

# INSTALLATION

The subject of installation represents an area commonly overlooked when selecting a radial shaft seal for an application. Improper installation methods are a major cause of premature seal failure. The most expertly designed and manufactured seal will not function properly if the installation is incorrect.

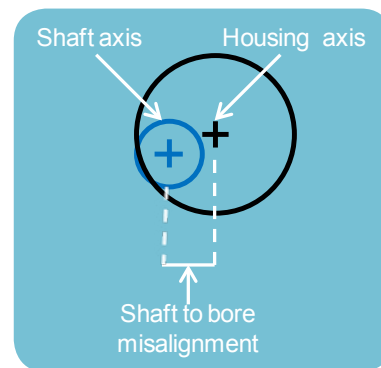
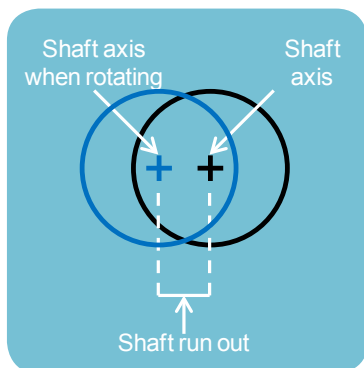
## ALIGNMENTS

There are two areas that need to be checked before installing the seal, the Shaft to Bore Misalignment and the Shaft Run-out.

The shaft to bore misalignment is the deviation of the center axis of the shaft and the receiving bore, if this value is higher than required it will cause an irregular distribution of force around the seal.

Shaft run out or dynamic run out is the distance that the shaft does not rotate around the center axis. At high RPM the shaft sealing surface will run in a different centerline than the seal centerline, and create a leakage.

### INSTALLATION



#### Alignments.

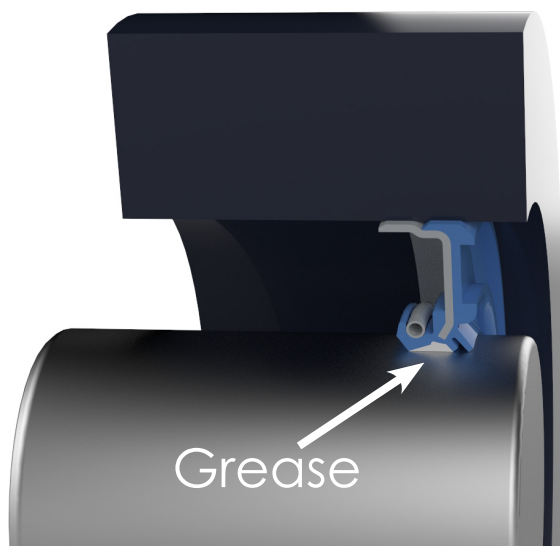
The shaft to bore misalignment and the shaft run-out, need to be checked prior to installation.

## PRE-INSTALLATION

Before starting the installation, the seal should be inspected to make sure it does not have any abnormalities or damage.

Even if the seal has a small cut on the OD it can cause the seal to leak. The bore should be also checked to be sure it does not have any scratches or contamination that could affect the seal.

The seal and shaft need to have some level of lubrication, before starting to run, this will protect the lip during the initial break-in. Some seals have grease between the main lip and the dust lip to protect the lip during the break-in period.



### Pre-Installation.

The seal and shaft need to have some level of lubrication before starting to run.

## INSTALLATION

## INSTALLATION METHODS

An installation tool should always be used when installing a radial shaft seal. The use of a tool improves ease of installation and reduces the possibility of seal cocking (non-perpendicular to shaft). Press-fitting tools should have an outside diameter approximately 0.010" (0.25 mm) smaller than the bore size.

A hydraulic or pneumatic press is advised to supply the necessary force to install the seal.

## SEAL COCKING

Cocking can seriously affect the function of the seal. Seal cocking causes one side of the sealing lip to have greater interference with the shaft. This can generate more heat which is harmful for the lip because it can harden and crack. If the cocking is severe the spring may also dislodge from the lip.



### Cocked Seal.

Seal cocking causes one side of the sealing lip to have greater interference with the shaft.

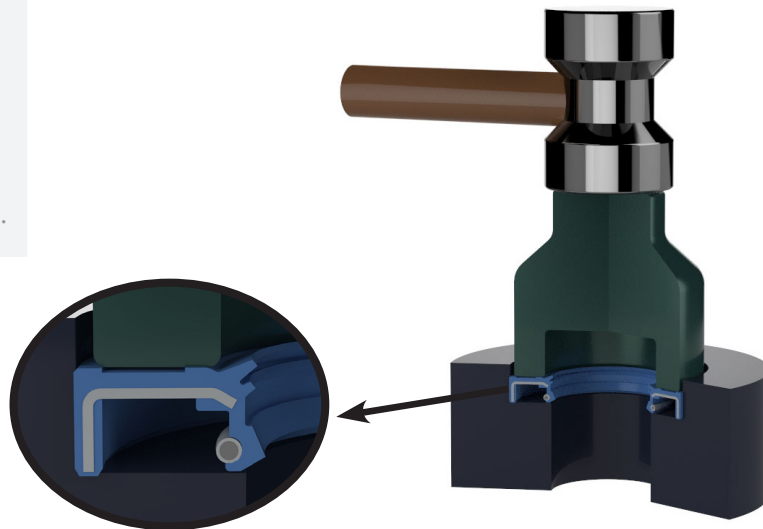
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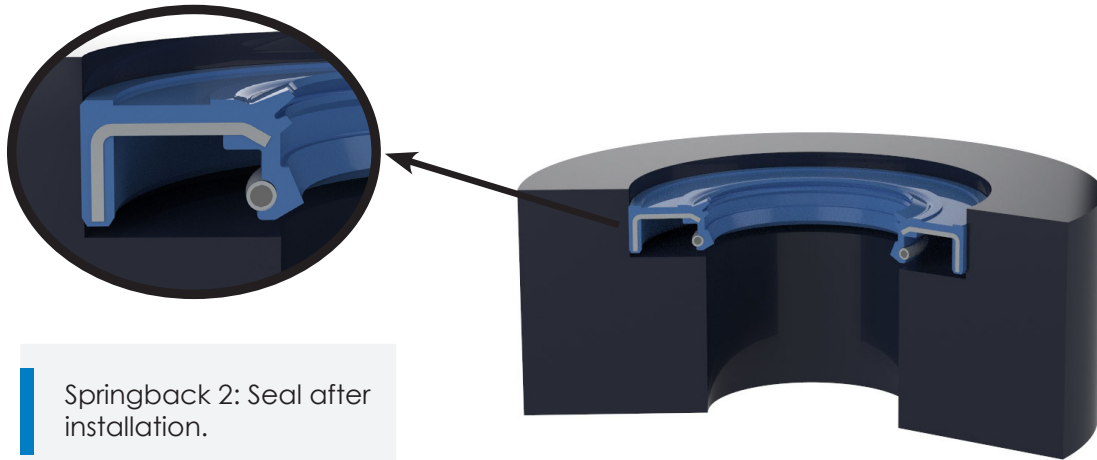
## SPRING BACK

When the OD of a seal is rubber covered, the seal may spring back after it has been installed. The friction between the rubber OD of the seal and the bore can cause the seal to retract from the installation position, after it has been pressed in.

### Springback 1: Seal being installed.

When the seal is being installed, it contacts the bottom of the bore.





**Springback 2: Seal after installation.**

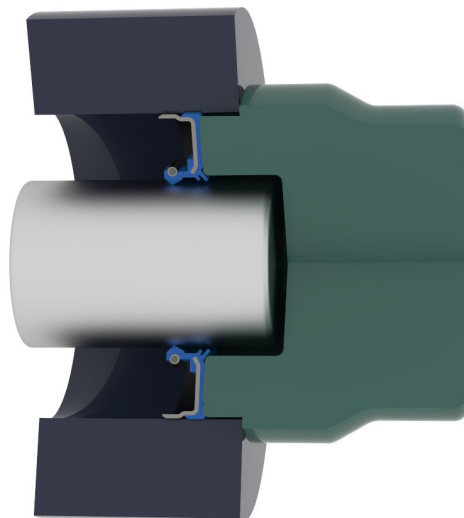
After the installation force is removed, the seal will shift slightly away from the bottom of the bore, this effect is called springback.

**INSTALLATION**

**ACCEPTABLE INSTALLATION METHODS**

**HOUSING SURFACE STOP INSTALLATION**

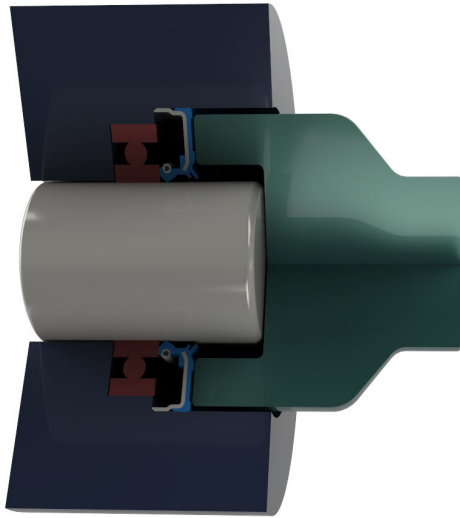
The machined face of the installation tool bottoms on the machined housing face.



## HOUSING STOP INSTALLATION

The seal bottoms on the interior shoulder of the bore.

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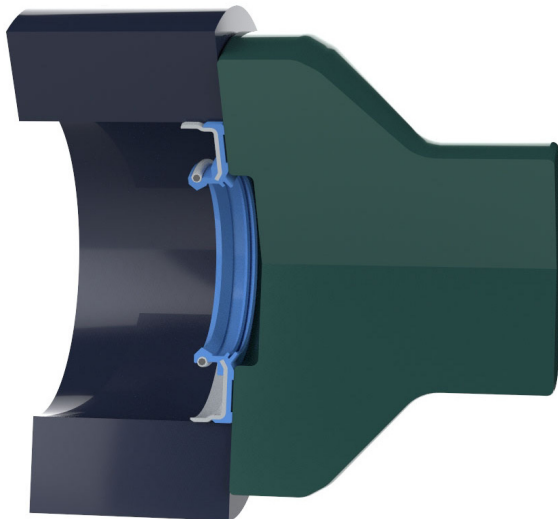


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## SURFACE STOP INSTALLATION

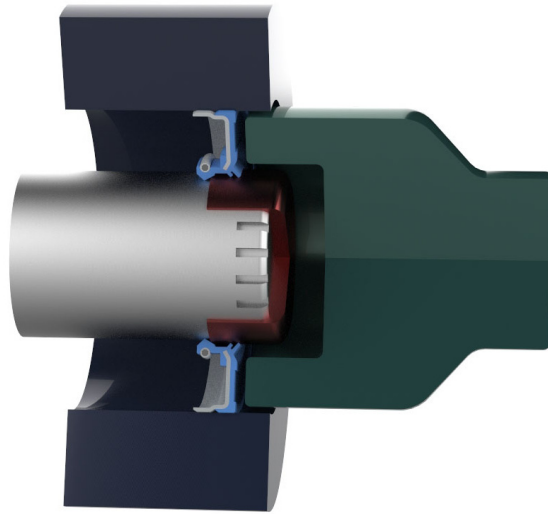
The installation tool bottoms on the machined housing face.

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## INSTALLATION OF SEAL OVER SPLINES

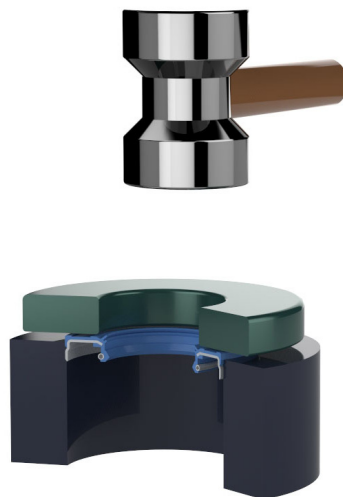
A thin walled lubricated assembly sleeve prevents damage to seal lip from the splines, keyways and unchamfered shafts.



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## STRIKE PLATE INSTALLATION

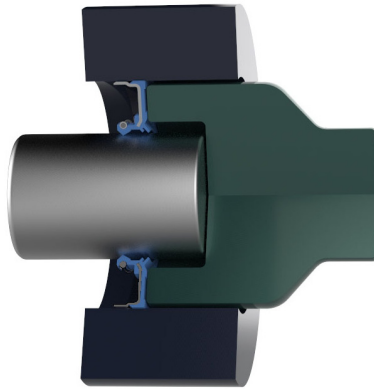
The face of strike plate bottoms on the machined housing face. Care must be taken to insure proper seal to bore alignment while the seal is being installed.



## SHAFT STOP INSTALLATION

The installation tool bottoms on the face of the shaft.

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## INSTALLATION

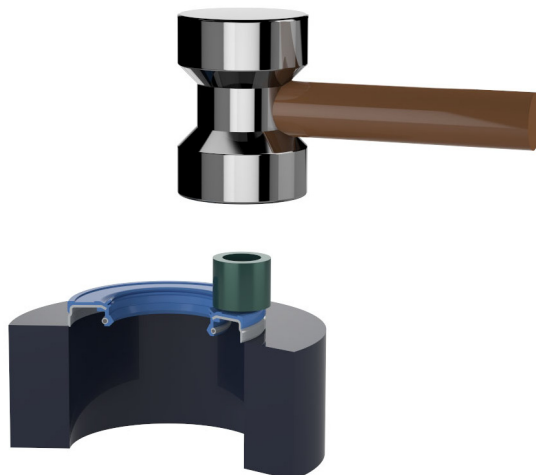
## UNACCEPTABLE INSTALLATION METHODS

The following are schematics of common improper installation procedures. These methods are presented because they are commonly seen and not recognized as being incorrect in the industry. If a seal is improperly installed, it could be deformed or severely damaged, greatly reducing its life. Typically, when a seal is not properly installed, it will be cocked in the bore and fail in application.

### IMPROPER DRIVING

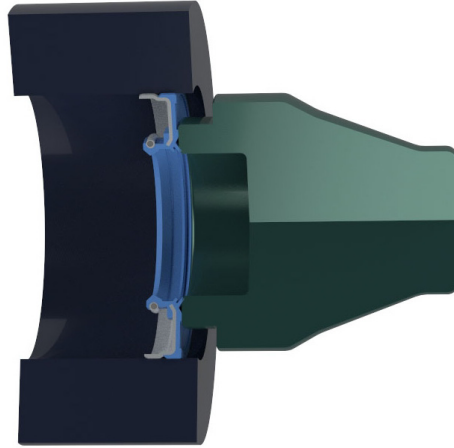
Always use an appropriate type of driving ring to install the seal. Without it, localized seal deformation may occur.

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## UNDERSIZED INTALLATION TOOL

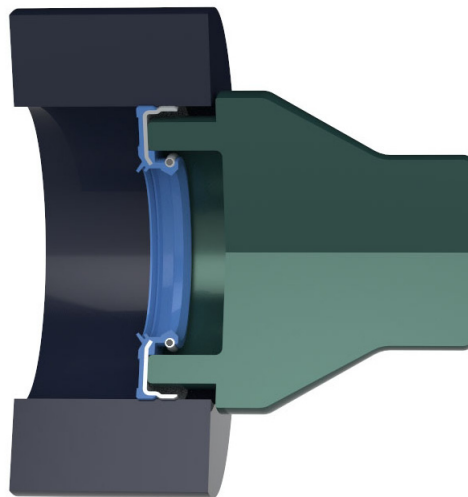
If the driving diameter of the installation tool is too small, it may cause the seal to deform during installation.



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## POORLY ENGINEERED INSTALLATION TOOL

When the installation tool is not appropriate for the seal, deformation may occur. In this situation the installation tool should be designed similar to the Surface Stop Installation Tool.

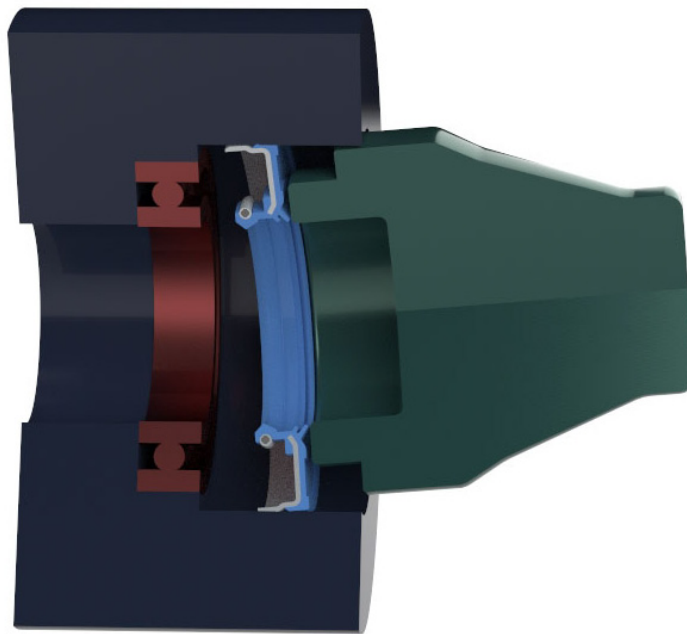




## MISALIGNMENT ERRORS

When the centerline of the tool and bore do not coincide, the seal may be deformed or cocked in the bore, providing a leak path for the media being sealed.

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## INSTALLATION CHECKLIST

- Bore: Verify the proper chamfer and remove any contamination, burrs or nicks.
- Shaft: Verify the proper lead in chamfer on end of shaft. Remove any burrs nicks, grooves or lead that could come in contact with the seal.
- Spline and keyways: Sharp edges should be covered with a lubricated assembly sleeve, shim stock or tape to protect the seal lip.
- Component Specifications: Check all components that come in contact with the seal and verify proper dimensions within tolerances, surface roughness and hardness.
- Part Interference: Verify that other machine parts do not rub against the seal, causing friction and damaging heat.
- Radial Shaft Seal: Visually inspect seal for cuts, nicks or other damage or contaminations. Verify that the spring is in place.
- Seal Direction: If replacing an existing seal, face in the same direction. Otherwise, generally, the lip faces the media being sealed.
- Pre-Lubrication: It is common practice to use lubrication to aid in installation for both the ID and OD of the seal. This is also beneficial for initial startup for the primary lip in application.
- Correct Installation Tool: Press-fitting tools should have an outside diameter approximately 0.010" (0.25mm) smaller than the bore size. For best results, the center of the tool should be open so pressure is applied only at the seal outer edge.
- Improper Driving Tool: Use proper driving tool such as a soft-face tool arbor press or soft workpiece (wood). To avoid cocking the seal, apply force evenly around the outer edge.
- Avoid Cocking: Bottom out the tool on the shaft, the housing or bottom out the seal in the housing counterbore.

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