tapered bearing sets for PreSet® hub assemblies.

SKF also provides specifically-toleranced half stand tapered bearing sets for the PreSet hub assemblies:

- World-class quality of SKF, a global OE supplier
- Precision manufactured to tighter dimensional tolerances specified by ConMet®
- Superior design and materials reduce friction and provide excellent reliability under heavy loads and misaligned conditions
- Approved as an OE tapered bearing set in PreSet hub assemblies beginning in 2007

See the complete SKF tapered bearing sets part listing and interchange chart on page 56.

SKF Rebuild kits for PreSet®

PreSet® reliability and SKF quality in one convenient box

SKF addressed a big void in the commercial vehicle market by being the first to introduce an all inclusive Rebuild kit for PreSet hub assemblies. SKF's rebuild kit contains everything needed for successfully maintaining the wheel end and returning the truck/trailer to service. It includes the SKF Scotseal PlusXL, one of the most advanced wheel seals in the industry. It also includes tighter toleranced bearing sets, an SKF TF hubcap (if applicable), and a precision machined PreSet bearing spacer.

With parts that meet the exact specifications of the original PreSet system components, the SKF rebuild kit helps ensure longer service life and less downtime. Plus, a simplified installation procedure saves time.

SKF Scotseal PlusXL

SKF half stand tapered bearing sets (2)

SKF TF hubcap (when applicable)

Featuring precision machined PreSet spacer

- Proprietary machined bearing spacer along with the SKF specifically toleranced bearings provides the most reliable bearing end-play setting, optimizing wheel end life
- Eliminates need for manual end-play adjustment

Why install the kit, instead of off-the-shelf components?

While you could pull the spacer and rebuild your PreSet® wheel end with individual components from several suppliers, there are some compelling reasons to install the SKF rebuild kit for PreSet®

Reduce fleet downtime – Unlike off-the-shelf components, all of the kit's parts are manufactured to SKF's and ConMet's specifications, ultimately reducing downtime and lowering operating costs.

Simpler installation – One procedure regardless of axle type, eliminating potential failures due to error; no need for complicated torquing and use of a dial indicator.

Extended 3-year warranty – In addition, by installing the ConMet® approved SKF rebuild kit for PreSet®, you will receive an extended 3-year warranty on these SKF wheel end components.

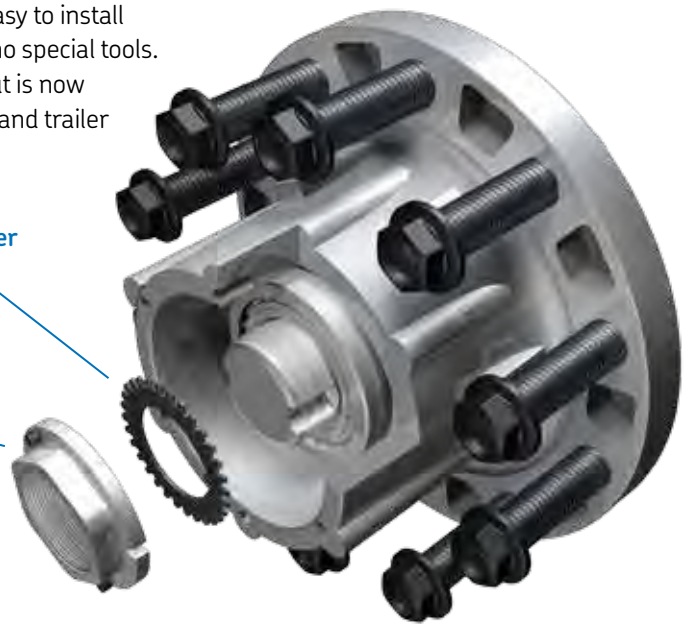
Longer service life – Because the kit meets the exact specifications of the original PreSet® system components, you can expect the same kind of reliability and performance from your rebuilt wheel end.

See the complete Rebuild kit for PreSet part listing on page 57.

SKF Spindle nut locking system

The SKF spindle nut locking system offers a new, robust and affordable lock nut system for tractors and trailers alike. Forged, precision machined and assembled with two high-strength lock bolts, the SKF spindle nut locking system yields one of the strongest systems available today. Coupled with the precision stamped lock washer, this system provides the user with end-play adjustability that exceeds the stringent demand of today's field environment and maintenance requirements.

This system is intuitively easy to install and service, and requires no special tools. The SKF spindle locking nut is now available in steering, drive and trailer sizes.



See the complete SKF Spindle nut locking system part listing on page 57.

SKF two-piece wheel nut for hub piloted wheels

Turn to a proven supplier for safety-critical wheel end components

The wheel end is critical to highway safety including the driver, cargo and others traveling on the roads. It's always best to trust a proven supplier with safety critical components.

The SKF wheel nut is designed to provide increased clamp force while maintaining optimized torque/tension, reducing operating costs with extended life and improved fuel economy.

SKF M22 X 1.5 two-piece wheel nuts, available in 33mm and 38mm OD, fit most tractors and trailers with hub piloted wheels.

Benefits of the SKF two-piece wheel nut include:

- Reduced potential for catastrophic failure – loosened wheel nuts can result in wheel-off conditions, as well as reduce the operating life of the wheel end's seals and bearings.
- Reduced operating costs – wheel nuts effect overall tire life and wheel end life, ultimately reducing fuel usage and costs.
- Quality design and manufacturing – manufactured to precise tolerances and meets the stringent requirements of SAE J1965.
- Provides increased clamp force while maintaining optimum torque/tension.
- Extended nut life – PTFE coating protects against corrosion and reduces friction.
- OE first fit wheel nut on many new production units.

SKF recommends placing a small bead of oil on the end of each stud before installing the two-piece wheel nut.

See the complete SKF two-piece wheel nut part listing on page 57.

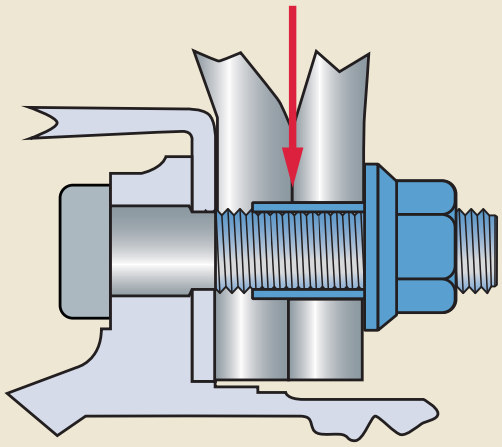
SKF sleeve nut

Help reduce wheel and wheel stud damage

The SKF sleeve nut was developed to reduce wheel and wheel stud damage and help prevent unpredictable wheel off situations.

This system is specifically designed for Class 7 and 8 trucks, tractors, trailers and any vehicle that uses M22 X 1.5 two-piece wheel nuts.

Sleeve fills in gap between stud and hole, eliminating "clocking" and damage to studs that can cause wheel-offs.



Benefits of the SKF sleeve nut include:

- Minimizes the clearance between the wheel stud and the wheel bolt hole
- Reduces the movement or "clocking" of loose wheels
- Engages both dual wheels
- Protects and covers the threads from wear
- Slows the process of wheels loosening
- Lengths designed for specific axle applications and wheel configurations

6 mm sleeve
Designed for:

Steer axles:
Steel wheels

Drive/trailer axles:
Steel wide single wheels

19 mm sleeve
Designed for:

Steer axles:
Aluminum wheels

Drive/trailer axles:
Aluminum wide single wheels

Drive/trailer axles:
Steel outer/steel inner dual wheels

28 mm sleeve
Designed for:

Drive/trailer axles:
Steel outer/aluminum inner dual wheels

Drive/trailer axles:
Aluminum outer/steel inner dual wheels

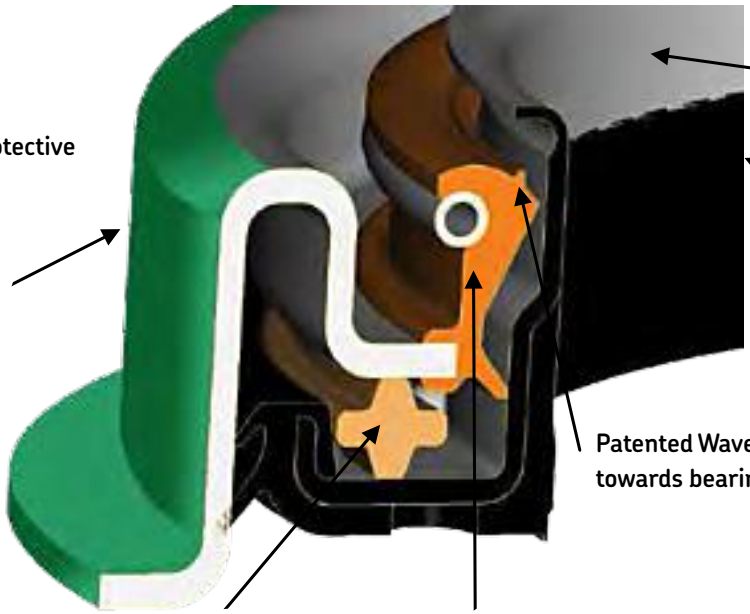
39 mm sleeve
Designed for:

Drive/trailer axles:
Aluminum outer/aluminum inner dual wheels

See the complete SKF sleeve nut part listing on page 58.

SKF Unitized pinion seal

The SKF unitized pinion seals offer the optimum sealing performance with extended life. The superior design provides a perfectly matched running surface for the sealing lips made from highly engineered fluoroelastomer. High temperature capable with extensive exclusion properties provides long life in a highly aggressive application. The unitized design incorporates the patented wave seal that sweeps lubricant back to the bearings promoting cooler running operation. Another innovative feature of this seal adding long life is the 1/2 metal, 1/2 rubber ID allows for heat dissipation while holding a positive grip on the shaft.



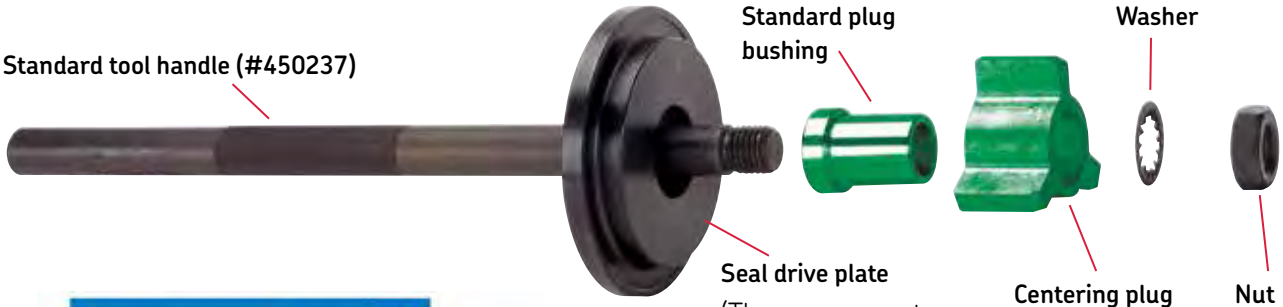
PT6000 tool installs all SKF unitized pinion seals

See the complete SKF Unitized pinion seal part listing on page 58.

Tools and accessories

Scotseal installation tools

It is recommended that SKF Scotseal Classic and Longlife wheels seals be installed with the Scotseal installation tool. Precisely matched centering plugs are engineered to fit within the inside diameter of the inner bearing cone and allow accurate centering of the Scotseal in the bore of the hub, as well as preventing cocking of the seal. **See page 59 for a complete listing of drive plates and centering plugs.**



The Scotseal toolboard

- Keeps tools orderly and lessens chances of tools being misplaced or damaged
- Sturdy metal construction – mounts easily on shop wall
- Fitting chart included
- Just order Part No. TB-2

SKF SRT-1 Seal Removal Tool

The SKF SRT-1 Seal Removal Tool is recommended for removal of most tractor, truck, dolly or trailer wheel seals. With the wheel hub assembly removed from the axle, simply insert the hook tip of the tool between the seal and bearing.

- Saves bearings – tool grabs seal only and bearings go undamaged.
- Seal is removed intact allowing for proper seal inspection and failure analysis if required.
- Works with steer, drive, and trailer wheel seals.

Universal bearing cup installer

The universal bearing cup installer (HD1) from SKF is a three-jaw system that provides evenly distributed pressure, eliminating cocked installations.

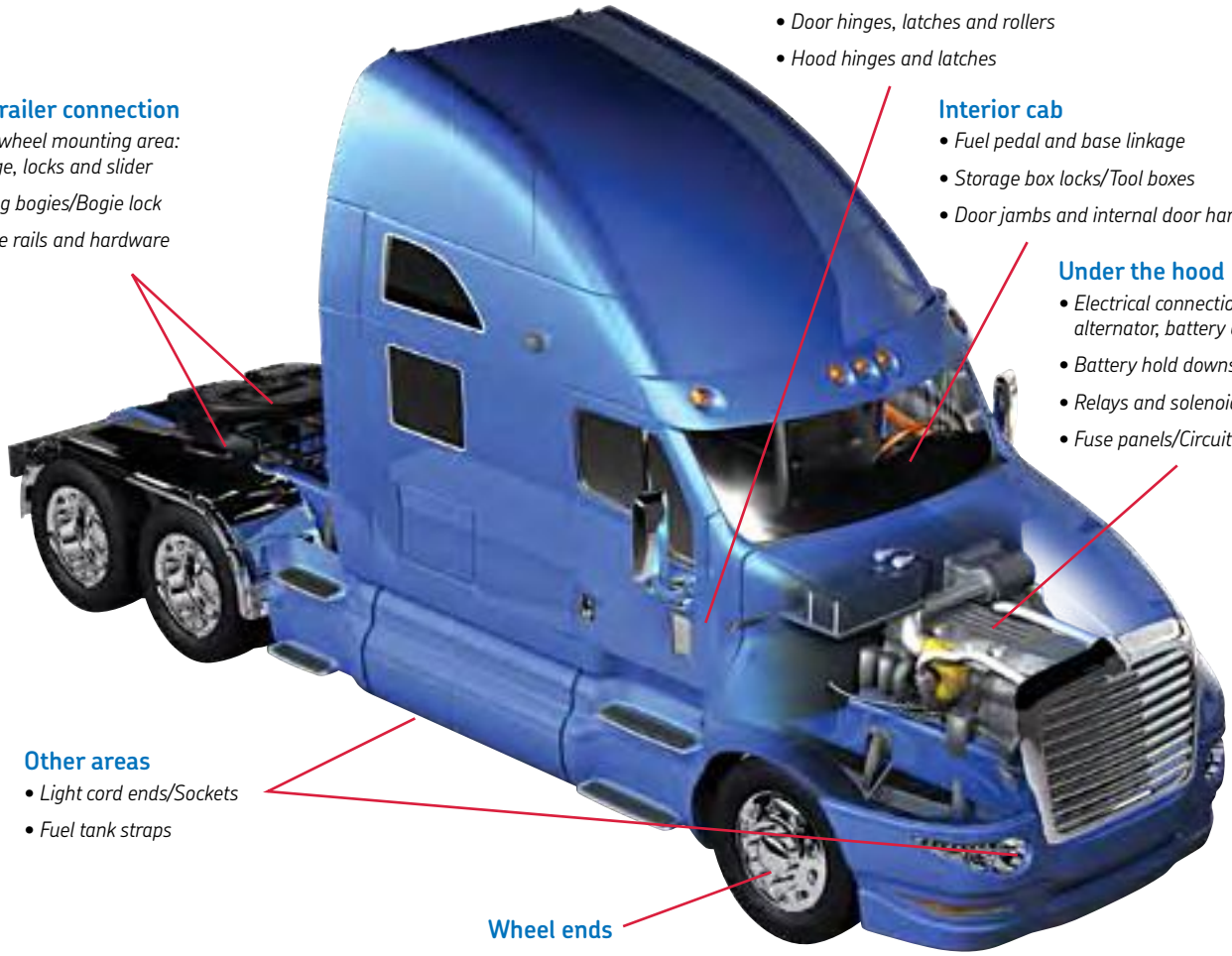
Krown

Fast, easy solutions to protect vehicles from road debris, salt and rust

Heavy duty trucks endure rugged operating conditions. Protect your investment with the Krown family of lubricants. Available in 55-gallon drums, 5 gallons, and easy to apply aerosol spray cans.

Krown Corrosion Inhibitor is formulated to help control corrosion in the most damaging of environments. Unlike many competitive products, this rust inhibitor contains no solvents which are hazardous to the environment, dangerous to the user and damaging to paint, plastic and rubber.

Tractor service



Exterior cab
- *Bunk locks*
- *Door hinges, latches and rollers*
- *Hood hinges and latches*

Interior cab
- *Fuel pedal and base linkage*
- *Storage box locks/Tool boxes*
- *Door jambs and internal door hardware*

Under the hood
- *Electrical connections: alternator, battery and starter*
- *Battery hold downs*
- *Relays and solenoids*
- *Fuse panels/Circuit breakers*

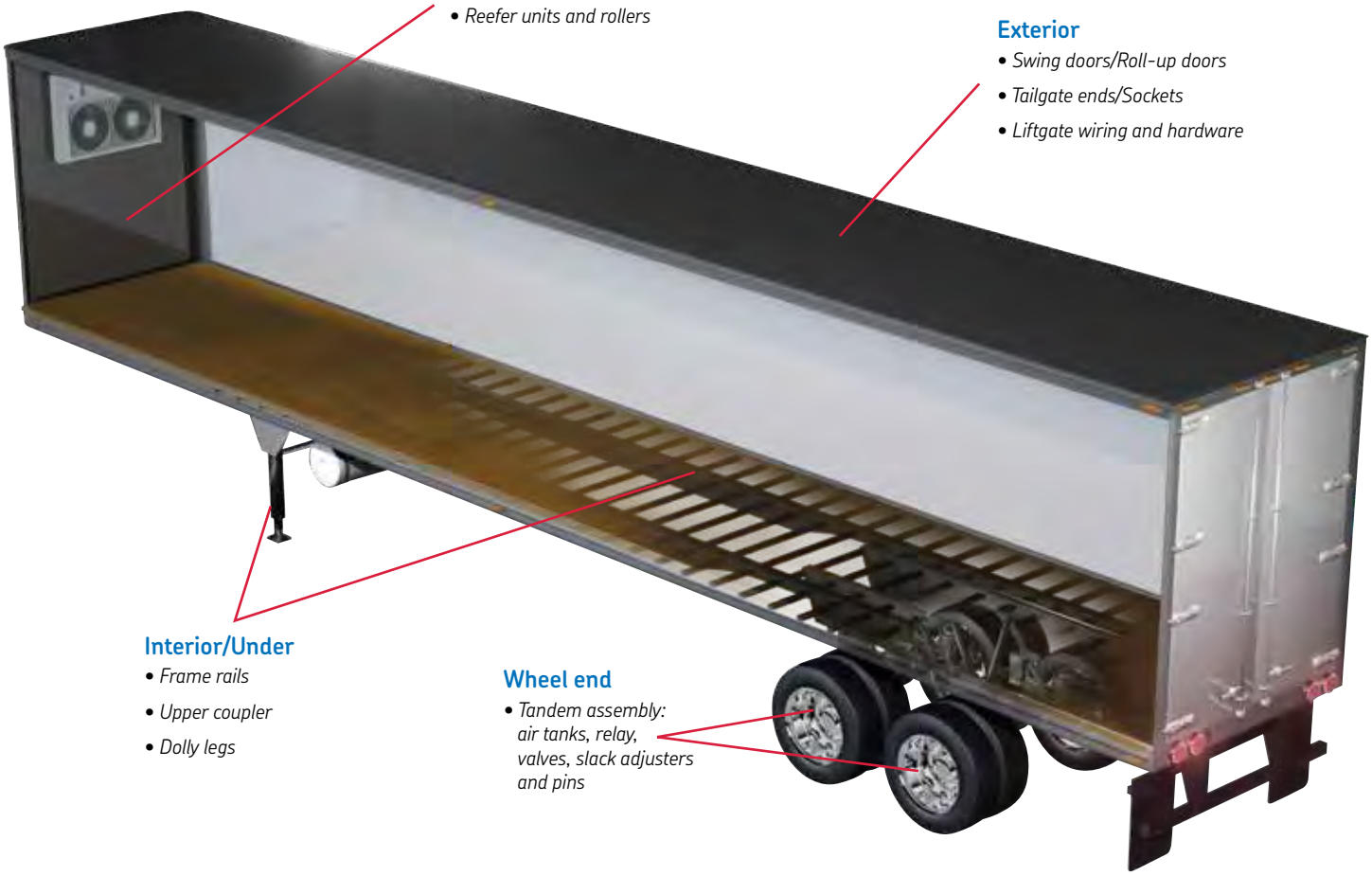
Cab-trailer connection
- *Fifth wheel mounting area: linkage, locks and slider*
- *Sliding bogies/Bogie lock*
- *Frame rails and hardware*

Other areas
- *Light cord ends/Sockets*
- *Fuel tank straps*

Wheel ends

Contact SKF Customer Service or your SKF sales representative to set up a Krown maintenance program.

Trailer service



Other Krown products

Krown Salt Eliminator is a very unique, equipment saving, protection product that makes the difficult task of salt removal easy. This proprietary formulation not only dissolves salt much more quickly, but also breaks the bond between chloride and metal while preventing the reforming of these salts after cleaning is complete.

Krown Fast Acting Penetrant will rapidly penetrate and loosen seized and rusted parts. This product is a solvent-free penetrant, which means the product remains on surfaces, lubricating and protecting from rust.

Krown Chain Lubricant is a solvent-free product designed to substantially enhance chain life while reducing wear and friction. Safe for self-lubricating chain, it will reduce corrosion and help to keep debris from sticking and causing costly repair and downtime. Engineered for high-heat applications.

Wheel end inspection and maintenance

It is important to inspect a vehicle's wheel ends periodically for safety and to maximize over-the-road performance. SKF recommends inspecting wheel ends every 100,000 miles or every 12 months using SKF's inspection check list found at *www.vsm.skf.com*. After inspection you may determine that a wheel end repair is necessary.

ConMet® PreSet® hub assemblies require service at 500,000 miles or every 2nd brake service.

Use a proper supporting device to support the vehicle. Carefully release air spring brakes.

When inspecting wheel ends, be sure to block wheels and lift axle.

WARNING: Never work under a unit supported by only a jack. Always support the vehicle with stands. Block the wheels and make sure the unit will not roll before releasing brakes. Always wear eye protection.

Helpful hints before you start.





- Stay organized—a messy shop is dangerous and inefficient.
- Keep loose components together
- It is important to not mix wheel-end components – bearings are "mates" that wear together. This includes new bearings.
- Do not use chisels, impact wrenches and torches
- Do not use hammers directly on seals or bearings

Hub removal

Using a proper hub support, remove spindle nut and pull hub assembly off spindle.

Inspection of spindle and hub

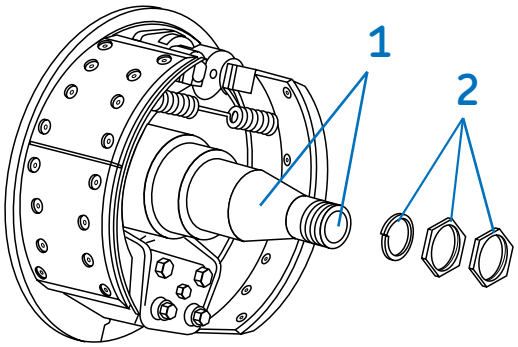
It is important to inspect a vehicle's wheel ends periodically for safety and to maximize over-the-road performance. SKF recommends inspecting wheel ends every 100,000 miles or every 12 months using SKF's inspection check list found at *www.vsm.skf.com*. After inspection you may determine that a wheel end repair is necessary.

ConMet® PreSet® hub assemblies require service at 500,000 miles or every 2nd brake service.

1 **Inspect the spindle and spindle threads for damage, and remove light frett. Also check for the following:**

- Spalling
- Corrosion pits
- Discoloration from overheating
- Punch marks / chisel marks
- Weld beads
- Upset metal

NOTE: Damaged threads can be repaired using a pitch thread file or die nut.

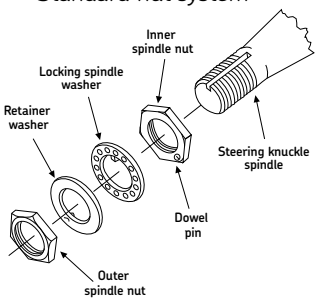


2 **Inspect the fastener / Locknut / Bearing adjustment nut / Washer**

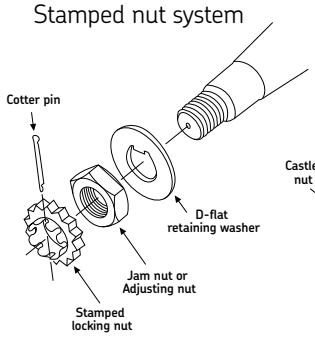
(The use of these spindle end components varies by truck or trailer manufacturer. See illustrations below of the various nut systems you may encounter.)

Look for chisel marks or other deformation as a sign of improper installation, or an attempt to make temporary repairs.

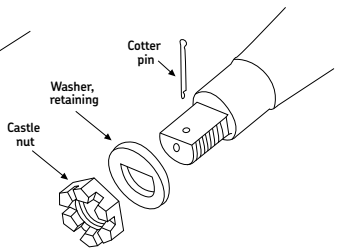
Standard nut system



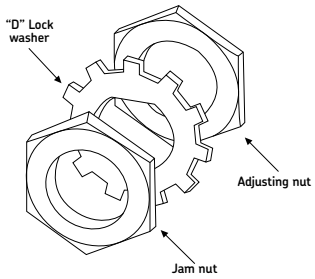
Stamped nut system



Castle nut system



Double nut pack system

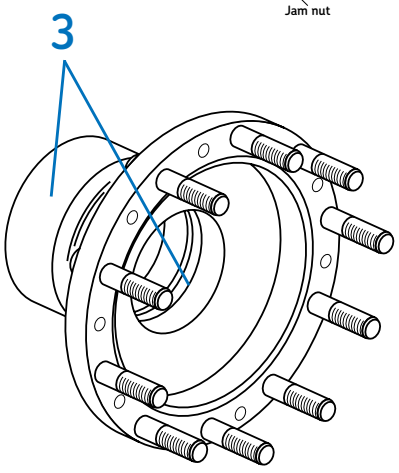


To learn about the one-piece SKF spindle nut locking system, see page 14.

3 **Inspect the inside and the outside of the hub. Look for the following:**

- Broken fasteners / bolts
- Cracks in the housing
- Damage to the hub and bore

NOTE: If the bearing cup is loose in the hub, this indicates a serious condition and the hub must be replaced.



Seal and bearing removal

The SKF SRT-1 Seal Removal Tool is recommended for removal of most tractor, truck, dolly or trailer wheel seals. With the wheel hub assembly removed from the axle, simply insert the hook tip of the tool between the seal and bearing. The unique design of the tool allows you to use leverage to easily and safely remove the seal, without damaging the spindle.

Remember performing seal failure analysis will ensure improved performance. See **pages 36-52** for seal failure analysis information.

WARNING: **Do not add a handle extension to the tool. This tool is to be used for seal removal only.**

Bearing inspection

Once the seal is removed, inspect the bearing cone and cup for any nicks, burrs or spalling. Reference the failure analysis section in the back of this guide.

Bearings must be cleaned for inspection and can be re-used. Use only clean solvents – effectiveness of solvent in removing old lubricant depends on how clean the solvent is.

Good cleaning requires proper equipment such as:

- A solvent bath
- A filter system and regular changes of the solvent and the filters

NOTE: Do not allow bearing to sit on the bottom of the container to avoid contact with sediment.

Bearing cup removal

If the bearing cone or cup is damaged, you must replace both. To remove the cup, follow one of the procedures below based on the type of hub you are working with.

Ferrous hubs:

Use hydraulic press

Aluminum hubs:

Weld bead around face of the bearing cup. Allow to cool for 15 minutes and remove. ***DO NOT USE hydraulic press***.

Bearing installation

There are two main types of serviceable wheel hub assemblies – manually adjusted and pre-adjusted. The re-assembly instructions are different for both so be sure to follow the correct procedure for each wheel end type.

The pre-adjusted hub assembly, such as ConMet's® PreSet®, includes a spacer between the inner and outer bearings. The bearings are specially tolerenced in order to achieve the targeted adjustment setting.

The specific installation instructions for PreSet are included in the SKF rebuild kit for PreSet® and can also be found on-line at www.vsm.skf.com.

Care in handling components and proper tooling are always the critical factors in all procedures which lead to trouble-free operation.

Bearing installation

Bearing installation is handled differently depending on whether you are working with a ferrous hub or an aluminum hub. With either hub, never directly hammer on the bearing.

For ferrous hubs:

Use the SKF HD2 tool to install the bearing cups into the hub.

For aluminum hubs:

Heat the hub in boiling water or in an oven to no more than 300° F. Do not use localized heat. Chill the bearing cup in a freezer. The hub will expand and the cup will contract. Place the cup into the hub.

For oil lubricated wheel ends, coat the bearing cones with a light oil film before inserting them into the hub. Always use the same lubricant being retained in the hub. Do not mix lubricants. Install the inner bearing cone into the hub.

Seal installation

Scotseal *PlusXL*

This seal is hand installable. No special tools are required.

Caution: **Do not install the Scotseal PlusXL directly onto the spindle.**

Place the hub (wheel) assembly flat or at least a 45° angle for seal installation. Clean bore of any particles, rust or grease.

1. Pre-lube the inner bearing cone with the lubricant that is being retained and place it into the hub.
2. Lightly lubricate the seal O.D. and I.D. evenly with the fluid that is being retained. Also apply a thin layer of oil on the hub bore that the seal is being pressed into. NEVER INSTALL DRY.
3. Press the seal by hand evenly into the bore. A rubber mallet or other soft-faced tool may be used to gently tap the seal into place. Be sure that the seal is evenly seated and bottomed in the bore. As in any seal installation, apply an even driving force to avoid cocking the seal or damaging the flange surface.
4. Allow seal to set for about 5 minutes prior to installing hub assembly onto spindle.

Caution: **Install a new seal if the seal is cocked or damaged during or after installation.**

Watch the Scotseal PlusXL installation video.

Lightly lubricate the OD and ID with the fluid being retained.

Press the seal into the bore evenly by hand.

A rubber mallet may be used to tap into place.

Scotseal *Classic* | Scotseal *Longlife*

When installing a Scotseal Classic or Longlife seal, it is important to use the proper installation tool to set the seal correctly into the hub. The SKF installation tool is specifically contoured to fit the profile of the seal. Refer to the seal installation tool charts on the following page.

Caution: **Do not install the Scotseal directly onto the spindle.**

Place the hub (wheel) assembly against a solid surface or bench at a 45° angle for seal installation. This aids in centering the bearing and seal in the hub bore. Clean bore of any particles, rust or grease.

1. Pre-lube the inner bearing cone with the lubricant that is being retained and place it into the hub.
2. Place the Scotseal Classic or Scotseal Longlife into the hub bore and insert the tool assembly with centering plug into the seal. Note: Be sure to wear proper eye protection.
3. Hold the tool handle firmly and straight, and drive the seal with firm hammer strokes until the seal is squarely seated. Continue driving the seal into the hub until the sound of impact changes.
4. After the seal is bottomed in the bore, check for freedom of movement by manually moving the packing of the seal up and down. Ensure that the inner bearing rotates freely.

Caution: **Install a new seal if the seal is cocked or damaged during or after installation.**

For detailed information about the Scotseal Installation tool, see **pages 18-19**.
For drive plates and seal match-ups, see **Table 1** on **page 59**.
For match-up of bearing cones and centering plugs, see **Table 2** on **page 59**.

Watch the Scotseal Classic installation video.

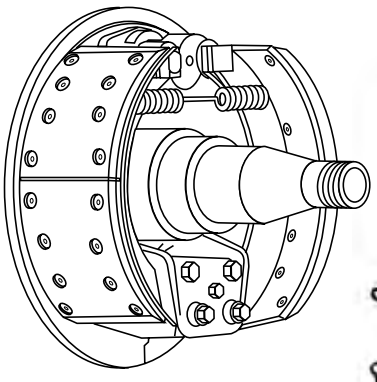
Installing hub assembly

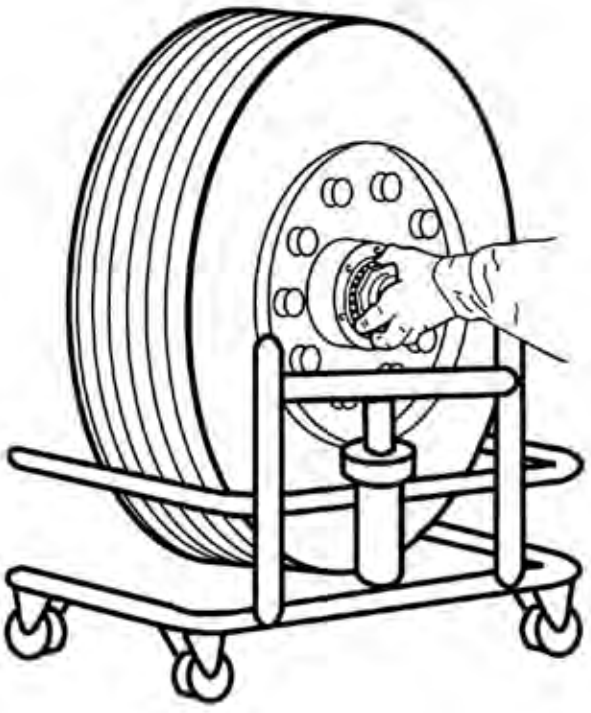
1. When installing the hub assembly over the axle spindle be sure to align the hub bore to the center of the spindle. Mechanical supports will allow you to do this without scraping or otherwise damaging the spindle, the threads and in particular the seal.
2. Install the outer bearing cone and adjusting nut. Tighten nut only until it is snug against the bearing cone. DO NOT USE A PNEUMATIC TOOL during this part of the procedure. Be sure to maintain support of the hub assembly until the adjusting nut is secure. Failure to do so may cause damage to the seal and subsequent leakage of lubricant.
3. Remove the hub support so that the hub is resting on the bearings. Check for free rotation of the bearings. Never allow hub to rest on seal.
4. Follow wheal bearing adjustment as instructed on following page.

WARNING

Do not attempt to install the hub assembly by hand! Whether the hub is with or without the tire, do not install it without mechanical support.

Axle spindle (shaft)





Wheel bearing and end play adjustment procedures

Wheel bearing adjustment procedure

Step 1: Lubricate the wheel bearing with clean axle lubricant of the same type used in the axle sump or hub assembly.
Note: Never use an impact wrench when tightening or loosening lug nuts or bolts during the procedure.

Initial adjusting nut torque	Initial back off	Final adjusting nut torque	Back off			Jam nut torque		Acceptable end play
			Axle type	Threads per inch	Final back off	Nut size	Torque specifications	
Step 2	**Step 3**	**Step 4**		**Step 5**	**Step 6**	**Step 7**		**Step 8**
200 lb·ft (271 N·m) While rotating wheels	One full turn	50 lb·ft *(68 N·m)* While rotating wheels	Steer (front) non-drive	12	1/6 Turn[1]	Install cotter pin to lock axle nut in position		0.001 in – 0.005 in *(0.025 mm– 0.127 mm)*
				18	1/4 Turn[1]			
				14	1/2 Turn	Less than 2 5/8 in *(66.7 mm)*	200–300 lb·ft *(271–407 N·m)*	
				18				
			Drive	12	1/4 Turn	Dowel type washer	300–400 lb·ft *(407–542 N·m)*	As measured per procedure with dial indicator
				16		Tang type washer[2]	200–275 lb·ft *(271–373 N·m)*	
			Trailer	12	1/4 Turn	2 5/8 in *(66.7 mm)* and over	200–300 lb·ft *(271–407 N·m)*	
				16				

[1] If dowel pin and washer (or washer tang and nut flat) are not aligned, remove the washer, turn it over, and reinstall. If required, loosen the inner (adjusting) nut just enough for alignment.
[2] Bendable type washer lock only: Secure nuts by bending one wheel nut washer tang over the inner and outer nut. Bend the tangs over the closest flat perpendicular to the tang.
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PreSet® wheel bearing adjustment procedure

ConMet® PreSet® hub assemblies are equipped with specially, half-toleranced bearings and a spacer, and require a specific bearing adjustment procedure. Use the OEM seal, Scotseal PlusXL, when servicing a PreSet® hub assembly.

1) Lubricate the wheel bearing with clean axle lubricant of the same type used in the axle sump or hub assembly. Never use an impact wrench when tightening or loosening lug nuts or bolts during this procedure.

2a) For one-piece spindle nut systems, torque the nut to a minimum of 300 ft. lbs. Do not back off the spindle nut. Advance the nut until engagement takes place and the nut is locked.

2b) For a double nut or jam nut system, torque the inner nut to 300 ft. lbs. Do not back off the spindle nut. Install the outer nut with 200 ft. lbs. of torque.

NOTE: Be sure to engage any locking device.

2c) Per ConMet® Service Manual, rev 2011, ConMet® does not recommend the use of a one-piece castellated type nut system for use with PreSet® hubs.

SKF Wheel bearing lock nut system installation and adjustment procedures

1. Ensure all wheel-end components are assembled and pre-lubricated, if required, to their respective manufacturer's warranty, quality, care, and assembly instructions. Care must be taken not to lubricate spindle threads. **False torque readings will occur if spindle threads are lubricated.**
2. Install the wheel bearing lock washer as shown in **fig. 1**.
3. The lock nut can now be threaded onto the spindle, as shown in **fig. 2**, and tightened by hand.
4. Using a 2" six-point thin tubular socket for the 1.50-12 & 1.50-18 thread size, a 3" six-point thin tubular socket for the 2.625-12 & 2.625-16 thread size, a 3 3/4" six-point thin tubular socket for 3.25-12 and a 4 1/8" six-point tubular socket for the 3.48-12 & 3.50-12 thread size with the appropriated **calibrated torque wrench**, torque nut to 220 ft-lbs. while rotating the wheel. After torque is achieved, rotate wheel hub assembly an additional two full revolutions. (**Wheel should not rotate freely at a nut torque of 220 ft-lbs)** See **fig. 3** for socket placement.
5. Without disturbing the wheel/hub, back off the lock nut one half-turn.
6. Re-torque SKF spindle wheel nut to 105 ft-lbs while rotating the wheel.
   a) Rotate two full additional revolutions.
   b) Back off nut **4 washer notches for 1.50-12, 1.50-18, 3.25-12, 3.48-12, or 3.50-12 nuts. Back off nut 6 washer notches for a 2.625-12 or 2.625-16 nut using the sight-gage in flange of nut.**
   c) Verify bearing end play of .001 to .003 of an inch using process in step #10 of this procedure.

WARNING

Failure to follow these instructions could cause the wheel to come off and cause bodily injury and or property damage.

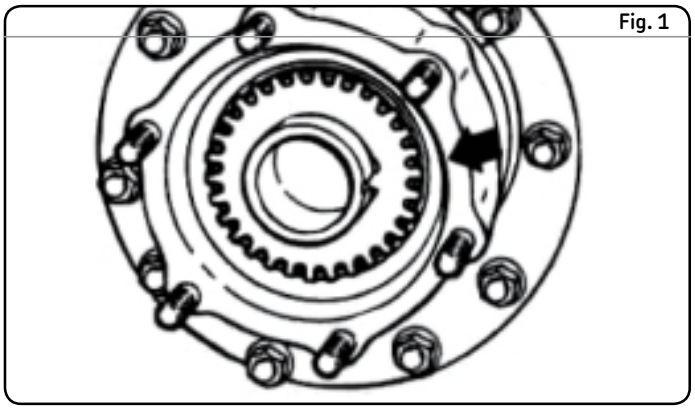


Fig. 1

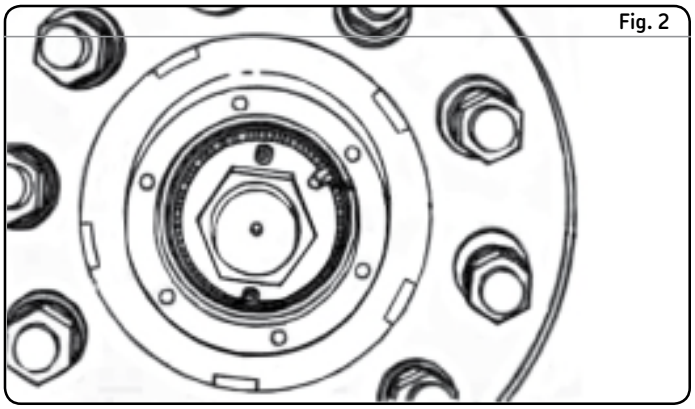


Fig. 2

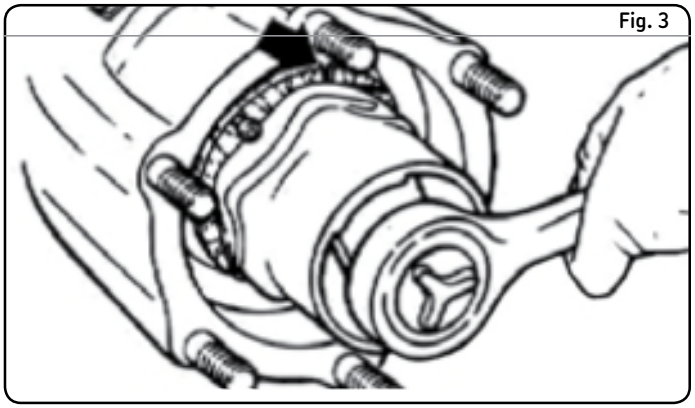


Fig. 3

7 When end play is verified it is time to arm the wheel bearing lock nut system for field use. Without disturbing the wheel/hub, locate the slot cut in the flange of the wheel nut. This slot is an alignment sight gage for the SHCS (Spindle hub Cap Screws) harmonic proof locking system. See **Figure 4**.

8 If sight gage slot aligns with washer slot, tighten and torque SHCS locking system as indicated in step #9. If sight gage slot does not align with washer slot, rotate nut clockwise until alignment occurs, then tighten and torque SHCS locking system as indicated in step #9.

9 When nut sight gage and lock washer slot alignment occurs the SHCS locking system can be torqued to a final reading of 10-13 ft-lbs using a 9/64 hex bit socket for 1.50-12 and 1.50-16 and for all others use a 3/16 hex bit socket and the appropriate calibrated torque wrench. **(Make sure heads of cap screws contact nut flange surface) Hub should rotate freely after SHCS locking system is armed. SHCS must be replaced with each and every removal of the wheel bearing lock nut system with a replacement cap screw and using Loctite® threadlocker on the threads.** See **Figure 5** for SHCS location.

10 The following procedure can be used to verify end play:

a) Make sure the brake drum to hub fasteners (wheel lug nuts) are tightened to the correct torque.

b) Clean off all surfaces of the exposed axle end and the hub face.

c) Setup gauging with similar equipment as shown in **Figure 6**.

d) Set the dial indicator to zero. (Gauge must be mounted to the hub and the indicator must be zeroed out on the spindle)

e) Grasp the hub/drum assembly at the 3 o'clock and the 9 o'clock positions. Push the assembly straight in, then straight out while reading the indicator. **DO NOT** rock or rotate the hub/drum assembly as an incorrect reading will result. Wheel bearing end play is the total movement of the dial indicator.

f) **Bearing end play must be at least .001 of an inch and not greater than .003 of an inch.**

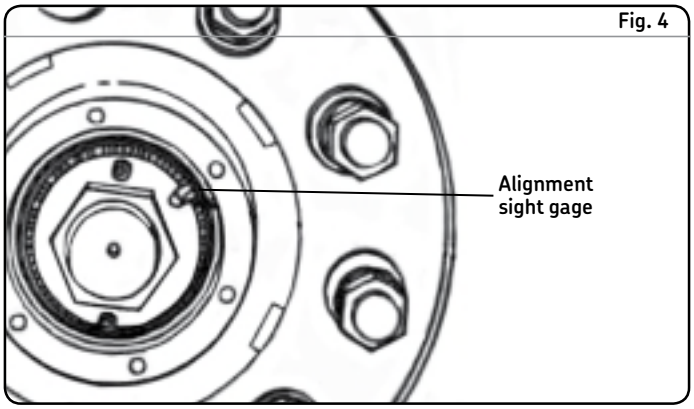


Fig. 4

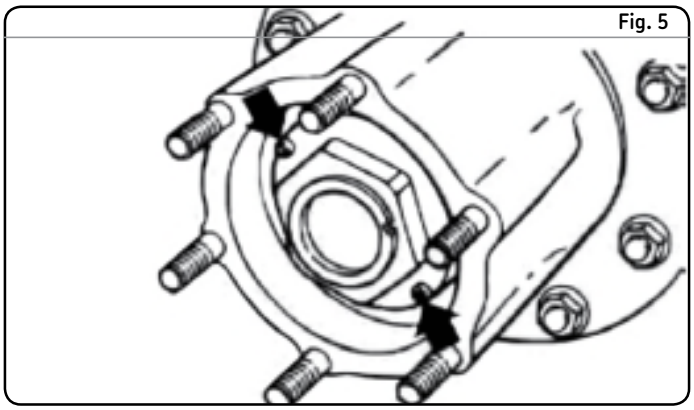


Fig. 5

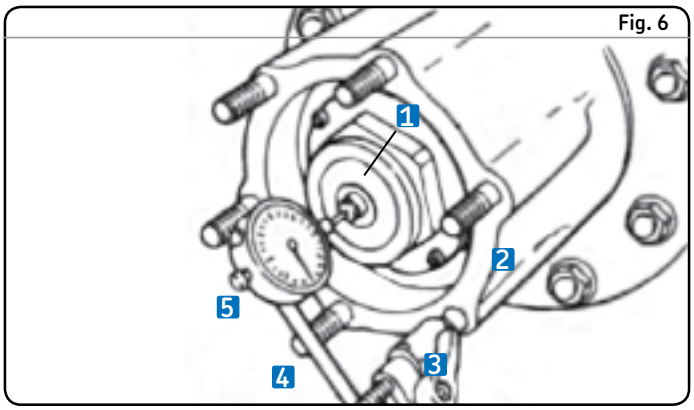


Fig. 6

1 *Magnetic drive axle end plate*

2 *Female adapter mounting rod*

3 *Sliding swivel*

4 *Dial indicator mounting rod*

5 *Dial indicator*

Wheel bearing end play verification

Wheel bearing end play is the free movement of the wheel assembly along the spindle axis. It is recommended, for verification purposes, that wheel bearing end play be measured with a dial indicator. (Example in photo at right.)

Step 1 Make sure the brake drum to hub fasteners are tightened to the manufacturers' specifications.

Step 2 Attach a dial indicator with its magnetic base at the bottom of the hub or brake drum.

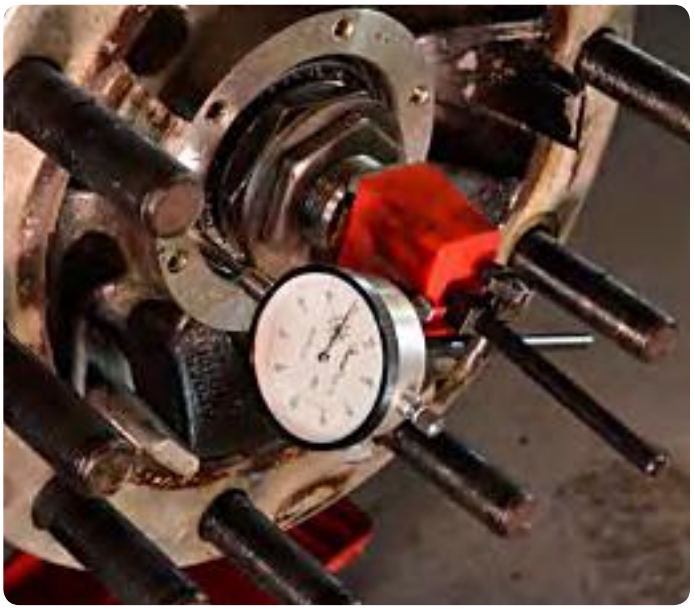
Step 3 Adjust the dial indicator so that its plunger or pointer is against the end of the spindle with its line of action approximately parallel to the axis of the spindle.

NOTE: For aluminum hubs, attach the magnetic base of the indicator to the end of the spindle with the plunger against the hub or brake drum.

Step 4 Set the dial indicator to zero by rotating the gauge face so the zero mark lines up with the gauge needle. For digital indicators, push the zero-out button.

Step 5 Grasp the wheel assembly at the 3 o'clock and 9 o'clock positions, while oscillating it to seat the bearings. Read bearing end play as the total indicator movement.

NOTE: If end play is not within specifications, refer to the readjustment procedure on **page 29**.



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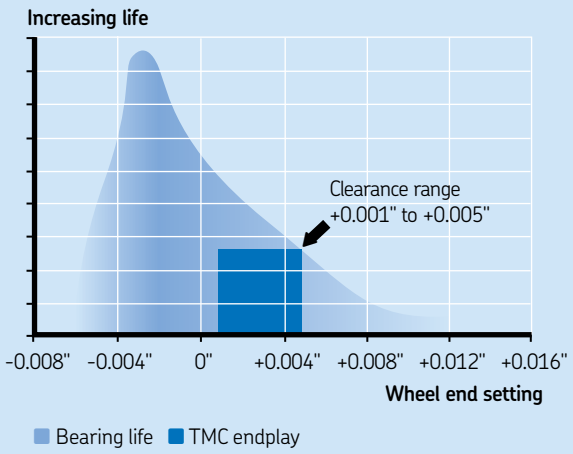
Bearing life chart



Hubcap installation procedure

Procedure

1 Hub mating surface must be free of dirt, burrs and radial score lines.

2 Hub mating surface, hubcap flange and gasket should not be greased or oiled.

3 Always install and re-install a hubcap with a new gasket.

4 When using a Tamper Proof system with synthetic grease, never fill hubcap with grease.

Bolt on hubcaps

- Use the plated SEMS bolts included with the TF Zytel hubcaps. The pre-assembled washers bite into the flange and protect the wheel end from exposure to contaminants.
- Use grade 5 bolts for the steel hubcaps with conical or internal toothed washers. Do not use flat washers.
- Thread all bolts loosely, then tighten down bolts uniformly in a star pattern per the following recommended torque values:

TF (Zytel) Hubcap with embedded metal ring	**12-16 lbs./ft.**
Stamped Steel Hubcaps	**10-14 lbs./ft.**
Plastic Hubcap with external metal ring	**6-10 lbs./ft.**

Threaded hubcaps

- Lightly lubricate the threads of the hubcap and the O-ring, with the lubricant that is being retained.
- Install the O-ring onto the hubcap.
- Install the hubcap assembly onto the hub.
- Using an 8-point 4 13/16" opening x 4 1/4" high socket, torque to the following recommended values:

Lexan 50-60 lbs./ft. (Note: Do not use solvent-based cleaners on Lexan hubcaps.)

Oil fill Through center fill port

- Fill wheel end assembly through centerfill port with the specified grade of oil. Wheel hub configurations vary, allowing different amounts of oil to be added depending on design. Allow for the oil to seep through the outer bearing and fill the hub cavity. Continue to add oil until the oil reaches the oil level fill line as indicated on the hubcap.
- Install center fill hubcap plug.

Through side fill port

- Fill wheel end assembly through side fill port with the specified grade of oil. Wheel hub configurations vary, allowing different amounts of oil to be added depending on design. Allow for the oil to seep through the outer bearing and fill the hub cavity. During this fill operation, **DO NOT ALLOW THE OIL TO GO ABOVE THE CENTERLINE OR WEEP HOLE**. This may result in a weeping condition that may be perceived as a leaking hubcap. Continue to add oil until the oil reaches the oil level line as indicated on the hubcap.

- Install side fill hubcap plug per the following recommended torque values:

3/8" - 18 NPT Pipe Plug	**100-140 lbs./in.**
3/4" - 16 UNF (Zytel) Side Fill Plug	**15-25 lbs./in.**

Clean up any overspills that would give the appearance of a leaky hubcap.

Grease fill: **See TMC RP631** *"Recommendations for Wheel End Lubrication"* and the vehicle manufacturer's recommendation for proper fill procedure.

TFO "Good practice" tips

Our experience has shown that there are many causes of wheel end leakage beyond the oil seal. If you look, you will find that leaking wheel ends leave clues pointing to which component or components are the culprits. Follow the guidelines of the checklist below as you service the wheel end. You may find that just changing the seal may not be your permanent solution.

To prevent wheel end leakage problems, be a good detective ... look for clues.

Inspect for indications of leakage:

Under vehicle inspection

- Oil present past the seal
- Oil contaminated hub, brake hardware, brake shoes

External leakage

- Oil present around hubcap, in wheel cavity
- Oil present around axle flange (drive axle)

Disassembling the wheel end

(Caution: Block wheels, support vehicle on stands)

- Check condition of hubcap. Check flange, window and centerfill plug
- Check bolts and axle flange area on drive axle

Remove hubcap

(Axle flange on drive axle)

Check condition of lube

- Cloudy or milky indicates water
- Shiny indicates bearing wear
- Metal flakes present could indicate loose shavings from an axle component
- Grit and sand indicates lube contamination
- Smells burnt indicates overheating

Check condition of fastening system

- Verify end-play measurement before removing fastener
- Examine outer nut, washer (dowel, tang or 'D' type), inner nut, cotter pin

Remove outer bearing

- Inspect for signs of damage

Remove wheel or hub assembly, using a wheel dolly

Check spindle

- Threads damaged
- Chamfer damaged

Set bearings aside for inspection

Remove seal

- Check hub
- Condition of chamfer
- Nicks, burrs, damage
- Consult the Failure Analysis section of the User's Manual

The importance of proper lubricants

Running conditions (Road surface, weather, terrain, speed and load)

Inspection of lubricant

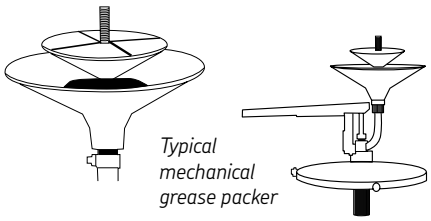
Inspection of grease or oil can provide a clue to other problems. Remove a sample from the wheel end and check for the following:

- Presence of contaminants
- Burnt aroma
- Presence of water

Grease and oil lubricants

The truck or trailer manufacturer has pre-determined that the wheel-end assembly is to be lubricated by grease or oil. The importance of following the manufacturer's specifications cannot be over emphasized – never change or mix grease and oil in the same assembly!

Always use lubricants as recommended by the manufacturer.



Typical mechanical grease packer

Grease lubricated wheel ends

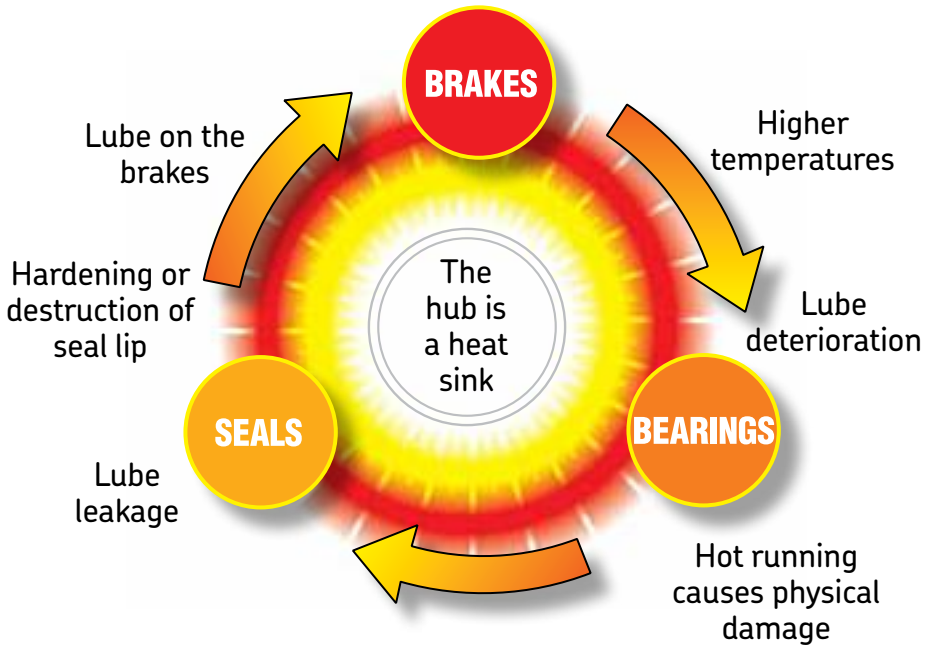
Wheel end lubricants are formulated to match the requirements of the truck and bearing manufacturer.

- Always use specified lubricant
- Do not mix lubricants
- Chemical interaction between lubricants and seal materials can damage the seal
- Whenever possible, use a grease packer

Prior to re-installing bearings, always check for the proper lubricant.

Wheel end lubricants are formulated to match the requirements of the truck and bearing manufacturer.

- Always use specified lubricant
- Do not mix lubricants
- Chemical interaction between lubricants and seal materials can damage the seal
- Whenever possible, use a grease packer



Failure analysis:

An important step in achieving wheel end TFO.

Failure analysis of prematurely failed seals is one of the best means to discover the cause of failure and to avoid a similar fate for the replacement seal.

The cross sectional drawings at right illustrate the critical components of each member of the **Scotseal** family. The captions identify these components as described in the following pages.

For Scotseal PlusXL, failures most likely result from these common errors:

- Improper installation
  - *O.D. and/or I.D. not lubed*
- Lube contamination
- Spindle not fully prepped
- Use of a hammer

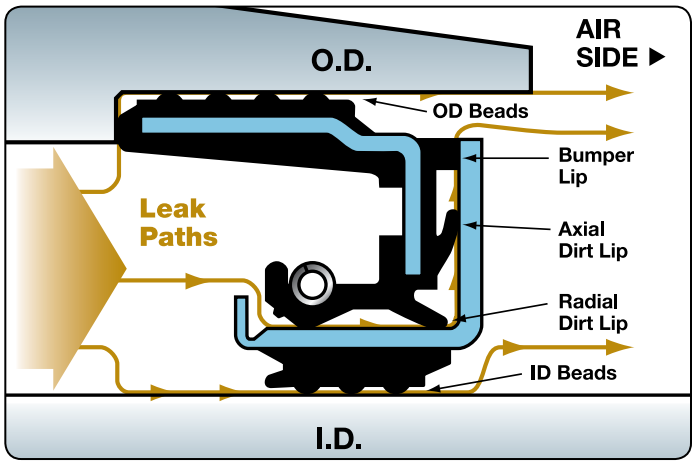
NOTE: replacing a narrow footed seal like the Scotseal Classic and Scotseal Longlife requires cleaning the spindle along the new area where the wider **Scotseal** *PlusXL* will sit.

Below are the key failure modes for **Scotseal** *Classic* and **Scotseal** *Longlife*. These account for the lion's share of premature seal failures.

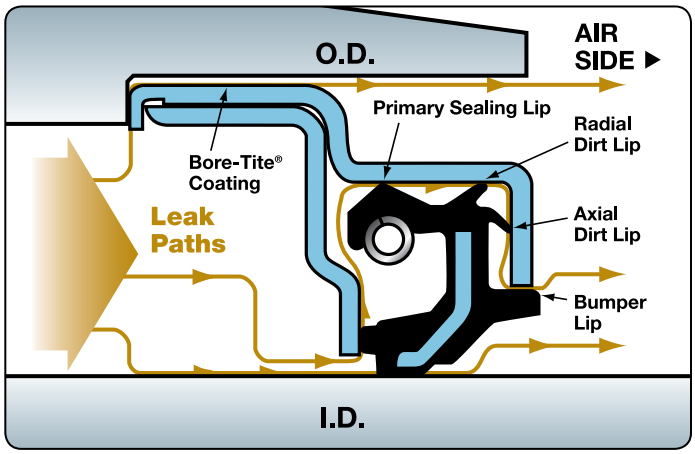
- Improper installation
  - *Wrong or no tool used*
- Cocked installation
- Lubricant contamination
  - *Metal flakes*
  - *Dirt or water*
  - *Mixing of lube types*
- Improper bearing adjustment
- Seal spinning on spindle
  - *Damaged spindle*
- Hub imperfections
- Installed over a wear ring

Consult the following pages for examples of failure analysis.

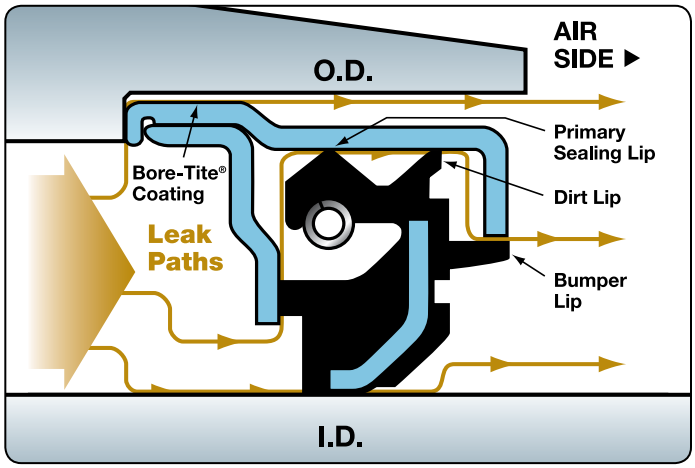
Scotseal *PlusXL*



Scotseal *Longlife*



Scotseal *Classic*



Failure analysis:

Scotseal *Classic* / Scotseal *Longlife*

External inspection – outer diameter

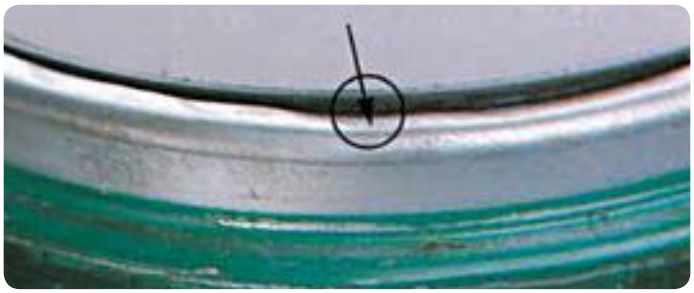
Normal scuffing
The surface will show some scraped areas, that's normal. But signs of nicks, scratches metal particles, or any foreign material are warning flags that something else is amiss. Make sure the hub bore is smooth and free of burrs or nicks.

O.D. radial grooves
If the Bore-Tite film has been scored all the way across the width of the seal, you should inspect the hub for burrs or damage. Before installation, the hub should be inspected and cleaned with emery cloth or a fine file.

Lines in the Bore-Tite
If you see lines around the seal, several things could have happened. If the lines are etched to the metal, the seal could have spun as a result of being the wrong application or, more likely, it was installed crooked or cocked.

As you can see in this example, the grooves run from high on the left to low on the right, indicating a cocked installation. Most likely, the seal was not properly "bottomed-out" or a centering tool was not used — common causes of premature seal failure.

Shiny leading edge
Occasionally someone will try to improve seal installation by changing the shape of the seal. They'll round off the leading edge of the outer cup on a grinder. This distorts the outer diameter and can possibly cause the seal to disassemble.



Outer cup damage
If you see dents, nicks, or a bent casing you can bet that the seal was installed without the proper tool or the tool was damaged. Gashes indicate the use of a sharp object, like a screwdriver or punch.

Failure analysis:

Scotseal *Classic* / Scotseal *Longlife*

External inspection – inner diameter

I.D. wear
If the I.D. of the packing is shiny, or has axial scratches, the seal has spun on the shaft. That can be caused by not bottoming-out the seal properly, leaving it cocked in the bore or installing the wrong part number.

Installed backwards
The only way that the packing can be worn shiny, as shown here, is by rubbing against the bearing race. The only way that can happen is by putting the seal in backwards.

Severely damaged I.D.
Scratches or dents in the I.D. are signs that the seal has struck the spindle or axle tube during installation. Rushing the installation and not lining up the wheel dolly is the usual suspect. Or a rough shop floor may be the problem.

Distorted packing
One way to damage the packing of a Scotseal is to try to install it over a wear ring. The wear ring will deform the inner surface and ruin the seal. Any previously installed wear ring must be removed prior to installing a Scotseal.

Foreign matter on I.D.
Occasionally, you will come across a seal with a shaft leak that has a mysterious, tacky substance on it. Most likely someone added a silicone sealant to "improve" the seal. Old habits die hard.

Reference the Scotseal installation wall poster (457626) as a convenient seal and bearing installation guide.

Failure analysis:

Scotseal *Classic* / Scotseal *Longlife*

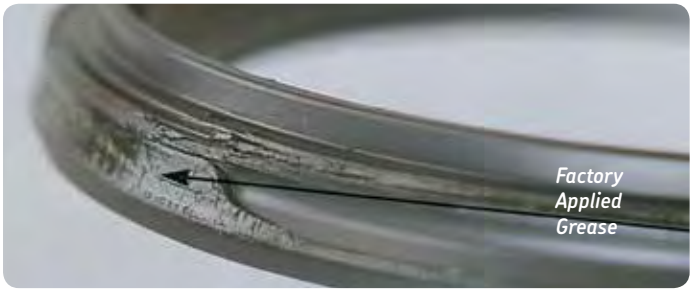
Internal inspection

Use pliers or end cutters and work your way all the way around the seal, straightening the outer cup flange.

Remove the inner cup. Be sure to wear gloves or use a shop rag to protect your hands, the open flange edges are sharp.

Remove the packing without disturbing the lip surfaces, as shown.

Internal inspection – the major clues



Lip grease
Every Scotseal comes with grease between the primary and dirt lip. If it's not there, it's very likely oil has washed it away. Suspects are excessive end-play, a cocked seal or improper ventilation of the wheel end (dirt, corrosion or paint-plugged vent).

Brittle primary seal lip
After cleaning the entire seal, use your fingers to curl the primary seal lip back. Run your finger completely around the circumference. The oil lip should be smooth and pliable. If not, the seal has overheated; lack of lubrication or overtightened bearing adjustment could be the cause. Be sure to inspect bearings carefully.

Broken dirt lip
Using the same technique, check the dirt lip. If it's dry and brittle, most likely it's been baked. It will probably split away from the seal at some point around the circumference.

Lack of lubrication may have fried the bearings as well.

Failure analysis:

Scotseal *Classic* / Scotseal *Longlife*

Internal inspection – wear tracks

Good pattern
What you will see in a good Scotseal are the two parallel lines that look like they've been drawn with a sharp pencil. They're approximately the same size and equidistant from the edge all the way around the inside of the outer cup.

Wide, wide
If both lines are wider than pencil lines, it means that the primary lip and dirt lip have been allowed to move in and out on the outer cup. The cause of this is excessive end-play, indicating that the bearing end-play is greater than the recommended range of .001" and .005".

Metal shavings in lip area
Before cleaning the seal, inspect the seal area for traces of metal particles. A magnet can attract metal particles. Sharp edges of metal may have cut the seal primary lip causing the seal to leak.

Cocked seal—inner markings
Holding the outer cup just below eye level and flat, like a bowl, rotate your wrist through 360°. If the seal has run cocked, the two lines will be parallel to each other, but they appear to move closer and then farther from the outer cup flange.

Failure analysis:

Scotseal *PlusXL*

External inspection – checking the beads

Normal exterior
The tough nitrile covering on the ***Scotseal*** *PlusXL doesn't supply clues as readily as Bore-Tite does. But it can still reveal problems and lead to corrective measures. There should be lubrication in each of the O.D., I.D. beads.*

Dry exterior
If, in good illumination, you cannot see any residual lubrication between the beads of the outer sleeve, the seal may have been installed dry. A ***Scotseal*** *PlusXL does not need special tools, but it does need lubrication for proper installation.*

Damaged O.D. beads
If the external ridges appear damaged, most likely someone has tried to force the seal in place without proper lubrication. Burrs or dirt in the bore can also cause problems, but they're not as visible with the thick nitrile rubber protection.

Worn I.D. beads
A worn I.D. indicates the seal has been slipping on the spindle. Look for three main causes: a cocked seal, a bent seal section, or poor spindle preparation in changing from another seal to the ***Scotseal*** *PlusXL.*

Damaged I.D.beads
Cuts or scarring in the I.D. is caused by jamming the seal into the spindle or axle tube. Misaligning the wheel dolly is usually the result of haste, however the work area should be checked to make sure the floor is smooth and free of clutter.

Dented, scarred sleeve assembly
A dimpled or dented surface indicates damage caused by a problem during installation. Lack of lubrication would be a prime suspect, but a poorly prepared hub or the use of hard-faced tools or seal driver could be the culprit.

Failure analysis:

Scotseal *PlusXL*

Opening a Scotseal *PlusXL*

Use pliers to straighten the flange on the sleeve section. Be sure to wear gloves or use a shop rag to protect your hands. The opened flange is extremely sharp.

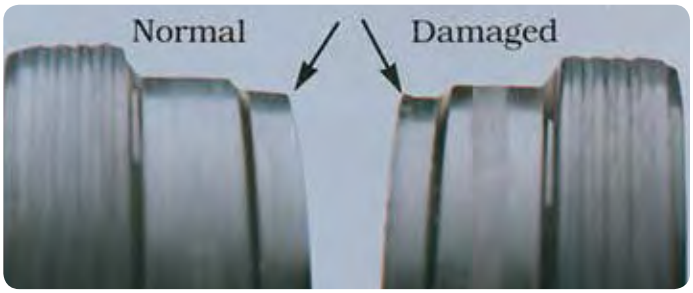
Pull the two components apart. Then set the sleeve assembly aside (the top component shown above). Place it carefully where it is out of the way, but won't be disturbed.

Internal inspection – sealing lip condition

Check for grease
Locate the primary sealing lip and radial dirt lip. If the area between them is dry, something has allowed oil to wash away the grease. The cause could be excessive end-play or a cocked seal. Or internal pressure from a blocked vent.

Normal lip flexibility
Check the primary sealing lip and dirt lips by pressing downward on them with your thumbs, sliding them around the entire circumference. The rubber should remain soft and flexible in normal use.

Cracked lips
If, when you check the primary and dirt lips the nitrile feels rough and dry, it has probably been subjected to excessive heat. Loss of lubrication and overtightened bearing adjustment are the prime suspects.



Flattened bumper lip
Scale or rust on the spindle will prevent the wider ***Scotseal*** *PlusXL from sealing properly. This creates extra pressure on the bumper and axial dirt lips. The spindle must be fully cleaned and all wear rings removed before installing a* ***Scotseal*** *PlusXL.*

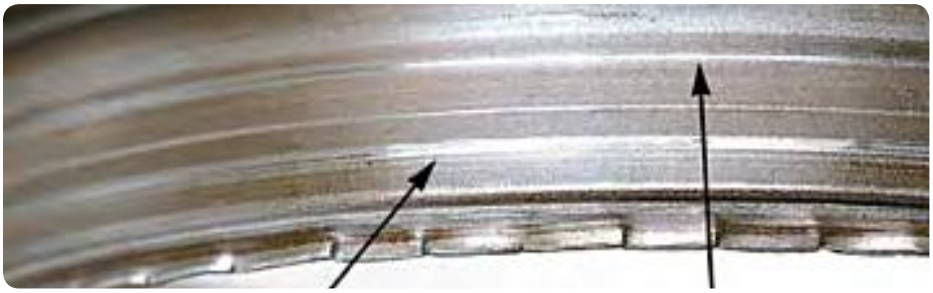
Failure analysis:

Scotseal *PlusXL*

Internal inspection – primary and radial dirt lip wear patterns

Primary lip wear pattern | Radial dirt lip wear pattern

Good primary lip pattern
You should see two parallel lines. The primary lip line is slightly wider than the radial lip marking, because it's a SKF Waveseal® design.



Primary lip wear pattern | Radial dirt lip wear pattern

Wide, wide
If both of the tracks formed by the primary and dirt lips are wide, chances are the whole wheel assembly is moving in and out at an excessive rate. End-play like this causes leaks as well as increased tire wear. The solution, of course, is proper bearing adjustment.

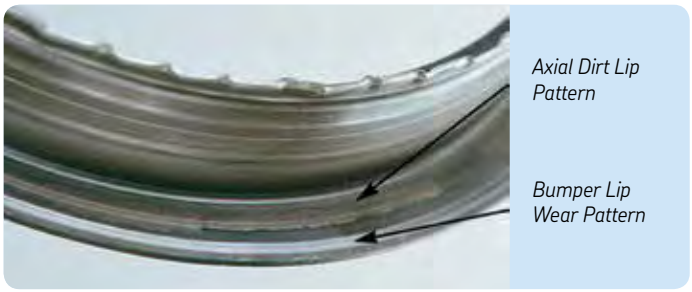
Primary lip wear pattern | Radial dirt lip wear pattern

Wide, thin
If the primary seal lip line (bottom) is extra wide, while the radial dirt lip line (top) is light, there is excessive pressure on the primary lip. For steer and trailer axles that can be a plugged vent, on drive axles the tube vent may be locked.

Failure analysis:

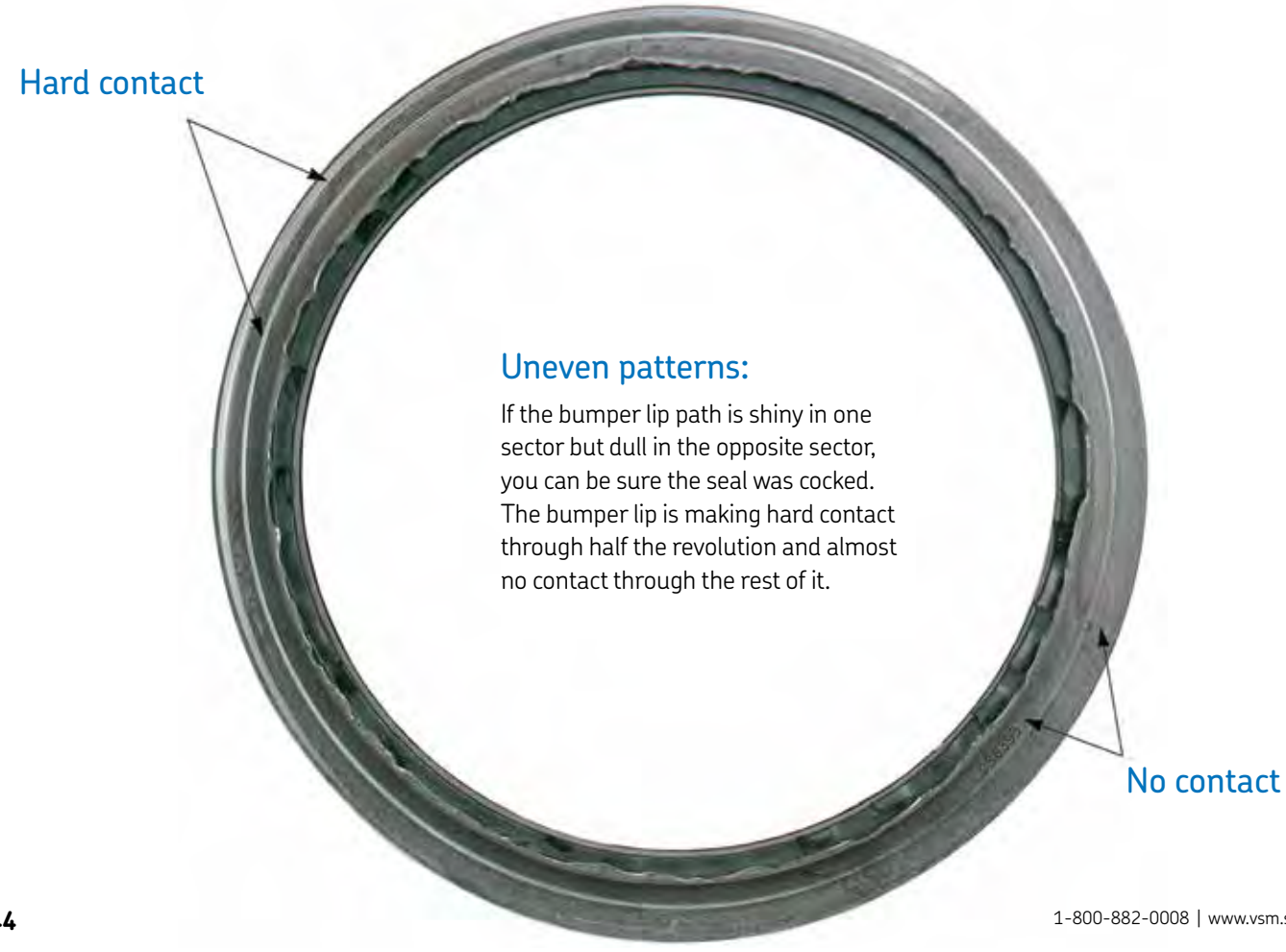
Scotseal *PlusXL*

Internal inspection – Axial dirt lip and bumper lip wear patterns



Good axial and bumper lip patterns
When you examine the axial face, you have two more wear patterns to learn from. About half way up on the face you should see a pencil line track from the axial lip, and at the top edge a gently scuffed pattern from the bumper lip.

Wide, shiny
If both lines are wide or polished clean, then you should suspect that the seal has been compressed. This will happen if the I.D. of the seal isn't lubricated before installation, if the sleeve wasn't sealed fully on the spindle, or if the bearing adjustment is too tight.



Uneven patterns:

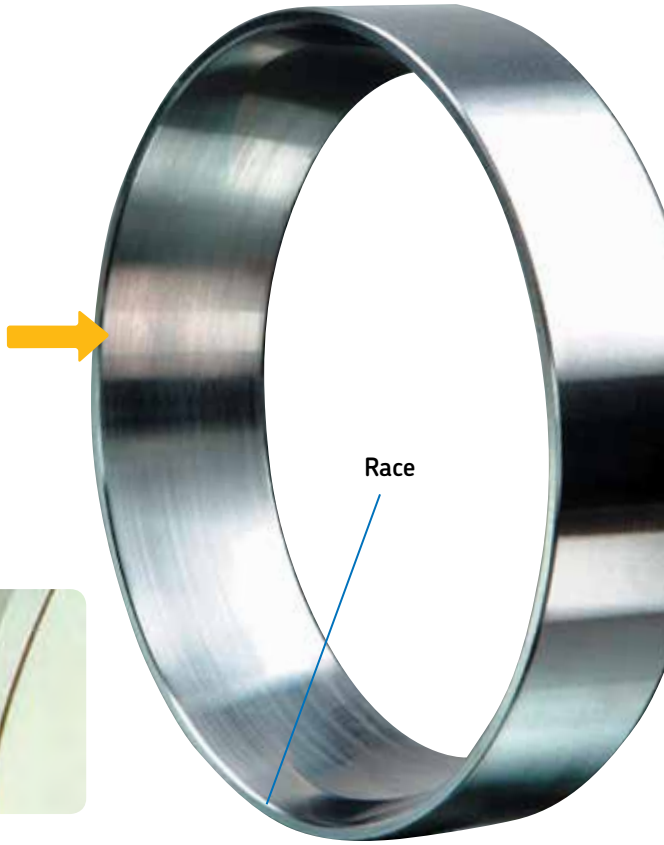
If the bumper lip path is shiny in one sector but dull in the opposite sector, you can be sure the seal was cocked. The bumper lip is making hard contact through half the revolution and almost no contact through the rest of it.

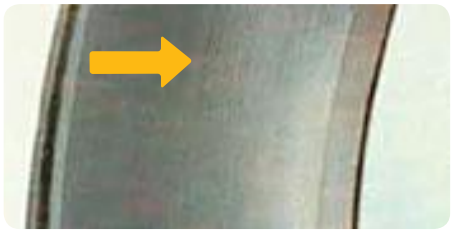
Inspection:

Bearing cup

The most commonly damaged portion of the bearing cup is the tapered raceway surface inside the cup. Make a careful inspection and look for the following:

- Evidence of corrosion
- Metallic debris
- Pitting of the surface
- Metallic flakes
- Any other signs of damage or foreign matter





Severe sliding wear due to presence of hard abrasives.

Etching of metal generally indicates water contamination, allowing oxidation to attack the surface.

Dent across the race indicates a sharp high impact.

Cup shows considerable corrosion. This will develop in spalling.

Heavy grooving by large hard particles in the lubricant.

Dings and dents in the bearing surfaces indicates a drift was used during installation.

Typical surface appearance with repeated effects of vibration (called "false brinelling").

Surface appearance caused by electrical arcing during welding.

Inspection:

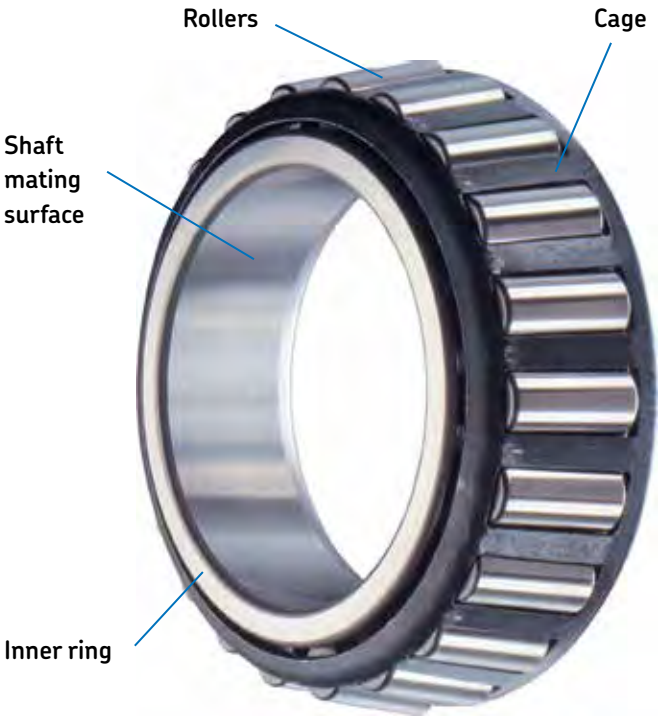
Bearing cone

The cone of the bearing is a composite assembly consisting of taper rollers and a metal or polymer cage. This cage contains the rollers and an inner ring which is the interface surface with the shaft or spindle.

Since there are many moving parts on the cone, you should slowly rotate the cone assembly for proper inspection of all surfaces of the components.

Make a careful inspection and look for the following:

- Corrosion
- Metallic debris
- Pitting
- Metallic flakes
- Other signs of damage or wear



Roller end fracture due to heavy stress peaks caused by slackness of too loose bearing adjustment.

Roller end wear caused by over tightening, lubrication degradation, or lack of lubricant.

Roller end cracks indicate excessive loading or excessive misalignment.

Scoring indicates contamination by dirt, grit or metallic particles.

Coloration indicates an overheated bearing - from straw brown to deep purple. Causes are lack of lubricant, misadjustment or excessive loading.

Wear marks in bands are due to foreign particles causing mild abrasive wear.

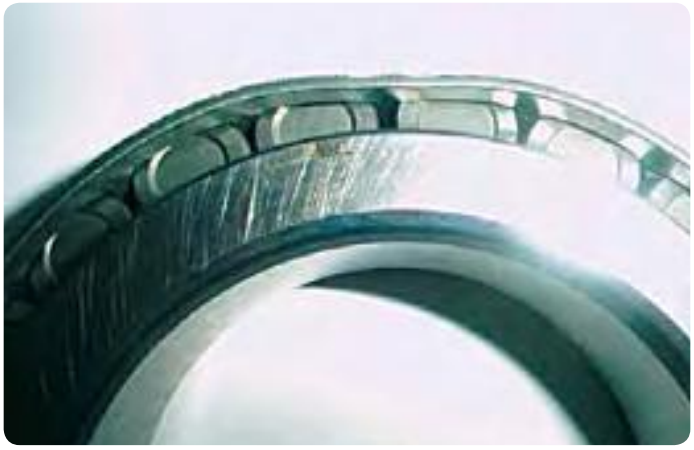
NOTE: *Not to be confused with honing marks, which occur in the manufacturing process that produces a precision surface.*

Inspection:

Bearing cage and inner ring

The bearing cage is made of either pressed steel or polymer and is therefore subject to various forms of damage.

These cages are deformed due to rough handling (dropping on the floor, being thrown in a box with other hard components, etc.) or poor installation with shock loads caused by hammering during removal or installation.



Inspection of the inner ring often requires a sharp eye because the damage can be very subtle. The most common types of fatigue damage are shown below.

Examine the inner ring raceway by holding the bearing against a light and turning the cage slowly. Look for pitting, flaking, discoloration and corrosion.

Dirt

Misalignment

Insufficient lubricant

Failure analysis for bearings:

Improper bearing adjustment

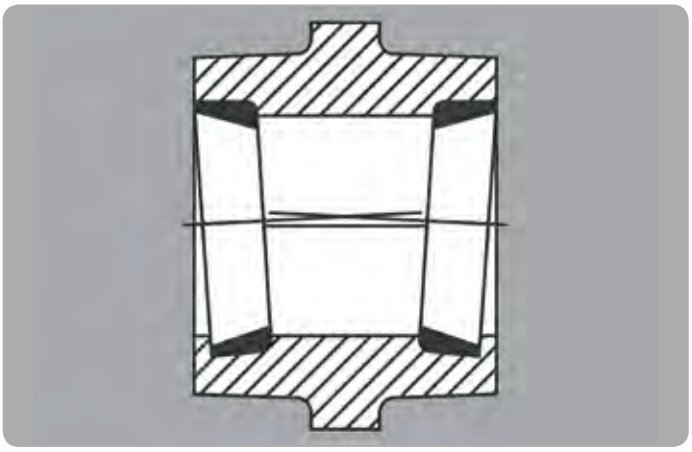
Large end of roller shows scoring, the result of excessive preload.

Large end of the roller shows spalling, the result of insufficient lubrication and/or excessive preload.

Pitting

Small end of the roller shows excessive wear, the result of loose bearing adjustment.

Pitting of the race, as a result of debris in the lube causing surface deformation.



Misalignment

Misalignment occurs when the center lines of the two bearings are not parallel to each other. The causes can be an improperly seated bearing, where dirt or burrs prevent a flush mount; an outer cup installed without the proper tool; a warped shaft; or nut faces that are out of line.

Failure analysis for bearings:

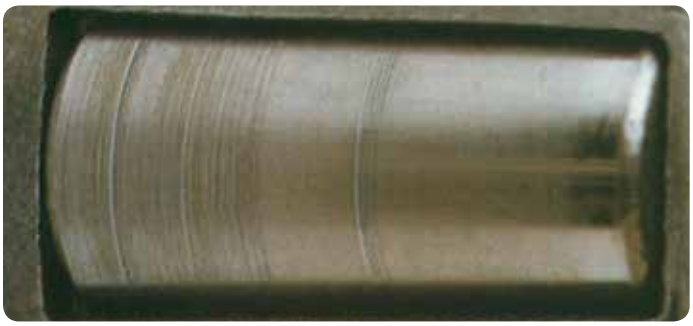
Misalignment

Uneven wear on the roller, the result of improper installation.

Contamination

Circular wear in the race, the result of hard particle contamination in the lube.

Vertical etching on the race, the result of moisture contamination within the lube.



Circular wear on the roller, the result of hard particle contamination in the lube.

Failure analysis for bearings:

Misalignment

Peeling, the tearing away of metal from the race, the result of the breakdown of lubrication.

Discoloration indicates high levels of heat, the result of improper lubrication or improper bearing adjustment.

Installation damage

Deformation of the cage, the result of improper installation or mishandling prior to installation.

Cage damage, the result of abuse prior to or during installation.

Cracked cone, the result of misapplication or cocking the cone at installation.

Damage to the cup front face, the result of installation damage through use of a hardened driver.

Failure analysis for bearings:

Brinelling

Brinelling, the result of severe impact to the bearing, causing one or more of the roller bodies to deform the surface of the race.

Other damage

Fretting corrosion of the outer surface is often the result of a worn hub or spindle.

Light pitting can be caused by electrical arcing. The probable cause is electrical welding grounded through the shaft.

Spalling, the wearing away of metal from the bearing surface, the result of contamination, brinelling, improper installation, improper lubrication, or the normal end of bearing life.

Failure analysis for bearings:

Inspection of lubricant and hub cap

The hub cap is constantly exposed to the environment. That means hot, cold, wet, dry and salty. But some of it's roughest treatment can come from inside. A lack of lube or an over-tight bearing adjustment can cook the hub cap and permanently damage it. Here are a few of the clues to indicate why a hub cap has failed.

Distorted bolt hole
Bolt hole, or flange distortion, may be the result of excessive bolt torque during installation. The use of an impact wrench may damage the flange at the bolt hole area during assembly.

Milky window
The view window in the hub cap will become nearly opaque white when subject to heat. The heat comes from inside and spells trouble. You'll want to pull the wheel and check the bearing adjustment, check for low lube or a change to an incompatible lubricant.

Melted window
With the hub cap removed, inspect the edges of the view window for damage or discoloration. If the edge has a rippled look, chances are it has started to melt from excessive heat. Heat build-up could be from running low on lube, excessive pre-load on bearing or a recent switch to an incompatible lubricant.

Warped Flange
Place hubcap on a flat surface. When flange is distorted it will not hold contact all the way around. Proper torque specifications may not have been followed.

Notes

Scotseal family interchanges

Scotseal PlusXL	Scotseal Classic	National	National 5 Star	Stemco Guard. / G.G.[1] wheel sets	Stemco (seal w/ring)	Stemco Voyager	Stemco Discover
23590	–	370199A	–	–	–	383-0175	–
28759	28758	370150A	–	308-0866	(2164/1008)	383-0166	–
29400	–	370211A	–	–	–	383-0176	–
34384	34387	370047A	–	309-0935/ 392-9035	(2728/1728) (2057/1062)	–	–
34971	34975	370132A	–	308-0863/ 382-8063	(2721/1721) (2133/1036)	–	–
34994	35000	370169A	–	392-9036/ 392-9111	(2057/1063)	–	–
35058	35066	370001A	380001A	308-0836/ 382-8036	(2702/1702) (2036/1036)	383-0136	383-0236
–	36358/36365	370011A	–	382-8071	(2216/1034)	383-0171	–
–	38750	370024A	–	309-0915/ 392-9099	(2102/1501)	393-0115	–
38776	38780	370023A	380023A	309-0912/ 392-9099	(2707/1707) (2102/1501)	393-0112	393-0212
39426	–	–	–	–	–	–	–
39979 w/456301	39988 w/455031	370033A/ w/AR-12	–	382-8039/ 382-8023	(2039/1038) (2039/1011)	383-0139	383-0239
40091	40086	370066A	–	382-8001	(2086/1013)	383-0101	–
40129	40136	370349A/ 370036A	380036A	307-0713/ 372-7098	(2704/1704) (2109/1507) (2109/1013)	373-0113	373-0213
42627	42623	370065A/ 376590A	380065A/ 386590A	307-0723/ 372-7099	(2705/1705) (2023/1503)	373-0123	373-0223
42673	42672	370031A	380031A	309-0904/ 392-9112/ 392-9130	(2718/1705) (2132/1515)	393-0104	393-0204
43754	43752	370338A/ 370037A	–	307-0744/ 372-7095	(2709/1709) (2118/1510)	373-0144	–
43761	43764	370182A/ 370048A	380048A	308-0864/ 382-8064	(2711/1711) (2137/1037)	383-0164	383-0264
–	43860	370019A	–	309-0965/ 392-9096	(2713/1713) (2114/1508)	–	–
44916	44922	370124A	–	308-0853/ 382-8053	(2708/1708)	383-0153	–
–	44964/ 45010	370178A	–	392-9033	–	–	–
45093	45099	370022A	380022A	309-0903/ 392-9094	(2706/1706) (2129/1511)	393-0103	393-0203
45095	45103	370131A	380131A	308-0855/ 308-0856/ 382-8056	(2710/1710) (2710/1706)	383-0156	–
45157	45160	370021A	–	309-0964/ 392-9088	(2712/1712) (2113/1517)	–	–
46300	46305	370025A	380025A/ 386002A	307-0743/ 372-7097	(2701/1701) (2110/1504) (2110/1048)	373-0143	373-0243
47691/47692[2]	47697	370003A	380003A	309-0973/ 392-9131	(2703/1703) (2106/1502)	393-0173	393-0273
48002	48000	370005A/ 370173A	–	309-0960/ 392-9081	(2717/1761) (2009/1079)	–	–
–	48690	370195A	–	392-9054	–	393-0134	–

[1] Guard. (Guardian HP) / G.G. (Grit Guard)

[2] Use to depletion and reorder 47691

SKF Hubcap interchange reference chart

SKF TF/Zytel			Stemco					National Oil	Dual Dynamics		SKF
Oil	Grease	Application	Oil			Sentinel Oil	Sentinel Grease		Oil	Grease	Steel
1282[2]	1284[2]	Pro-Par Trailer		343-49 75		348-4075	349-4075	HU-075A	276-P	275-G	
1600		Trailer/Hubo	347-4009								
1608[1]		Steer	340-4065	343-4065				HU-065A			
1612[1]	1326[1]	Steer	340-4024	343-4024	350-4024			HU-024A	302-P	301-G	1711
1613[1]		Steer	340-4249	343-4249	350-4249			HU-149A			1703
1623		Trailer	340-4066	343-4066				HU-066A			1723
1627		Trailer	340-4002	343-4002							1727
1627		Steer	340-4019	343-4019				HU-019A			
1630[1]		Trailer	340-4014	343-4014						202-G	
1642		Trailer	340-4013	343-4013		348-4013	349-4013	HU-013A	282-P		1742
1643	1343	Trailer	340-4009	343-4009		348-4009	349-4009	HU-009A	203-P	283-G	1743
1643	1343	Trailer	340-4046	343-4046				HU-046A	303-P	304-G	
1644[1]	1343	Trailer/Steer	340-4009	343-4009		348-4009	349-4009				1743
	1343W	Trailer					342-4009				
1665		Trailer	340-4042	343-4042				HU-042A			1765
1669[1]		Steer	340-4025	343-4025	350-4025			HU-036A			
1670[1]		Steer	340-4034	343-4034	350-4034			HU-034A			1770
1681		Trailer	340-4029	343-4029				HU-028A			
1691[1]		Steer	340-4098	343-4098							1790
1696	1399	Trailer	340-4195	343-4195		348-4195	349-4195		257-P	255-G	1796
	1399W	Trailer					342-4195				
1698		Trailer	340-4059	343-4059							1798
1698		Trailer	340-4080	343-4080							
1943[3]	1443[3]	Trailer		343-4370			340-4350		207-P	401-G	
1996[3]	1499[3]	Trailer		343-4372			340-4352		260-P	456-G	

[1] Black design
[2] Lexan design
[3] Designed for P.S.I. system

Splashguard center plugs

Available in green and black 4 packs	Standard center plug	Splashguard center plug
Green	450434-4	450439-4
Black	453807-4	450438-4
Display (6 sets of each)		454210
Display (12 sets green)		454215
Display (12 sets black)		454216

Tapered bearing sets

		Components		Competitive interchange	
SKF Set No.	General bearing application	Cone No.	Cup No.	BCA Set No.	Timken Set No.
SET401	R Drive Axle (outer)	BR580	BR572	HD206	SET401
SET402	R Drive Axle (outer)-Mack	BR582	BR572	HD211	SET402
SET403	R Drive Axle (inner)	594-A	592-A	HD203	SET403
SET404	R Drive Axle (inner)-Mack	598-A	592-A	HD204	SET404
SET405	Trailer Axle (inner) & Rear Drive Axle/Trailer Axle (outer)	BR663	BR653	HD207	SET405
SET406	FF Steer Axle (outer)	BR3782	BR3720	HD205	SET406
SET407	Rear Axle (inner) & Front Steer Axle (outer)	BR28682	BR28622	HD213	SET407
SET408	L Drive Axle (outer)	BR39590	BR39520	HD210	SET408
SET409	Front Steer Axle (outer)-Mack	BR45280	BR45220	HD219	SET409
SET410	Front Steer Axle (inner)	BR45284	BR45220	N/A	SET410
SET411	L Drive Axle (inner)	BR47686	BR47620	HD209	SET411
SET412	FF Steer Axle (inner) & N Trailer Axle (outer)	HM212047	HM212011	HD202	SET412
SET413	FF Steer Axle (inner) & N Trailer Axle (outer)	HM212049	HM212011	HD200	SET413
SET414	N Trailer Axle (inner)	HM218248	HM218210	HD201	SET414
SET415	P Trailer Axle (inner & outer)	HM518445	HM518410	HD208	SET415
SET416	Trailer Axle	BR45291	BR45220	N/A	SET416
SET417	Trailer Axle	BR47890	BR47820	N/A	SET417
SET418	Front Steer Axle (inner)	H715334	H715311	N/A	SET418
SET419	Front Steer Axle (inner)	H715343	H715311	N/A	SET419
SET420	Front Steer Axle (inner)	H715345	H715311	N/A	SET420
SET421	Rear Axle (inner)-Mack	HM516449-A	HM516410	HD214	SET421
SET422	Rear Axle (inner)-Mack	HM516449-C	HM516410	HD212	SET422
SET423	FL Steer Axle (inner)	6461-A	BR6420	HD218	SET423
SET424	FL Steer Axle (outer)	555-S	552-A	HD217	SET424
SET425	Front Steer Axle/Trailer Axle (inner) & Rear Axle (outer)-Mack	BR567	BR563	HD216	SET425
SET426	Rear Axle (outer)-Mack	BR47679	BR47620	HD215	SET426
SET433	HD Tapered Set	BR594	592-A	N/A	N/A
SET439	FF Steer Axle (inner)-Volvo	HM212049-X	HM212011	N/A	SET439
SET499	HD Tapered Set	BR687	BR672	N/A	N/A

Half stand interchanges

SKF set No.	ConMet set No.	SKF cone	SKF cup	Timken LMS set no.	Timken cone	Timken cup	Position
PreSet® half stand interchanges							
SET427	107500	RBT10433	LBT10433	SET427	NP899357	NP026773	Inner FF front
SET427	107500	RBT10433	LBT10433	SET427	NP899357	NP026773	Outer TN trailer
SET428	107501	RBT10429	LBT10429	SET428	NP874005	NP435398	Outer FF front
SET429	107502	RBT10434	LBT10434	SET429	NP034946	NP363298	Inner R drive
SET430	107503	RBT10431	LBT10431	SET430	NP840302	NP053874	Outer R drive
SET431	107504	RBT10430	LBT10430	SET431	NP965350	NP503727	Inner TN trailer
SET432	107506	RBT10426	LBT10426	SET432	NP174964	NP593561	Inner/Outer TP trailer
LMS half stand interchanges							
SET427	107500	RBT1-0433	LBT1-0433	SET433	NP431952	NP378092	Inner FF front
SET427	107500	RBT1-0433	LBT1-0433	SET433	NP431952	NP378092	Outer TN trailer
SET428	107501	RBT1-0429	LBT1-0429	SET434	NP555065	NP720703	Outer FF front
SET429	107502	RBT1-0434	LBT1-0434	SET435	NP588900	NP107783	Inner R drive
SET430	107503	RBT1-0431	LBT1-0431	SET436	NP577914	NP975161	Outer R drive
SET431	107504	RBT1-0430	LBT1-0430	SET437	NP022333	NP250023	Inner TN trailer
SET432	107506	RBT1-0426	LBT1-0426	SET438	NP417549	NP156827	Inner/Outer TP trailer

Rebuild kit for PreSet

Rebuild kit part number	Position	Scotseal Plus XL	Inner half stand bearing	Outer half stand bearing	Hubcap	Spacer
FFSK1	FF steer axle	35058	SET427	SET428	1612	103592
RDSK1	R drive axle long and short haul	47691	SET429	SET430	N/A	103593
TNSK1	TN trailer axle, oilbath	46300	SET431	SET427	1643	104144
TNSK2	TN trailer axle, grease	46300	SET431	SET427	1343	104144
TPSK1	TP trailer axle, oilbath	42627	SET432	SET432	1696	104412
TPSK2	TP trailer axle, grease	42627	SET432	SET432	1399	104412

Spindle nut locking system

Part number	Application	Thread size	Outer tapered bearing	Hex socket *(6-point)*	Hardened washer *(not sold separately)*	Notes	Stemco interchange
–		in.	–	in.	–		
SN150CWFF	Steer Axle-Meritor/Navistar	1.50–12	Set406	2	150CWBW	Bag of 1	448-4836
SN150CWFFG-45	Steer Axle-Meritor/Navistar	1.50–12	Set406	2	150CWBW	Carton of 45 pcs.	448-4836
SN150FWFE	Steer Axle-Meritor/Eaton/Ford	1.50–18	Set406	2	150CWBW	Bag of 1	448-4837
SN150FWFEG-45	Steer Axle-Meritor/Eaton/Ford	1.50–18	Set406	2	150CWBW	Carton of 45 pcs.	448-4837
SN262GWDA	Drive Axle-Meritor/Eaton/Ford/Navistar	2.625–12	BR3984/BR3920, Set408	3	262KWBW	Bag of 1	449-4974
SN262GWDAG-25	Drive Axle-Meritor/Eaton/Ford/Navistar	2.625–12	BR3984/BR3920, Set408	3	262KWBW	Carton of 25 pcs.	449-4974
SN262KWTN	Trailer Axle-Meritor/Dana/Eaton	2.625–16	Set413	3	262KWBW	Bag of 1	447-4743
SN262KWTNG-25	Trailer Axle-Meritor/Dana/Eaton	2.625–16	Set413	3	262KWBW	Carton of 25 pcs.	447-4743
SN325GWDT	Drive Axle-Meritor/Dana/Eaton/Mack/Navistar[1)]	3.25–12	Set401	3.75	325GWBW	Bag of 1	449-4973
SN325GWDTG-20	Drive Axle-Meritor/Dana/Eaton/Mack/Navistar[1)]	3.25–12	Set401	3.75	325GWBW	Carton of 20 pcs.	449-4973
SN348GWTP	Trailer Axle-Meritor/Dana/Freuhauf/Hendrickson	3.48–12	Set415	4.125	350GWBW	Bag of 1	447-4723
SN348GWTPG-20	Trailer Axle-Meritor/Dana/Freuhauf/Hendrickson	3.48–12	Set415	4.125	350GWBW	Carton of 20 pcs.	447-4723
SN350GWTA	Trailer Axle-Eaton	3.50–12	Set415	4.125	350GWBW	Bag of 1	447-4724
SN350GWTAG-20	Trailer Axle-Eaton	3.50–12	Set415	4.125	350GWBW	Carton of 20 pcs.	447-4724

[1)] Also fits trailer axles for Meritor TR and Dana EST230-P & P22TQ (Axles before 1/1/2006 & uses outer bearing SET415)

Two piece wheel nut

Part number	Size	Outside diameter	Number of pieces in container	Metform Securex part number
MV33333-10	M22 × 1.5 (high profile)	33 mm hex	10 ct. box	39702
MV33333G-100	M22 × 1.5 (high profile)	33 mm hex	100 ct. box	39702
MV33333B-300	M22 × 1.5 (high profile)	33 mm hex	300 ct. bucket	39702
MV22273-10	M22 × 1.5 (low profile)	33 mm hex	10 ct. box	39874
MV22273G-130	M22 × 1.5 (low profile)	33 mm hex	130 ct. box	39874
MV88838-10	M22 × 1.5	38 mm hex	10 ct. box	39514
MV88838G-80	M22 × 1.5	38 mm hex	80 ct. box	39514

Sleeve nut

Part number	Size	Outside diameter	Number of pieces in container
SLN22006-10	M22-1.5 × 6 mm sleeve nut	33 mm hex	10 ct. box
SLN22006G-100	M22-1.5 × 6 mm sleeve nut	33 mm hex	100 ct. box
SLN22195-10	M22-1.5 × 19.5 mm sleeve nut	33 mm hex	10 ct. box
SLN22195G-70	M22-1.5 × 19.5 mm sleeve nut	33 mm hex	70 ct. box
SLN22280-10	M22-1.5 × 28 mm sleeve nut	33 mm hex	10 ct. box
SLN22280G-70	M22-1.5 × 28 mm sleeve nut	33 mm hex	70 ct. box
SLN22395-10	M22-1.5 × 39.5 mm sleeve nut	33 mm hex	10 ct. box
SLN22395G-70	M22-1.5 × 39.5 mm sleeve nut	33 mm hex	70 ct. box

SKF unitized pinion seal reference chart

SKF unitized	Axles	Position	Arvin Meritor No.	National No.	Stemco No.	SKF DL	SKF Grease	Bore	Yoke shaft
32500	14X/16X/18X/38X	F-R UI (FUI)[1)]	A1205R2592/ A11205X2728	100494	429-0007	32385	32397	4.249	3.250
30008	14X/16X	F-R UO (FUO)[2)]	A1205P2590/ A11205Y2729	100495	429-0005	30007	29867	3.751	3.000
30009	14X	R-R UI (RUI)[3)]	A1205N2588/ A11205Z2730	100263	429-0010	30153	30145	4.936	3.000
32503	16X/18X	R-R UI (RUI)[3)]	A1205Q2591/ A11205A2731	100557	429-0011	33254		5.501	3.250

[1)] F-R UI - Forward-Rear Unit Input (FUI)
[2)] F-R UO - Forward-Rear Unit Output (FUO)
[3)] R-R UI - Rear-Rear Unit Input (RUI)

Drive plates & seal matchups
Table 1

Drive plates appear in bold with matching seal numbers.

427	**445**	**457**
34387	39380	40040
36285	39420	40136
36358	39425	40139
36365	42550	
	42672	**461**
428	42800	45152
31175		45160
31244	**446**	45162
31281	43860	
31323	43865	**462**
32470	43875	38747
	46390	38750
435	47483	38780
47690	48690	
47693	48794	**463**
47696	48796	27438
47697	48884	28758
47698	50124	28820
48000		28832
	448	
436	38709	**465**
34975	39988	43752
35000		43764
35060	**449**	43800
35066	47699	
35072		**473**
35075	**451**	39380
35103	46305	(w/disc brks.)
	46308	
441		**474**
40086	**452**	52658
	42623	
	42624	**484**
	42631	44922
		44964
		45010
		45099
		45103

Matchup of bearing cones & centering plugs
Table 2

Precisely matched centering plugs are engineered to fit within the inside diameter of the inner bearing cone and allow accurate centering of the SKF Scotseal in the bore of the hub, as well as preventing cocking of the seal.

Bearing cone no.	Centering plug no.	Bearing cone no.	Centering plug no.	Bearing cone no.	Centering plug no.
495-AX VP	708	**681-A VP**	714	**BR33895**	701
BR497	711	**BR683**	715	**BR39580**	702
BR539	701	**BR687**	718	**BR39581**	702
555-S VP	702	**BR749**	719	**BR39585**	704
557-A	703	**749-A VP**	710	**BR42688**	708
BR559	704	**756-A**	709	**BR45284**	700
BR560	706	**BR758**	711	**BR45285**	700
BR567	707	**BR759**	712	**BR47678**	708
BR568	731	**BR760**	717	**BR47686**	710
BR575	708	**BR776**	715	**BR47687**	710
BR580	710	**BR780**	718	**BR52400**	718
BR582	710	**BR3778**	730	**BR52401**	718
BR593	712	**BR3982**	704	**JH217249**	719
BR594	715	**BR3984**	706	**JM205149-A**	722
594-A VP	715	**BR4595**	701	**JM207049-A VP**	723
BR595	710	**BR5557**	721	**JM511946 VP**	724
BR596	711	**BR5760**	708	**JM716649**	719
BR598	714	**BR6379**	705	**JM718149 VP**	713
598-A VP	714	**BR6386**	706	**JM719149**	733
BR639	704	**BR6389**	706	**HM212044 VP**	703
BR641	706	**BR6461**	708	**HM212046**	704
BR659	708	**6461-A VP**	708	**HM212047 VP**	704
BR663	710	**BR6559**	710	**HM212049-X VP**	706
663-A	710	**BR6580**	712	**HM212049 VP**	706
BR664	732	**BR28995**	703	**HM218248 VP**	713
BR665	711	**BR33281**	716	**HM518445 VP**	712
665-A VP	711	**BR33287**	707	**H715345 VP**	716

SKF Scotseal PlusXL

SKF Scotseal Classic

SKF TF Hubcap

SKF Spindle nut

SKF Sleeve nuts, wheel nuts and lug locks

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