

Installation Instructions

Like any precision-made machine part, a Garlock KLOZURE Oil Seal should be handled with reasonable care when being installed in your equipment. Although a KLOZURE Oil Seal is compactly built and is not fragile, rough handling may mar or damage the flexible lip of the sealing member, resulting in an imperfect sealing job.

Assembled and Bonded Seals

● Check Sizes

Before proceeding with the installation, it is well to make sure that the seal of the correct size has been selected and that the surrounding equipment parts are in proper condition. It is suggested, therefore, that the following checks should be made.

1. Is the seal of correct size to fit the shaft? If the shaft is undersize, leakage may follow. If the shaft is oversize, excessive frictional drag may result.
2. Is the bore that is to receive the seal of the proper diameter so that a leakless press fit will be obtained?

● Preparation of oil seal

An oil seal does not require any special treatment or conditioning prior to its assembly in the equipment. However, a film or coating of a suitable lubricant makes it easier to apply the seal over the shaft or mounting tool. We recommend lubricating either the shaft or seal lip before mounting the seal.

● Preparation of shaft

The shaft surface over which the seal will slide must be smooth and free from burrs, nicks or scratches which may damage the sealing lip. Recommended shaft finishes are shown on Table 1, page 12. The free, inside diameter of the lip of a seal is smaller than the diameter of the shaft on which it is used. The end of the shaft should be chamfered or rounded to prevent lip damage and to ease installation of the seal. See Figure 1.

If for any reason the shaft cannot be chamfered or rounded, then a suitable mounting tool should be used for applying the seal. Typical tools for this purpose are shown in Figure 2.

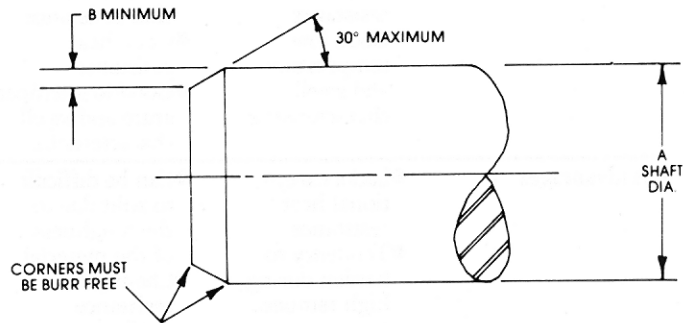
● Preparation of housing bore

The bore should be chamfered to permit easy entry of the seal and should have smooth, machined surfaces. Rough surfaces may score the metal case of the seal and permit seepage. See Figure 3, page 18.

When a lubricant head is present, if the bore is 100 micro-inches AA (2.54 micrometers) or better, bore leakage problems should not be encountered if no tool removal defects are present.

Recommended Shaft Lead Corner

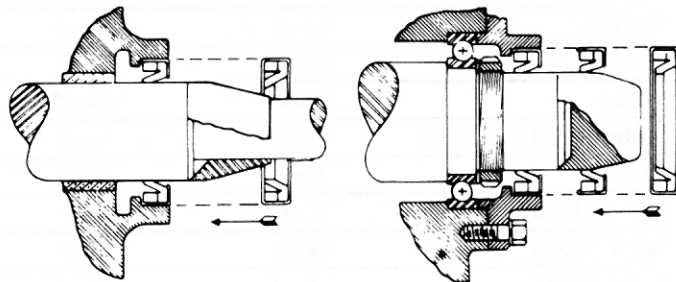
Figure 1



| A - Shaft Diameter | | B - Minimum* | |
|--------------------|-----------------|--------------|------|
| Inch | MM | Inch | MM |
| Thru .394 | Thru 10.00 | .030 | 0.75 |
| .395 - .787 | 10.01 - 20.00 | .040 | 1.00 |
| .788 - 1.181 | 20.01 - 30.00 | .050 | 1.25 |
| 1.182 - 1.575 | 30.01 - 40.00 | .060 | 1.50 |
| 1.576 - 1.969 | 40.01 - 50.00 | .070 | 1.75 |
| 1.970 - 2.756 | 50.01 - 70.00 | .080 | 2.00 |
| 2.757 - 3.740 | 70.01 - 95.00 | .090 | 2.25 |
| 3.741 - 5.118 | 95.01 - 130.00 | .110 | 2.75 |
| 5.119 - 9.449 | 130.01 - 240.00 | .140 | 3.50 |
| 9.450 & Up | 240.01 & Up | .220 | 5.50 |

*If a shaft lead-in radius is used, maintain the diametral difference to no less than indicated value

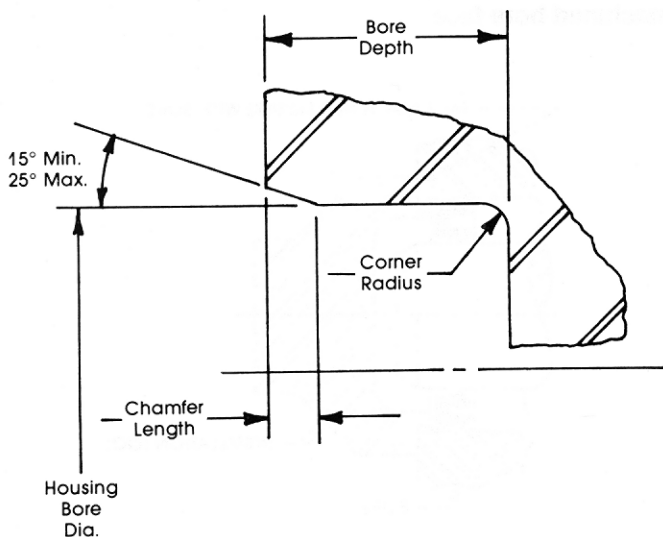
Figure 2



Remove all burrs, break or chamfer all sharp edges. Surfaces over which seal slides must be smooth and free from nicks or rough spots.

Installation Instructions

Figure 3
Housing Bore Dimensions



| Nominal Seal Width | | Chamfer Length | | Maximum Housing Corner Radius | |
|--------------------|---------|----------------|---------|-------------------------------|------|
| Inch | MM | Inch | MM | Inch | MM |
| Thru .394 | Thru 10 | .03-.04 | 0.7-1.0 | .020 | 0.50 |
| Over .394 | Over 10 | .05-.06 | 1.2-1.5 | .030 | 0.75 |

If the surface is rougher than 100 microinches AA (2.54 micrometers) a bore sealer should be used to insure that no outside diameter leakage occurs. If oil seals are purchased without O.D. sealant, a thin coating of shellac or gasket cement may be applied to the inside of the bore recess or outside of the seal case.

If such materials are used, however, care must be taken to make certain that none is spilled on the shaft or on the sealing element.

On grease applications, no bore sealer is required.

● Mounting the seal

The preceding recommendations apply to plain shafts. Take additional precautions to prevent sharp edges from damaging the sealing lip when mounting a seal on a shaft having keyways or holes. On these shafts, we recommend a mounting thimble, as shown in Figure 4, page 19. The thimble wall should be as thin as possible to avoid undue distortion of the sealing lip during the mounting operation. On very large shafts, where the use of a thimble may be impractical, brass shim stock with smooth edges may be wrapped around the shaft.

An alternate and less desirable method is to fill the keyway or hole with a smooth wooden plug shaped to protrude slightly above the surface of the shaft. In an emergency, and if no other means are available, the shaft may be wrapped with a heavy, well lubricated kraft paper to protect the sealing lip from the shaft irregularities.

● Seating the seal

A suitable press is recommended for pressing an oil seal into the bore. The press ram or driving tool should not be more than .010" (0.25 mm) smaller in O.D. than the bore diameter and should have a flat face to contact the back of the metal case on the seal. If installing the seal in a reverse position, be sure that the ram pressure is applied only to the roll-over bead around the outer diameter of the seal and not to the inside face or filler ring inside the metal outer case.

If a press is unavailable or the use of a press is not feasible, the seal may be seated with a driving plug or tool (see Figure 5, page 19). This tool is placed into position and tapped with a mallet. When large seals are being seated, or in an emergency, a block of wood resting squarely on the seal may be used instead of a driving tool. When seating a seal 20" (508 mm) in diameter or larger the best practice is to drive it simultaneously at opposite points on its circumference. **NEVER HIT THE SEAL DIRECTLY!**

A factor in the functioning of a lip seal is the installed squareness of the seal with respect to the normal shaft centerline. Good general practice is to keep this within 0.010 in. (0.25 mm) TIR. The proper squareness can be obtained by pressing the seal flush with the front of the bore or bottoming it against a shoulder. The surface a seal is aligned with should always be a machined one. Unfinished surfaces should never be used for alignment purposes because of the danger of cocking the seal. Typical installation tools are shown in Figure 6, page 19.

Some applications require the seal to be pressed into a separate cover plate or bearing retaining ring, with the assembly subsequently mounted over the shaft. On this type of installation, care must be exercised to prevent undue distortion of the sealing member by permitting this heavy assembly to hang on the shaft, supported only by the seal. Designing the cover plate or retaining ring with close tolerances over the shaft helps to relieve the weight on the seal.

If the seal is pressed into a bore or housing before the bearing is installed, it is essential to support the heavy shaft to prevent its weight from damaging the sealing element.

WARNING:

Properties/applications shown throughout this brochure are typical. Your specific application should not be undertaken without independent study and evaluation for suitability. For specific application recommendations consult Garlock. Failure to select the proper sealing products could result in property damage and/or serious personal injury.

Performance data published in this brochure has been developed from field testing, customer field reports and/or in-house testing.

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Installation Instructions

Figure 4

A - Ram seated on back of seal

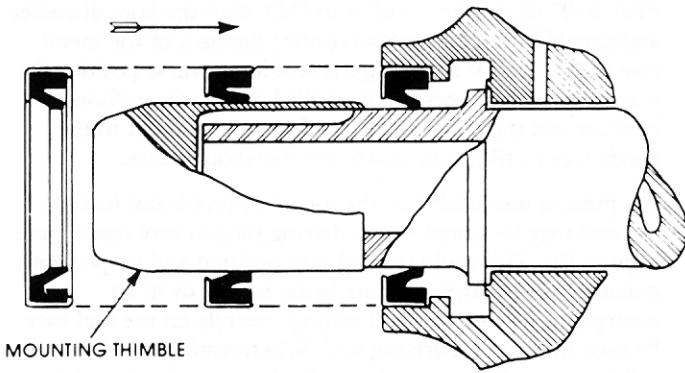
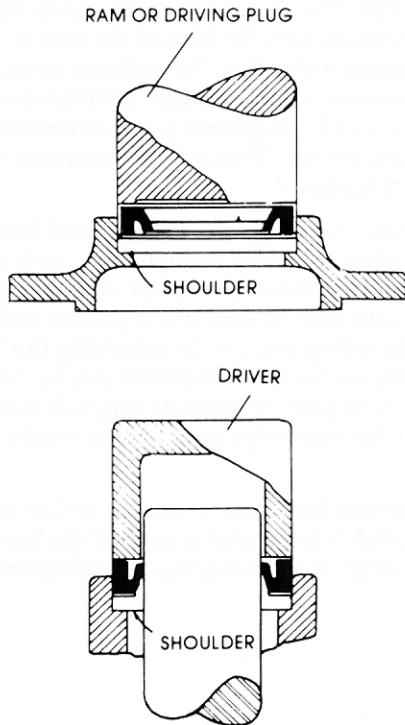


Figure 5

B - Driver seated on roll-over bead of seal



Note: shoulder provides stop and insures mounting seal at right angle to the shaft

WARNING:

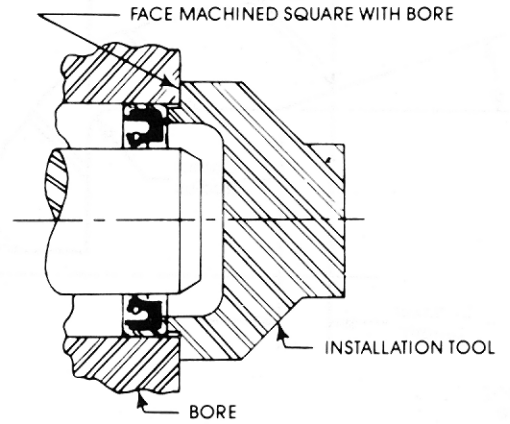
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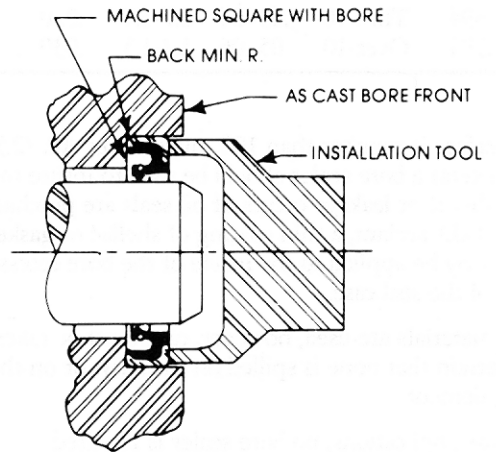
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Figure 6

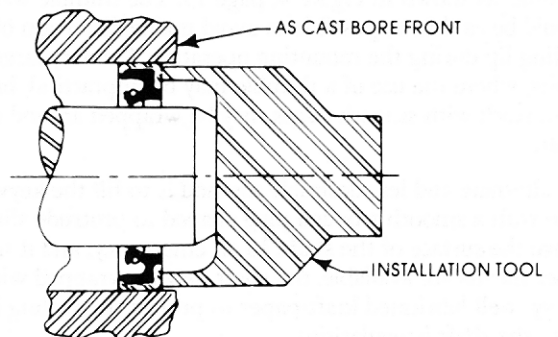
A - Through bore: installation tool bottoms on machined bore face



B - Bottom bore: seal bottoms on machine bore shoulder



C - Through bore: installation tool bottoms on shaft



Garlock Split-KLOZURE Oil Seals Models 21, 23, 24, 25 and 26

The Garlock Split-KLOZURE Oil Seal can be split or cut open on the diameter. The seal is installed by placing it around the shaft instead of sliding the seal over the shaft as is necessary with solid seals of the conventional type.

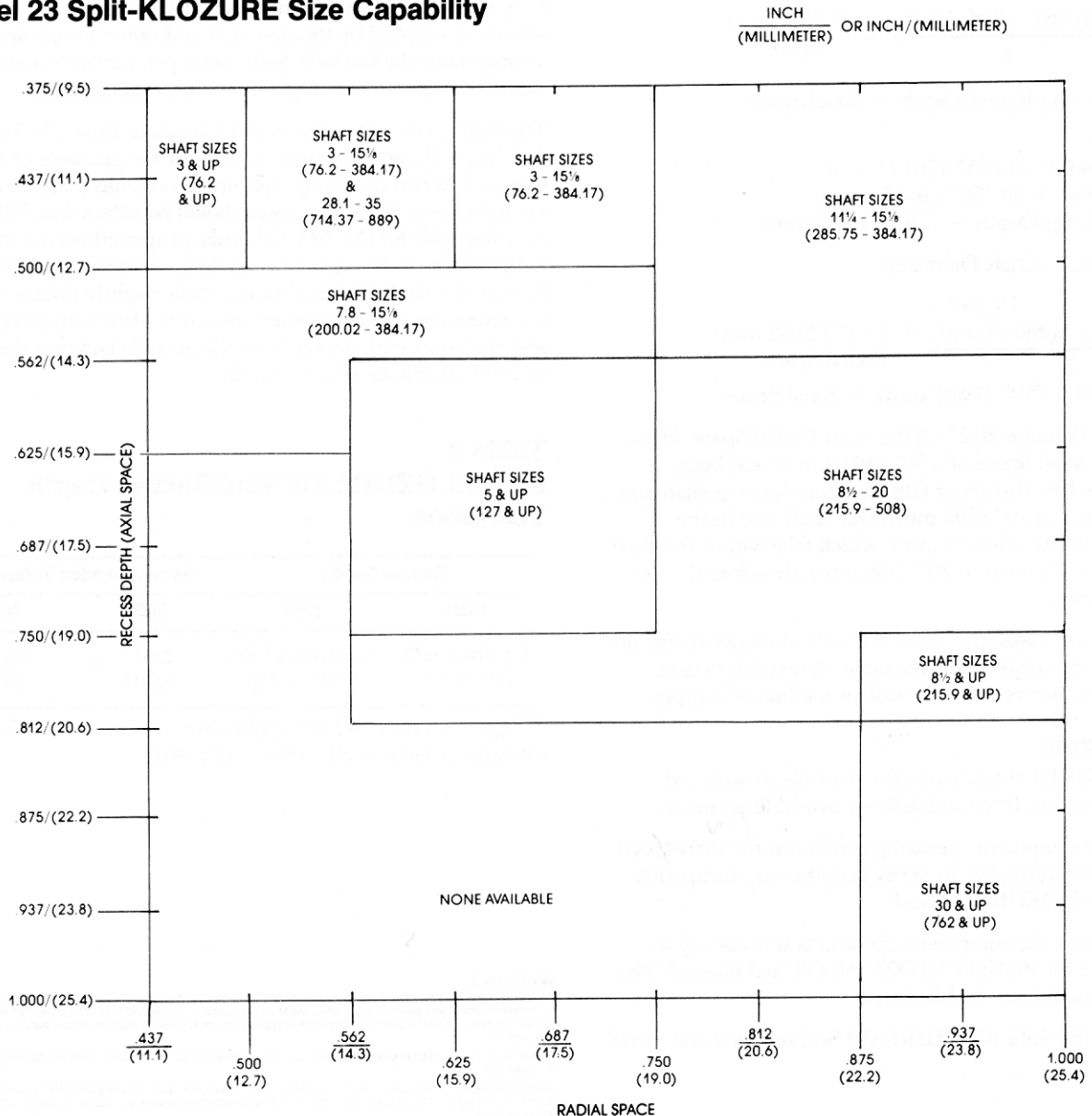
Split-KLOZURE Oil Seals are used on original equipment applications or maintenance applications to replace a conventional oil seal installation when for any reason the renewal of the original seal becomes necessary.

For applications to bearings mounted on shafts carrying couplings, gears, sprockets or flywheels as found on heavy equipment in steel mills, pulp and paper mills and other industries, Split-KLOZURE Oil Seals are particularly suitable as they can be applied without removing or otherwise disturbing those parts.

Contractors' equipment and machines of other types frequently are operated in isolated localities remote from repair and service facilities. On such equipment, the renewal of a conventional oil seal may be an exceedingly difficult, expensive and time-consuming job. A Split-KLOZURE Oil Seal, however, can be installed on the spot easily and quickly by a mechanic or machine operator.

The Split-KLOZURE Oil Seal, because it is not suitable for pressure service, will not work as universally on all applications as the conventional Garlock KLOZURE Oil Seal. If in doubt as to whether a split or conventional oil seal is more suitable for a specific application, supply your Garlock representative with full details and Garlock will make a recommendation.

**Table 6
Model 23 Split-KLOZURE Size Capability**



Conversion Instructions - Split Seals

When converting equipment from conventional oil seals to Split-KLOZURE Oil Seals, the following instructions should be followed.

1. Obtain shaft diameters, bore diameter and recess depth dimensions of existing seal or equipment (Figure 12, page 22).
2. Check size listing section (Table 6, page 20) to determine availability of a Split-KLOZURE Oil Seal for the equipment dimensions.

Non-stock Split-KLOZURE Oil Seal sizes

Sizes other than those shown in the stock listing can be produced, provided the radial and axial dimensions fall within the limits shown in Table 6, page 20.

To determine the radial and axial dimensions of your application, use the following formula:

$$A. \frac{\text{Bore Diameter} - \text{Shaft Diameter}}{2} = \frac{\text{Radial (Packing) Space}}{\text{Space}}$$

$$B. \text{Bore Housing Recess Depth} = \text{Axial Space}$$

Example:

Bore Diameter = 11.875" (301.63 mm)

Shaft Diameter = 10.250" (260.35 mm)

Recess (Packing) Depth = .750" (19.05 mm)

(Bore Diameter - Shaft Diameter)

$$\frac{11.875'' \quad 10.250''}{(301.63 \text{ mm}) \quad (260.35 \text{ mm})} = .812'' \quad (20.62 \text{ mm})$$

2 Radial Space

$$(\text{Recess Depth}) .750'' (19.05 \text{ mm}) = \text{Axial Space}$$

Using Table 6, locate .812" (20.62 mm) Radial Space. Move up until the Axial Space of .750" (19.05 mm) has been located. Note that this point falls in a box showing shaft size 8½" (215 mm) to 20" (508 mm). Our shaft size in the example is 10.250" (260.35 mm), which falls within the shaft sizes of 8½" (215 mm) to 20" (508 mm), therefore this seal can be produced.

NOTE: In some cases, the radial and axial dimensions fall on lines separating segments of the table. When this occurs, shaft size parameters on either side of the line will apply.

Metric Sizes:

Split-KLOZURE Oil Seals are also available in standard metric dimensions. Price and delivery available on request.

3. Check the equipment operating conditions for shaft speed, runout, temperatures, etc. to verify that they are compatible with a Split-KLOZURE Oil Seal.
4. Proceed with the equipment alterations if necessary to provide space for the Split-KLOZURE Oil Seal selected. The cover plate should also be fabricated.
5. Purchase the Split-KLOZURE Oil Seal required and install as outlined.

Manufacturers of original equipment can supply equipment incorporating a conventional seal but with the ability to convert to a split seal in the field. The following suggestions are of assistance.

- a. Design into the equipment a conventional oil seal with the same shaft, bore and width dimensions as a stock Split-KLOZURE Oil Seal.
- b. Supply the equipment with the cover plate required for the Split-KLOZURE Oil Seal. The end user then can make the conversion from a conventional oil seal to a split seal without any modifications to the equipment.
- c. Maintenance manuals should include information covering the replacement of the conventional seal with a Split-KLOZURE Oil Seal and should list the Split-KLOZURE Oil Seal model number and show installation instructions.

The retaining cover plate, which is made in either a solid ring, two halves, or segments to fit around shafts and bolts or screws, is supplied by the customer and only through special arrangements by Garlock. Such metal parts must be made to meet the requirements of each individual installation.

The shaft, bore and recess depth tolerances shown in Tables 3, 4 (page 13) and 7 (this page) are for the guidance of the designer. When designing equipment on which these seals are to be used, these tolerances should be adhered to. When molding Split-KLOZURE Oil Seals, proper allowance in the radial width of the element is made to insure an interference fit with the shaft. The seal is also made slightly thicker than the recess depth so that when the cover plate is applied, the seal is compressed, preventing leakage and clamping the seal so it cannot rotate with the shaft.

Table 7
Split-KLOZURE Oil Seal Recess Depth Tolerance

| Recess Depth | | Recommended Tolerance* | |
|--------------|---------------|------------------------|-------|
| Inch | MM | Inch | MM |
| Up thru .625 | Up thru 15.88 | ±.002 | ±0.05 |
| .625 & Up | 15.89 & Up | ±.004 | ±0.10 |

*Single seals only. Where application involves two seals, tolerance is to be +.010 -.000 (+0.25 -0.0)

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Installation Instructions for GARLOCK Split-KLOZURE Oil Seals

A Split-KLOZURE Oil Seal should be installed with the split at the top of horizontal mounted shafts. To insure proper application and to prevent damage to the sealing lip of the Split-KLOZURE Oil Seal, the installation should be accomplished as follows:

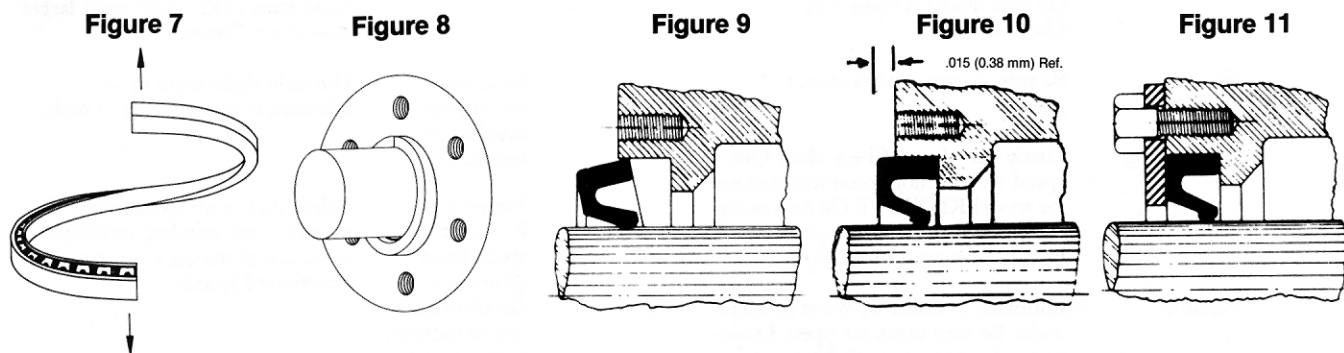
1. See that the recess is thoroughly cleaned and that all burrs and sharp cutting edges are removed.
2. Apply grease or oil to the shaft.
3. Open Split-KLOZURE Oil Seal joint sideways (as shown in Figure 7) and place it around the shaft at a point near the recess into which the seal is to be installed.
4. Start the sealing element into the recess at the top of the housing by lining up the sealing lip on both sides of the joint as shown in Figure 8. Compress the leading edge of the Split-KLOZURE Oil Seal to enter the housing as shown in Figure 9.
5. Continue this process around the entire periphery of the shaft until the sealing element is inserted in the recess.

6. Seat the seal in the recess as indicated in Figure 10 by tapping the seal lightly with a mallet on a block of wood, using care to prevent damage to the seal lip. Once seal is seated, approximately .015" (0.38 mm) should be protruding from the bore cavity allowing compression of seal as described in paragraph seven (7).

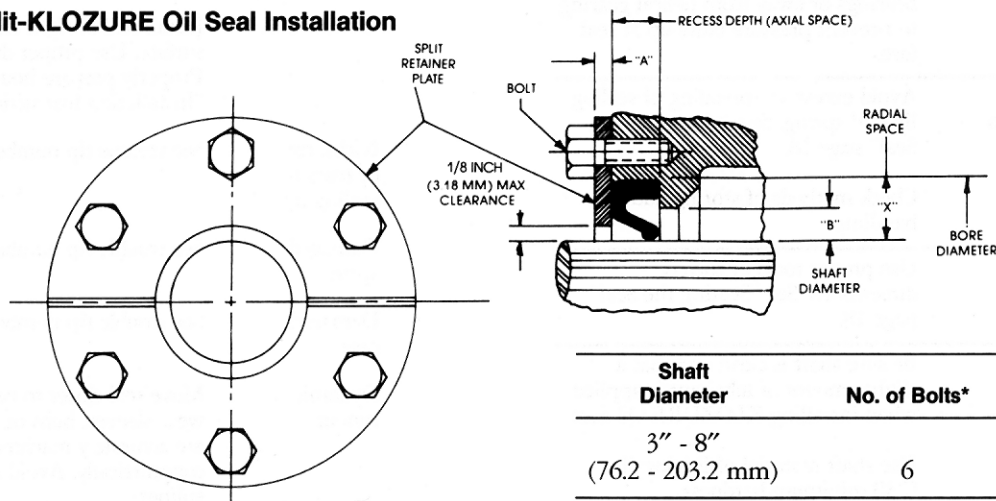
7. Bolt the cover plate tightly into position to compress the Split-KLOZURE Oil Seal in the recess as shown in Figure 11. Cover plate should be sufficiently heavy to compress the sealing element firmly in recess. Screws or bolts should be as near as possible to the recess bore to prevent cover plate from dishing. Model 26 seals do not require a cover plate.

8. When the Split-KLOZURE Oil Seal replaces the conventional seal, the equipment recess depth may be greater than the thickness of the Split-KLOZURE Oil Seal, thus requiring a filler. Filler gaskets or a split metal washer may be used for this purpose.

9. When a Split-KLOZURE Oil Seal is installed at the end of a plain or sleeve bearing, a drain or vent should enter the space between the seal and the bearing to prevent pressure building up at this point.



Standard Split-KLOZURE Oil Seal Installation Figure 12



"B" = .28 "X" Minimum, .5 "X" Maximum
 "X" = $\frac{\text{Bore Dia.} - \text{Shaft Dia.}}{2}$

| Shaft Diameter | No. of Bolts* | "A" Minimum Plate Thickness |
|------------------------------|--|-----------------------------|
| 3" - 8" (76.2 - 203.2 mm) | 6 | 1/8" (3.18 mm) |
| over 8" (over 203.2 mm) | Bolts on a maximum of 6" (152.4 mm) chord, spacing centered about split in end plate | 1/4" (6.35 mm) |

*Figures shown are for a guide only.
 Good machine design practices should be followed.

Trouble Shooting



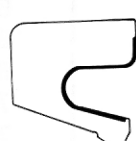


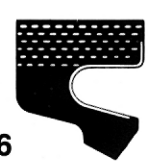
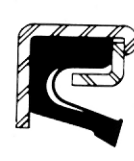
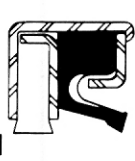
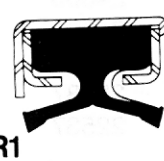
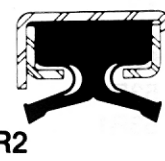
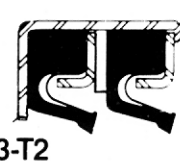
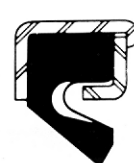

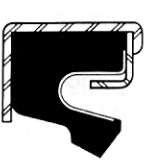
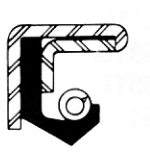
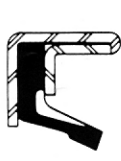
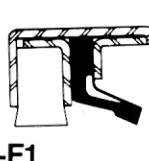
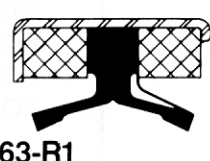
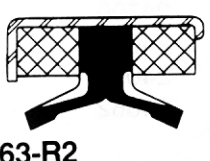
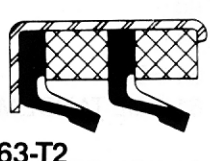
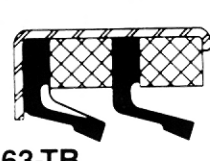
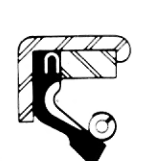
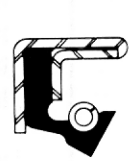
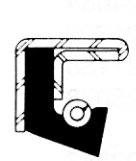
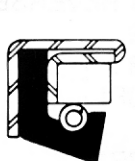






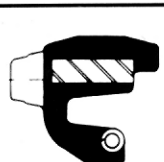






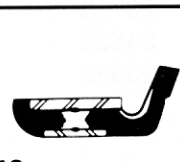

This chart indicates possible sources of seal trouble on general applications. Special installations may require a more complete

| Check for | Possible sources of trouble | Suggested remedy |
|---|-----------------------------|--|
| 1. Nicks, cuts or tears in sealing lip | Rough finish on shaft | Finish shaft surface from 10-20 microinch. AA (0.25-0.50 micrometers). Remove all burrs. See "Preparation of Shaft" page 17. |
| | Improper installation | Use mounting tool to carry sealing lip over keyways, splines and sharp shoulders. See "Mounting the Seal" page 18. |
| | Rough handling | Check methods of storing and handling. Seals deserve the same care as the bearings they protect. |
| 2. Excessive wear on hardening of sealing element | Rough finish on shaft | Finish shaft surface from 10-20 microinch. AA (0.25-0.50 micrometers). See "Preparation of Shaft" page 17. |
| | Tight fit on shaft | Check service recommendations in catalog to see if correct KLOZURE Oil Seal model is being used. Check sizes. |
| | No lubrication | Be sure adequate lubrication is present. |
| | Overheating | Check size of seal. Check shaft fpm speed with catalog recommendations for model KLOZURE Oil Seal being used. Check ambient temperatures. Be sure of proper lubrication. |
| | Pressure | Eliminate pressure by vents or drain-backs. Be sure vents are open. Drain-backs should be provided around bearings or away from helical gearing to prevent pressure build-up at seal face. |
| 3. Damaged spring | Improper installation | Avoid excessive spreading of sealing lip and spring. See "Mounting the Seal" page 18. |
| | Rough handling | Check methods of storing and handling. |
| 4. Damaged case | Improper driving tools | Use proper tools of correct dimensions. See "Seating the Seal" page 18. |
| 5. Excessive shaft wear | Abrasives | Be sure shaft is clean and that a slight amount of lubricant is applied when installing KLOZURE Oil Seal. |
| | Soft shaft | Use shaft material of Rockwell C 30 minimum hardness. |

analysis. If advice or assistance is needed, please contact the nearest Garlock office.

| Check for | Possible sources of trouble | Suggested remedy |
|--------------------------------|--|--|
| 6. Scores in O.D. of seal | Coarse machining | Give better finish to housing bore. Check for imperfect casting. |
| | Sharp corners on housing bore | Chamfer housing bore. |
| | Bore undersize | Check housing bore diameter. See "Tolerance" page 13. |
| 7. Excessive leakage | Light fit on shaft | Check size diameter. See "Tolerances" page 13. |
| | | Check service recommendations in catalog to see if correct KLOZURE Oil Seal is being used. |
| | Abnormal spreading of sealing element | Use mounting tools with thin wall. See "Mounting the Seal" page 18. |
| | | Do not apply over shaft shoulder more than 1/32" (0.80 mm) larger than shaft diameter. |
| | Excessive use of pre-installation lubricant | Use only slight amount of lubricant to apply and start seals. |
| | Presence of lead, helix or spiral from grinding in a direction causing an outward pumping action | Polish shaft with crocus cloth. If possible alter grinding technique to reduce, eliminate or reverse direction of spirals. |
| | Cocked seals | Install seal at right angle to shaft surface. Use proper driving tool. Properly prepare housing bore. See "Installation Instructions" page 18. |
| | Nicks, cuts or tears in sealing lip | See trouble tip number 1. |
| | Damaged spring | See trouble tip number 3. |
| | Damaged case | See trouble tip number 4. |
| Dynamic runout | Move seal closer to bearing. Be sure wear sleeves, hubs or retaining rings are accurately machined concentrically. Avoid looseness in splines. | |
| Paint on shaft at back of seal | Provides suitable masks so that paint will not solidify under sealing element forcing sealing lip away from shaft. | |

Typical KLOZURE Oil Seal Configurations

| | | | | |
|---|---|---|--|---|
| 3  | 21  | 23  | 24  | 25  |
| 26  | 53  | 53-F1  | 53-R1  | 53-R2  |
| 53-T2  | 54  | 57  | 59  | 62  |
| 63  | 63-F1  | 63-R1  | 63-R2  | 63-T2  |
| 63-TB  | 64  | 66  | 67  | 68  |
| 71  | 72  | 76  | 77  | 78  |
| 82  | 88  | 91  | 92  | 94  |
| 111  | 113  | 123  | 142  | 145  |

WARNING:

Properties/applications shown throughout this brochure are typical. Your specific application should not be undertaken without independent study and evaluation for suitability. For specific application recommendations consult Garlock. Failure to select the proper sealing products could result in property damage and/or serious personal injury.

Performance data published in this brochure has been developed from field testing, customer field reports and/or in-house testing.

While the utmost care has been used in compiling this brochure, we assume no responsibility for errors. Specifications subject to change without notice. This edition cancels all previous issues. Subject to change without notice.