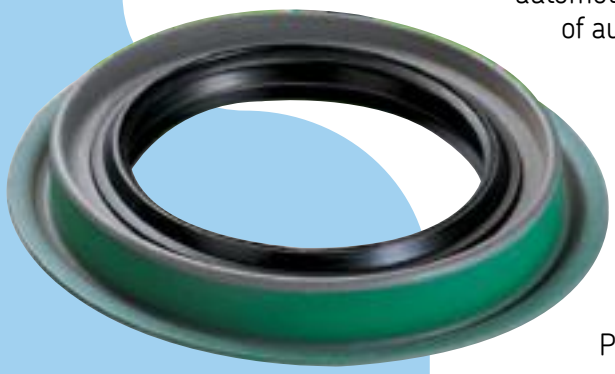
Oil and grease seals

SKF precision engineered seals for engine and drivetrain applications

SKF has a long history in sealing knowledge. From our patent on the first automotive wheel seal in 1928, we have evolved to a leading supplier of automotive and truck sealing technology.



The demand for increased speeds, higher operating temperatures and synthetic lubricants with aggressive additives increase the stress on oil and grease seals. SKF seals deliver unparalleled performance over a wide range of operating conditions for most automotive and truck applications.

Our sealing products include conventional rubber shaft seals, PTFE seals and low friction seals. All are made from the OE specified or better materials for each application.

Precision engineered

Seal lip profile

All SKF seals incorporate a seal lip design that meets or exceeds the OE specifications. This provides the toughest exclusion of dirt and contaminants, reliable dynamic sealing and a long service life.

Sealing element

SKF's synthetic rubber blends are formulated from families of complex polymers to provide protection to operate in temperatures as low as minus 40 degrees to as high as 400 degrees Fahrenheit.

Today's lubricants with their aggressive additive packages can attack the rubber compound of the seal. SKF seals are engineered to be compatible with these lubricants.

Case

The case components are made from the highest grade of carbon steel, and are coated with phosphate to ensure protection against rust. Most metal-cased seals are coated with Bore-Tite, a flexible coating on the outside diameter of the seal that fills in small housing bore imperfections, and provides a tight and leak proof seal.

Using lubricant to trouble-shoot wheel end component failure

Tech tip

Maintaining proper lubrication extends the life of the entire wheel end. SKF seals, bearings and hubcaps all interact with the wheel end lubricant. The lubricant condition can impact any of these components and vise versa. This technical bulletin will help the technician identify when the lubricant is exhibiting characteristics that require addressing.

TMC, Truck Maintenance Council, has several RP (Recommended Practices) that cover lubricants and their effect on the wheel end. TMC RP624, TMC RP631A & TMC RP644 have been used as reference in the development of this technical bulletin.

Acceptable wheel end lubricants

You will find any of the lubricants listed below in heavy duty wheel ends. Be sure to consult the vehicle OEM whenever switching away from the original lubricant. **Never** mix lubricants as this will have a detrimental impact on the seal.

- Fluid lubricant such as engine, transmission or gear oils
- Semi-fluid grease with NGLI grade of 000, 00 or 0

Trouble-shooting wheel ends with lubricants

Inspecting the lubricant condition is a very useful trouble-shooting tool when doing wheel end failure analysis. When inspecting wheel end lubricant, note the condition and if you answer "no" to any of these questions, closer inspection is warranted.

1) Is the color normal?
2) Is the viscosity or consistency typical?
3) Is it free of debris such as dirt, metal or water?
4) Is it free of an odd odor such as a burnt smell?

The lube condition can point you in the right direction in determining root cause of wheel end component failure. The following are some examples of common conditions, potential causes and what subsequent maintenance should be conducted.

Using lubricant to trouble-shoot wheel end component failure – cont.

Condition: Insufficient fill condition
An insufficient fill situation can create a condition of excessive heat and cause the oil to darken, increase in viscosity and/or exhibit a burnt smell. Greases could show evidence of drying or cracking.

Cause: Under filling, seal leakage, plugged breather

Maintenance: Carefully inspect all wheel end components and replace seal and other wheel end components as necessary. Clean hub thoroughly and fill with lubricant to the specifications of the vehicle OEM. Technicians should fill to proper levels and keep out air. Technicians should also check bearing adjustment, breathers and vents regularly. Drivers need to check lube levels on their walk-arounds.

Condition: Solid contamination
Lubricant will contain debris such as dirt or metal fragments which can cause the oil to darken with increased viscosity. The debris is often visible.

Cause: Ingression from seal failure, failure to clean hub properly after a previous failure or metal debris from internal metal component, unclean lubricant containers or dispensers

Maintenance: Carefully inspect all wheel end components and replace seal, lubricant and other wheel end components as necessary. Clean hub thoroughly and fill with lubricant as specified by vehicle OEM. Technicians should employ clean practices such as keeping lubricant containers and dispensers free of debris. Checking of bearing adjustment, seals, breathers and vents should be conducted regularly.

Condition: Water contamination
Lubricant will have a cloudy or milky appearance. Grease will have reduced consistency and oil will be thinned.

Cause: Seal or hubcap failure, or possibly uncovered lubricant containers

Maintenance: Water contamination will cause etching, staining, corrosion and bearing failure. Replace seal and lubricant and carefully inspect other wheel end components particularly bearings. Clean hub thoroughly and fill with lubricant as specified by vehicle OEM. Technicians should employ clean practices such as keeping lubricant containers and dispensers free of debris. Check bearing adjustment, seals, breathers and vents regularly. Technicians should not direct water spray directly at wheel end during vehicle cleaning.

Proper handling, storage and maintenance of lubrications help maximize wheel end component life which reduces the cost of operation – the ultimate goal in the shop.

Seal part numbering system description

Tech tip

SKF developed and patented its seal part numbering system as a support tool for its customers. The part number identifies the approximate shaft size for the seal it is designed to fit on. Here is how they work:

Small Diameter Oil Seals – the approximate shaft size is indicated by inserting a decimal point to the left of the last four digits in the number. For example, 20425 (2.0425) indicates a 2.040" shaft. Metric shaft sizes are cataloged by their INCH equivalents in the inch size listing section. A complete size listing of metric seals arranged by metric shaft, bore and widths can be found in the Metric-Complete size listing section of the Seal Handbook (457010).

Large Diameter Oil Seals (over 10") – the approximate shaft size is indicated by inserting a decimal point to the left of the last five digits. For example, 1600560 (16.00560) indicates a 16" shaft. Large Diameter and split seals under 10.000" (254 mm), as well as all axial clamp type seals, are listed under the assigned 500,000 series part numbers which do not relate to shaft size.

Speedi-Sleeves – the approximate shaft size is indicated by inserting a decimal point to the left of the last two digits in the number. For example, 99300 (993.00) indicates a 3.00" shaft.

V-Rings – the shaft size is indicated in metric dimensions within the stock number. Locate the fifth digit from the left to determine the approximate shaft size. For example, 400180 (400180) indicates a 18MM shaft and 401800 (4**01800**) indicates a 180MM shaft size.

When a counterperson is looking for a seal by dimension, it is simply a matter of going to the proper shaft size location in the Oil seal specifications manual, or checking the shelf in the proper numerical sequence location.

Proper pinion seal installation

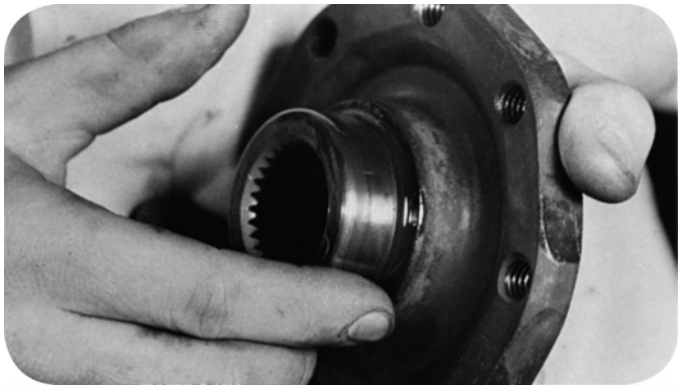
Tech tip

Pinion seal maintenance recommendations vary by manufacturer. Generally these seals must be replaced when leaks develop. Pinion seals should be checked and replaced whenever servicing a universal joint.

Replacement of the pinion seal usually requires removal and installation of only the pinion shaft nut and flange. Remember, a circular mounting flange, U-bolts or straps are used to hold the driveshaft in position on the differential pinion. The mounting flange attaches directly to the pinion yoke, while U-bolts/straps contact the bearing cups.

SKF recommends the following steps to achieve successful pinion seal installation:

1. Once a new seal is selected, clean and inspect the pinion yoke seal surface. If damaged, it may be repaired using an SKF Speedi-Sleeve®.



2. Apply lubricant to the seal lips. With an SKF seal installation tool and adaptor (or similar tool), press the seal into the housing. The seal should be centered and seated squarely.

3. Check pinion shaft splines and yoke for burrs or damage. Wipe the pinion clean.

4. Apply lubricant to the outer diameter of the pinion yoke and on flange splines.

5. Replace the pinion yoke on the shaft. Match previously made marks so shaft and yoke align.

Proper pinion seal installation – cont.

6. While holding the flange, tighten the pinion nut to previously recorded disassembly or preload torque.

7. Connect rear end of the drive shaft to pinion yoke. Align previously made markings.

8. Replace the circular mounting flange or install U-bolts or straps and secure the driveshaft in position.

9. Finally, add lubricant to within 1/8" – 1/4" from the bottom of the filler hole. Do not overfill.

For more information on pinion seal installation and replacement, consult your Pole Position Seals Self-Study Guide.

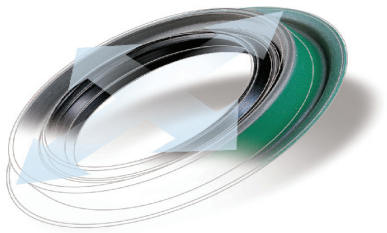
Seal selection very important when replacing seals

Tech tip

Faulty installation is a common cause for seal failure in today's vehicles. But the most common reason a seal fails is because it is the incorrect seal for the particular application. It is very important to check the old seal and replace it with a correct seal for the application.

When replacing an old seal in an application, you first should use the number on the old seal to identify the replacement seal. If there is no seal listed in exactly the same width, a narrower width is usually the best choice. A wider width is perfectly acceptable if space permits, however it is often limited.

If you are installing a seal in a new application, it is important to gather all measurements associated with the seal – seal bore diameter, seal outside diameter, seal width and shaft diameter. When measuring a seal's outside diameter, always remember to take measurements in at least three places equally spaced around the seal (see below). Taking the average of these readings represents the seal's diameter.



Speed, temperature and pressure also play a role in selecting the correct seal.

To find additional information on proper seal selection, please see chapter three of the Automotive Seal Self Study Guide (457492).

What are polyacrylate and nitrile seals?

Tech tip

Polyacrylate seals

Polyacrylates are elastomers that are compatible with higher operating temperatures, as well as extreme pressure (EP) lubricants. They are available in most general purpose designs.

Advantages of polyacrylate seals:

- Good compatibility with most oils, including EP lubricants
- High resistance to oxidation and ozone
- Better compatibility with higher operating temperatures than nitrile
- Operating range from -40 degrees F to 300 degrees F

Disadvantages of polyacrylate seals:

- Low compatibility with water and some industrial fluids
- Poor compression set characteristics

Polyacrylates are generally black with the same appearance as nitrile. Nitrile, silicone or fluoroelastomers can be used as substitute materials.

What are polyacrylate and nitrile seals?-cont.

Nitrile seals

Nitrile is the most popular material for the major applications of today's automotive seals. It is actually a mixture of two basic synthetic rubbers, Buna and Acrylonitrile polymers. Synthetic lip materials are bonded to the metal shell (case) to prevent leakage between the sealing lip and the shell; this provides a longer lasting, more effective seal. Different properties are obtained by changing the percentage of each polymer used in the mixture.

Nitrile seals have advantages and disadvantages – these should be reviewed and understood for your specific application choice.

Advantages of nitrile seals:

- Good oil/grease compatibility
- Abrasion resistance
- Good low temperature and swell characteristics
- Good manufacturing qualities
- Relatively low in cost

Disadvantages of nitrile seals:

- Lacks compatibility with synthetic oils
- Not recommended with EP lubes at elevated temperatures

Proper seal installation will prevent premature failure

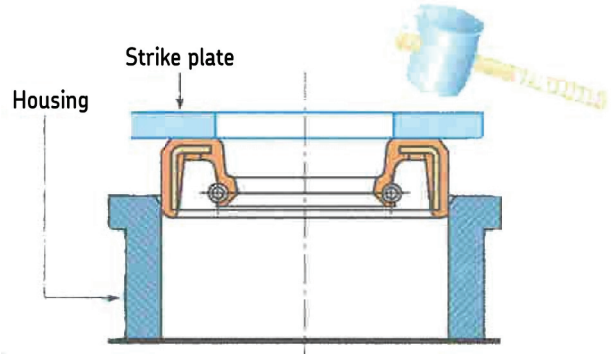
Tech tip

Proper seal installation is generally overlooked when selecting an oil or grease seal for any given application.

To begin the seal installation, an important step is to pre-lubricate the seal with the oil or grease you are going to seal. This will reduce the “sliding“ friction force that can damage the seal when installed dry. It also prevents a dry starting condition that can tear the seal material during initial run-in periods.

Acceptable installation methods used to install seals will always include supporting the seal case. Special tools are not necessarily required as long as the seal case is properly supported and an even force is uniformly applied. In each acceptable method, installation load is absorbed by either the housing or plate to prevent seal damage and to assist in properly locating the seal squarely in the bore. (See Illustrations A, B & C)

Illustration A



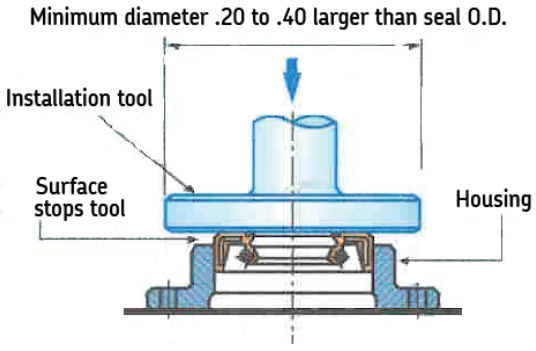


Illustration B

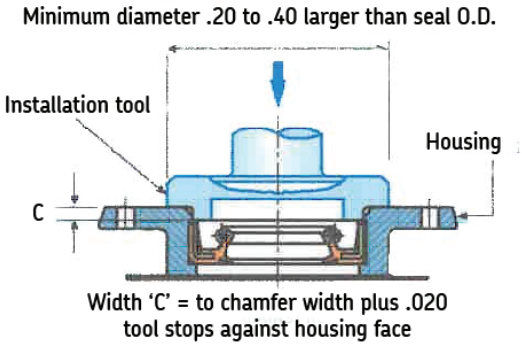


Illustration C

Proper seal installation will prevent premature failure – cont.

Improper methods will cause damage to the seal case which will change the geometry of the seal head in relation to the sealing surface, causing leakage. (See Illustrations D & E)

Improper methods of seal installation

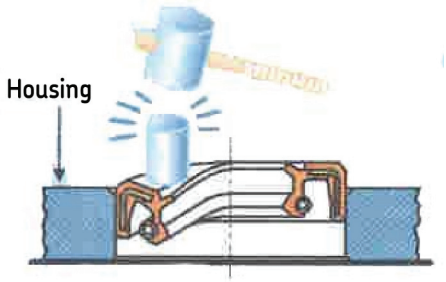


Illustration D

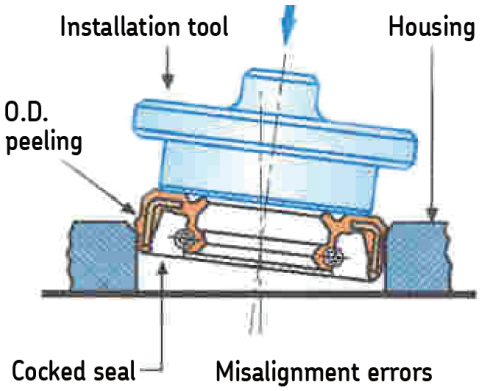


Illustration E

Proper seal maintenance and handling are critical. Follow the equipment manufacturer's installation instructions. Failure to follow proper installation methods can result in equipment failure.