Fristam PUMPS

INSTRUCTION AND MAINTENANCE MANUAL:

FKL-25, 50, 75, 150, 250 AND 400 STYLE PUMP

SANITARY POSITIVE DISPLACEMENT PUMP

Description

This manual contains installation, operation and repair instructions for the Fristam FKL 25, 50, 75, 150, 250 and 400 Series balanced circular piston pump.

The FKL pump is a positive displacement pump characterized by its balanced rotor design. The rotors travel through a precisely machined, close clearance channel in the housing and cover allowing the product to be pumped very efficiently.

The FKL series pump features a unique balanced rotor design with heavy-duty shafts allowing the pump to maintain its efficiency at differential pressures up to 300 psi. The pump also features rotors made from “non-galling” stainless steel, which allows the pump to continue to run even under extreme conditions.

The FKL series pump is ideal for pumping products that are shear sensitive, have a high viscosity and/or contain large particulate. The FKL series pump excels in applications with high differential pressure and/or low inlet pressures and its high efficiency, low slip performance makes it an excellent pump for metering applications for consistent flow control.

The FKL series pump is available with any connection type desired and may be mounted with the inlet/outlet connections in a horizontal or vertical orientation. The pump should be coupled to a motor/drive assembly properly specified to give the desired performance for the required application.

CAUTION: BEGIN ALL PUMP MAINTENANCE OPERATIONS BY DISCONNECTING THE ENERGY SOURCE TO THE PUMP. OBSERVE ALL LOCK OUT/TAG OUT PROCEDURES AS OUTLINED BY ANSI Z244.1-1982 AND OSHA 1910.147 TO PREVENT ACCIDENTAL START UP AND INJURY.

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Specifications

Normal Differential Pressure Range ..... 0 to 300 PSI
Normal Speed Range ..... 0 to 600 RPM
Normal Temperature Differential (Standard Rotors) .....Δ140°F
Normal Temperature Differential (High Temperature Rotors)..... Δ210°F

Materials of Construction

Major Product Contact Components ..... AISI 316L
Rotors..... Non-galling Stainless Steel
Cover Gasket..... BUNA (standard)
Also available in ..... Viton, EPDM and other options available
Surface Finish for Product Contact Surfaces ..... 32 Ra (standard)
Also available in ..... 25 Ra and 20 Ra
Cover Gasket and Other O-rings on Aseptic..... EPDM

Shaft Seals & O-rings

Mechanical Seal Type ..... Single/Double/Aseptic Double
Stationary Seal Ring Material .....Carbon (standard)
Also available in ..... Silicon Carbide
Rotating Seal Ring Material ..... Chrome Oxide coated Stainless Steel
Also available in ..... Silicon Carbide
Other O-rings (*mechanical seals*).....Viton (standard)
Also available in .....EPDM and other options available
O-ring Seal Type ..... Single/Double
O-ring Seal Material .....Viton (standard)
Also available in ..... EPDM and other availableupon request
Note: o-ring seal not available on the FKL 400

Lubrication

Oil Grade..... SAE 15W40
Oil Capacity - Horizontal
FKL 25 ..... 1.66 liters (1.75 US quarts)
FKL 50 ..... 1.4 liters (1.5 US quarts)
FKL 75 ..... 4.2 liters (4.5 US quarts)
FKL 150 ..... 7.1 liters (7.5 US quarts)
FKL 250 ..... 10.4 liters (11 US quarts)
FKL 400 ..... 17.5 liters (18.5 US quarts)
Oil Capacity - Vertical
FKL 25 ..... 0.65 liters (0.75 US quarts)
FKL 50 ..... 1.4 liters (1.5 US quarts)
FKL 75 ..... 2.6 liters (2.75 US quarts)
FKL 150 ..... 3.9 liters (4.25 US quarts)
FKL 250 ..... 4.2 liters (4.5 US quarts)
FKL 400 ..... 8.0 liters (8.5 US quarts)

Table A1: Woods Sure-Flex Coupling Alignment

Sleeve Size	Type E			Type H		
	Parallel A	Angular Y max. - Y min.	Y*	Parallel A	Angular Y max. - Y min.	Y*
6	.015	.070	2.375	.010	.016	2.375
7	.020	.081	2.563	.012	.020	2.563
8	.020	.094	2.938	.015	.025	2.938
9	.025	.109	3.500	.017	.028	3.500
10	.025	.128	4.063	.020	.032	4.063
11	.032	.151	4.875	.022	.037	4.875
12	.032	.175	5.688	.025	.042	5.688
13	.040	.195	6.688	.030	.050	6.625
14	.045	.242	7.750	.035	.060	7.750

Dimensions are in inches.
*The "Y" dimension is shown for reference.

Table A2: Recommended Torque Values

	FKL 25	FKL 50	FKL 75	FKL 150	FKL 250	FKL 400
Cover nut	15 ft.-lbs.	45 ft.-lbs.	45 ft.-lbs.	45 ft.-lbs.	45 ft.-lbs.	45 ft.-lbs.
Rotor bolt	25 ft.-lbs.	25 ft.-lbs.	25 ft.-lbs.	50 ft.-lbs.	65 ft.-lbs.	65 ft.-lbs.
Bearing cap screw	60 in.-lbs.	60 in.-lbs.	10 ft.-lbs.	10 ft.-lbs.	25 ft.-lbs.	25 ft.-lbs.
Bearing lock nut	50 ft.-lbs.	7 in.-lbs*	50 ft.-lbs.	50 ft.-lbs.	50 ft.-lbs.	50 ft.-lbs.
Hex head housing bolt	60 in.-lbs.	10 ft.-lbs.	45 ft.-lbs.	45 ft.-lbs.	45 ft.-lbs.	45 ft.-lbs.
Gearbox cover bolt	10 ft.-lbs.	10 ft.-lbs.	20 ft.-lbs.	20 ft.-lbs.	20 ft.-lbs.	20 ft.-lbs.
Mounting strap screw	10 ft.-lbs.	10 ft.-lbs.	70 ft.-lbs.	70 ft.-lbs.	70 ft.-lbs.	80 ft.-lbs.
Seal housing screw	30 in.-lbs.	30 in-lbs.	30 in.-lbs.	30 in.-lbs.	30 in.-lbs.	10 ft.-lbs.
Socket head housing screw		10 ft.-lbs.				

FKL 50:* the torque on the bearing lock nut is a rotating torque for the shaft without the oil seals in place.

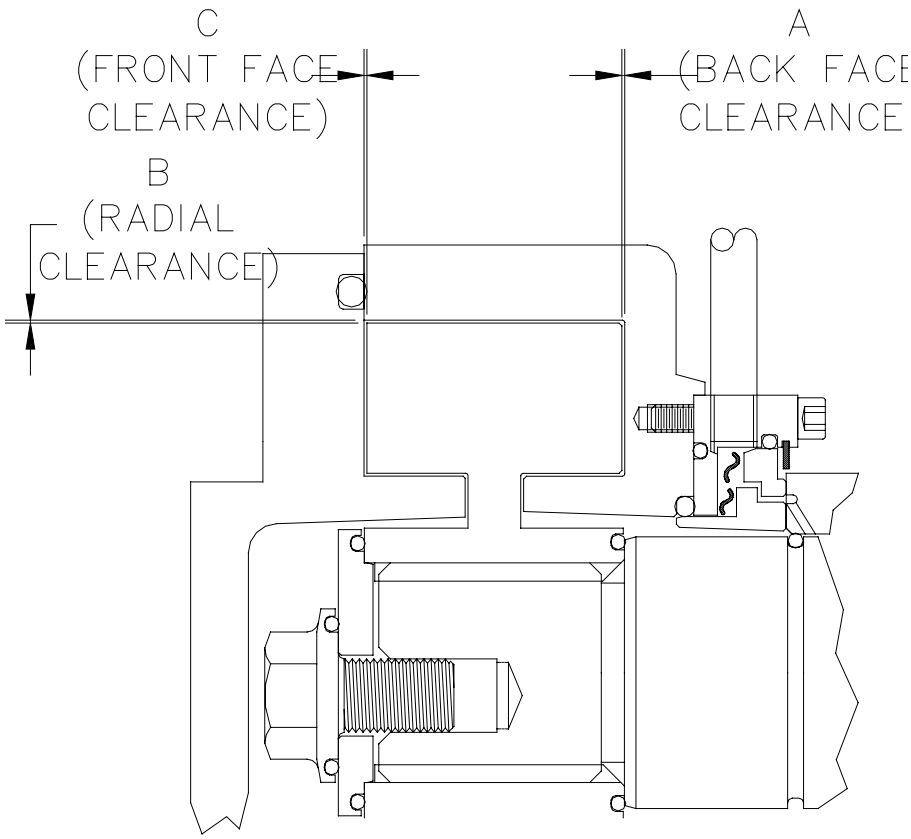


Table A3: FKL Rotor Clearances - Dimensions in Millimeters (inches)

	Standard rotors			High temperature rotors		
Model	**Back Face**	**Radial**	**Front Face**	**Back Face**	**Radial**	**Front Face**
25	0.06-0.08 (0.0024-0.0031")	0.05-0.09 (0.002-0.0035")	0.07-0.17 (0.0028 - 0.007")	0.11-0.12 (0.0039-0.0047")	0.08-0.12 (0.0031-0.0047")	0.13-0.23 (0.0051-0.0091")
50	0.07-0.11 (0.0028-0.0043")	0.055-0.105 (0.0022-0.0041")	0.08-0.20 (0.0031-0.0079")	0.11-0.15 (0.0043-0.0059")	0.095-0.145 (0.0037-0.0057")	0.15-0.27 (0.0059"-0.0106")
75	0.08-0.12 (0.0031-0.0047")	0.075-0.125 (0.003-0.0049")	0.10-0.22 (0.0039-0.0087)	0.12-0.16 (0.0047-0.0063")	0.125-0.175 (0.0049-0.0069")	0.18-0.30 (0.0071-0.0118")
150	008-0.12 (0.0031-0.0047")	0.085-0.135 (0.0033-0.0053")	0.13-0.25 (0.0051-0.0098")	0.13-0.17 (0.0051-0.0067")	0.135-0.185 (0.0053-0.0073")	0.22-0.34 (0.0087-0.0134")
250	0.09-0.13 (0.0035-0.0051")	0.110-0.170 (0.0043-0.0067")	0.16-0.28 (0.0063-0.011")	0.14-0.18 (0.0055-0.0071")	0.18-0.24 (0.0071-0.0094")	0.27-0.39 (0.0106-0.0154")
400	0.1-0.14 (0.0039-0.0055")	0.120-0.180 (0.0047-0.0071")	0.16-0.30 (0.0063-0.0118")	0.16-0.2 (0.0063-0.0079")	0.20-0.26 (0.0079-0.0102")	0.3.27-.41 (0.0106-0.0161")

	Chocolate rotors		
Model	**Back Face**	**Radial**	**Front Face**
25	0.24-0.26 (0.0094-0.0102")	0.229-0.279 (0.009-0.011")	0.265-0.345 (0.0104-0.0136")
50	0.28-0.32 (0.011-0.0126")	0.293-0.343 (0.0115-0.0135")	0.316-0.396 (0.0124-0.0156")
75	0.28-0.32 (0.011-0.0126")	0.293-0.343 (0.0115-0.0135")	0.316-0.396 (0.0124-0.0156")
150	0.31-0.35 (0.0122-0.0138")	0.305-0.355 (0.012-0.014")	0.341-0.421 (0.0134-0.0166")
250	0.33-0.37 (0.013-0.146")	0.380-0.440 (0.015-0.0173")	0.380-0.460 (0.015-0.0181")

Installation

Unpacking

Check the contents and all wrapping when unpacking the pump. Carefully inspect for any damage that may have occurred during shipping. Immediately report any damage to the carrier. Leave the protective caps over the pump inlet and outlet connections until you are ready to install the pump.

Installing

Prior to actually installing the pump, ensure that:

- the pump will be readily accessible for maintenance, inspection and cleaning.
- adequate ventilation is provided for motor cooling.
- the drive and motor type is suitable for the environment where it is to be operated. Pumps intended for use in hazardous environments e.g., explosive, corrosive, etc., must use a motor and drive with the appropriate enclosure characteristics. Failure to use an appropriate motor type may result in serious damage and/or injury.
- when switching the pump from top drive shaft to bottom drive shaft, or visa versa, the gear cover (37) needs to be rotated 180 degrees. This will move the drain plug (38), and sight glass (36) to the appropriate positions.
- when switching the pump mounting to vertical, the sight glass (36) and vent cap (10) will need to be switched.

Piping

CAUTION: Because the FKL pump is a highly efficient positive displacement pump, the user needs to ensure that the pump will not be over-pressurized during operation as this can cause severe damage to the pump. (Over-pressurization can occur if a valve is closed on the discharge of the pump and the pump continues to run beyond its differential pressure rating.) The pump warranty is void for damage caused by over-pressurization. The differential pressure can be determined by putting a pressure gauge at the discharge side of the pump and a pressure gauge at the inlet side of the pump and calculating the difference.

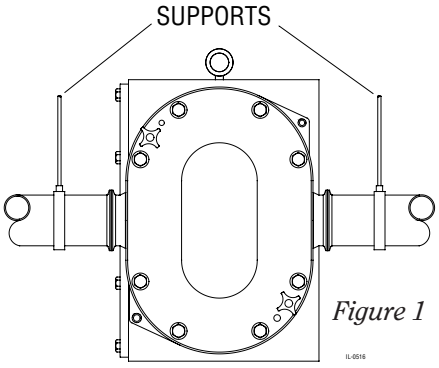


Figure 1

Follow good piping practices when installing your FKL series pump:

- Support all piping independently to minimize the forces exerted on the pump (*Figure 1*).
- Ensure that the piping can accommodate thermal expansion without stressing the pump.
- Slope inlet piping up to pump to avoid air pockets (*Figure 2*).
- Avoid sump areas where sediment may collect (*Figure 3*).
- Use a check or "foot" valve on the inlet side of the pump in lift applications to keep the suction piping flooded.
- Avoid throttling valves in the suction piping.

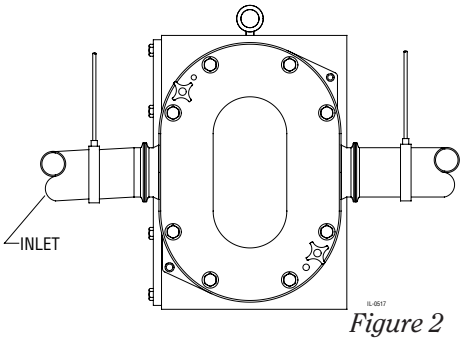


Figure 2

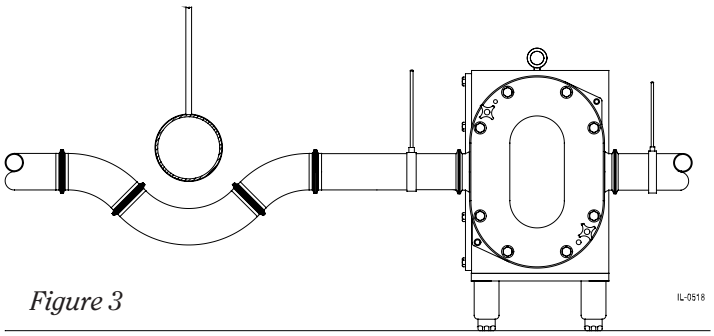


Figure 3

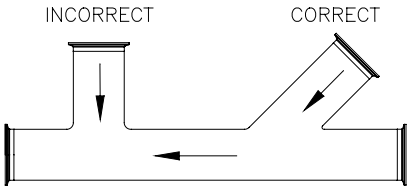


Figure 4

- Keep suction lines as short and direct as possible.
- Avoid abrupt transitions in the piping systems (*Figure 4*).
- Avoid the formation of air pockets in the piping (*Figure 5*).
- Ensure that the NPSH available in the system is greater than NPSH required by the pump.
- Avoid abrupt closure of shut-off valves, this may cause hydraulic shock which can cause severe damage to the pump and system.
- Avoid elbows in the suction line if possible. When necessary they should be located 5 pipe diameters away from the pump inlet and have a bend radius greater then 2 pipe diameters (*Figure 6*).
- Install a relief valve on the discharge side of the pump with a bypass loop back to the suction side to ensure that the pump cannot be over-pressurized.

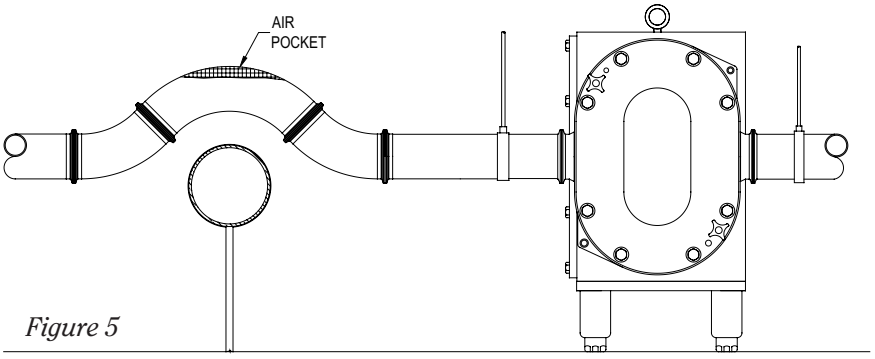


Figure 5

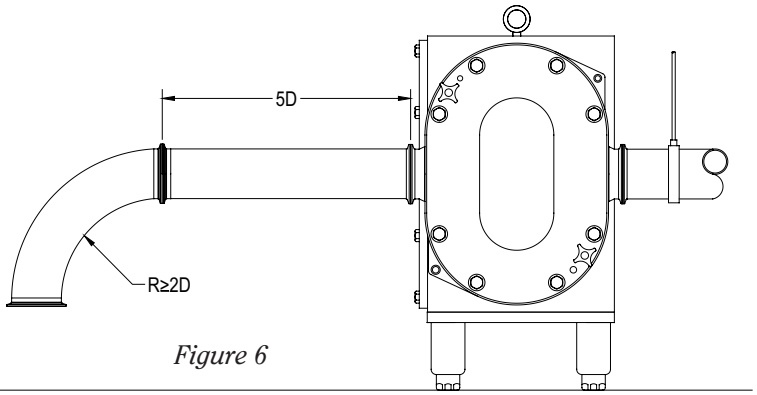
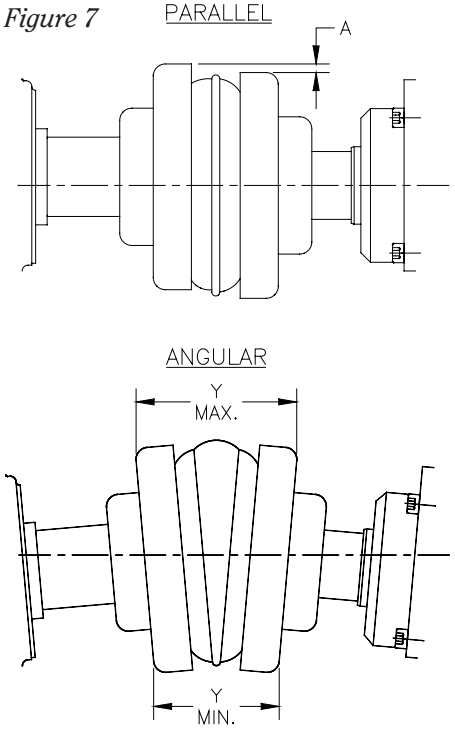


Figure 6

Alignment

In most cases, the pump will be shipped with a drive unit mounted on a common baseplate. The drive and pump are aligned at the factory; however, this alignment should be checked after installation (*Figure 7*). Misalignment between the pump and drive can result in premature bearing failure or other damage. If the pump is not shipped with a drive unit, use a flexible coupling between the pump and drive unit. Align the pump and drive unit according to the coupling requirements.

Figure 7



Checking alignment

Remove the wire ring from the coupling sleeve and let it hang between the sleeve and one of the flanges.

To check the parallel alignment place a straight edge across the two coupling flanges and measure the maximum offset at various points around the periphery of the coupling without rotating the coupling. If the maximum offset exceeds the figure shown under "Parallel" in Table A1 (page 53) , realign the shafts.

Check the angular alignment with a micrometer or caliper. Measure from the outside of one flange to the outside of the other ("Y") at intervals around the periphery of the coupling. Determine the maximum and minimum dimensions without rotating the coupling. The difference between the maximum and minimum must not exceed the figure given under "Angular" in Table A1 (page 53) . If a correction is necessary, be sure to recheck the parallel alignment.

Reinstall the wire ring on the O.D. of the coupling sleeve.

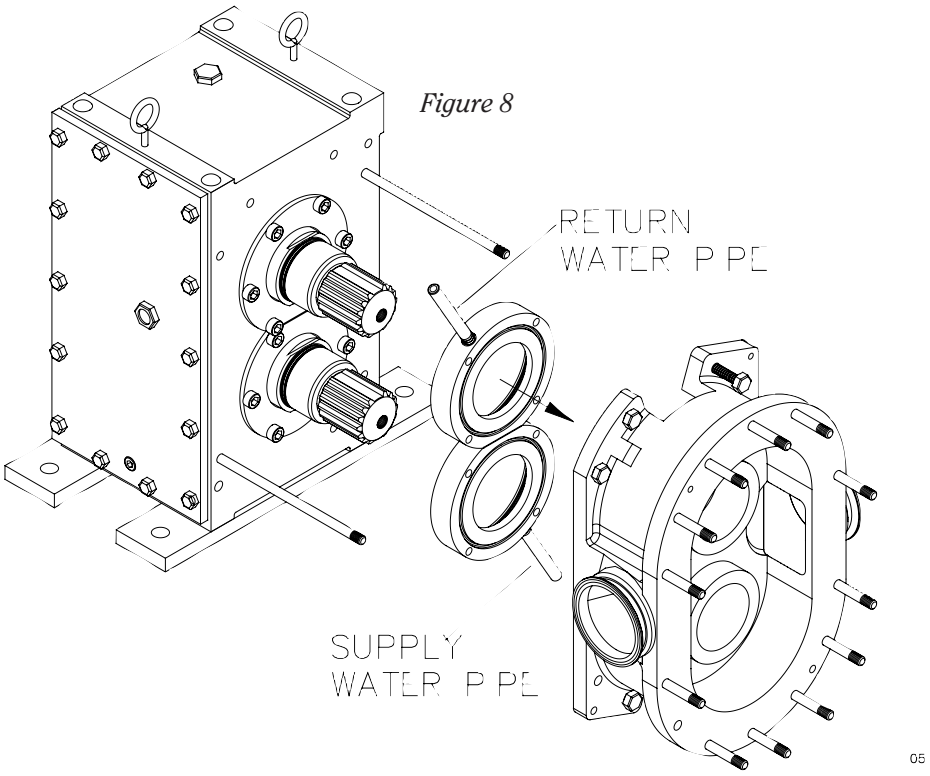
Electrical Connections

Have an electrician connect the drive motor using sound electrical practices. Ensure that proper motor overload protection is provided. The size of the drive selected should meet the requirements of the operating conditions. A change in conditions (for example, higher viscosity product, higher product specific gravity) can overload the motor. For technical assistance regarding operating condition changes, please contact Fristam Pumps. Make sure that the pump is rotating in the correct direction.

Water Flush Connections

If your pump is equipped with a double mechanical or double o-ring product seal, water must be supplied to provide cooling and lubrication. Connect supply and return lines to the water pipes supplied with the product seal on your pump. The water pipes have a 1/16" NPT thread. See *Figure 8* for the proper orientation.

Figure 8



Note: Water should flow from bottom to top and steam should travel top to bottom. Use about 3-12 gallons per hour of water at 1-2 psi. Excessive seal pressure and/or flow rate through the product seal cavity may cause increased seal wear and shorten seal life.

Start-up Check-list

1. Make sure that the pump and piping system are clear of any foreign matter. *Do not use the pump to flush the system*.
2. Make sure that the pump and drive are properly lubricated. Check the lubrication section (page 52) in this manual for the pump. See instructions from the manufacturer for the drive.
3. Check to make sure that all guards are in place and secure.
4. Check for proper pump and drive rotation (*Figure 9*). Make sure that the pump is flooded with product when checking the rotation. Running the pump dry even momentarily can cause seal damage.
5. Check that all valves on the discharge side are open to prevent over-pressurizing the pump.

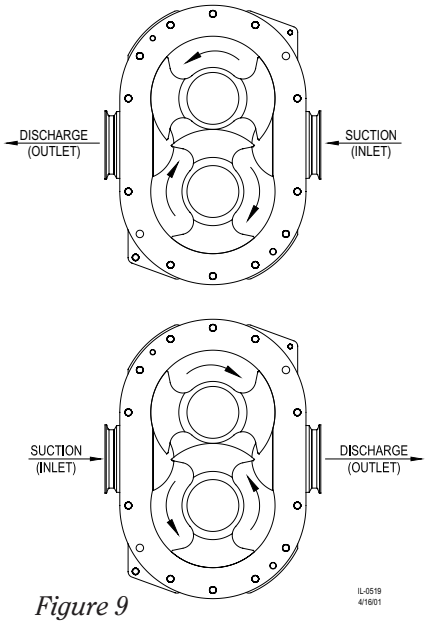


Figure 9

Recommended Preventive Maintenance

Recommended Torque Values

Table A2, page 5

Recommended Seal Maintenance

Visually inspect the mechanical seal regularly for leakage.

Annually replace mechanical seal under normal conditions.

Replace mechanical seal as often as required under severe conditions (abrasive product, dry running, etc.).

Elastomer Inspection

Inspect all elastomers when performing pump maintenance. We recommend replacing elastomers (o-rings and gaskets) during seal replacements.

Lubrication

The bearings and gears are lubricated with 15W40 oil. The oil level should be maintained in the center of the sight glass on the side of the gearbox housing. The oil should be changed every 4,000 hours under normal conditions and every 2,000 hours under severe conditions such as washdown applications. See the oil capacity listing on page 52.

Periodic Maintenance

Periodically inspect the pump housing, cover and rotors for any signs of wear or damage. If wear is present this could be a sign of over-pressurization, incorrect rotor gap or bearing wear.

Temperature Differntials

Positive pump efficiency depends on internal clearances between the rotors and the pump housing. The pump can withstand certain temperature changes based on the rotors. For example, if you are running CIP solution at 180°F and your product is 50°F, that is a 130°F temperature differential. This differential is in the standard rotor range.

The temperature differential is a concern, because if there is a severe temperature change in the pump, the shaft and rotors may expand inside the pump housing. This expansion can result in rotor to cover or rotor to housing damage.

The clearances inside the FKL pump are extremely small, below are the recommended temperature differentials.

FKL Temperature Differential	Correct Rotor
Δ 140°F	standard rotors
Δ 210°F	high temperature rotors

Fristam recommends high temperature rotors for pumps that will be cleaned or steamed at elevated temperatures.

Cleanning recommendations for FKL pumps:

When you are running products or cleaning solutions with different temperatures, you need to allow enough time for all of the wetted components inside the pump to reach a steady-state temperature before you start the pump. If your process does not allow you to stop the pump during this transition, you need to install rotors that provide larger clearances. Note: that the clearances inside the FKL pump are extremely small.

If the process lines are to be cleaned with the pump, use a by-pass loop around the pump during the CIP mode to maintain pipe velocity. Once the wetted components are at a steady temperature, the pump can be started and run around 100 RPM with a backpressure of at least 10 PSI. As the product viscosity increases, the required backpressure may need to be increased as well.

Seal Replacement

CAUTION! Begin all pump maintenance by disconnecting the energy source to the pump. Observe all lock out/tag out procedures as outlined by ANSI Z244.1-1982 and OSHA 1910.147 to prevent accidental start-up and injury.

Tools Required for Seal Replacement:

Soft-faced hammer
Screwdriver (flat blade)
1" diameter wooden dowel
4 mm Allen wrench
6 mm Allen wrench (FKL 400 only)
Torque wrench
Seal assembly tool or a press (part number 1018000011)

Tools Required for Specific Pump Model (wrench size in mm):

	FKL 25	FKL 50	FKL 75	FKL 150	FKL 250	FKL 400___
cover nuts	13 mm	19 mm	19 mm	19 mm	19 mm	19 mm
rotor bolt	19 mm	19 mm	19 mm	24 mm	32 mm	32 mm
housing bolts	10 mm	13 mm	19 mm	19 mm	19 mm	19 mm

Note: the reference numbers listed in the text (#) refer to the assembly drawing on pages 30-31, seal assembly drawings on pages 41-44 and the parts list on page 32-36 and 45-50.

Pump Head Disassembly

Drain all product from the pump head prior to disassembly. The pump head may be isolated with inlet and outlet valves. Disconnect the suction and discharge piping from the pump. Disconnect the seal flush supply and return lines to your pump if the pump is equipped with a double mechanical or double o-ring product seal.

Remove the Cover

WARNING

a) Loosen and remove the cover nuts (53) and cover nut washers (52) with the appropriate wrench.

b) Remove the cover (32) by turning the two forcing screws (33) clockwise.

c) Remove the cover o-ring (31).

For Jacketed Cover - start with instruction A and then remove the jacketed cover, jacketed cover o-ring and then continue with instructions B and C.

Remove the Rotors

a) To loosen the first rotor, place the wooden dowel between the rotors as shown in *Figure 10*.

b) Turn the first rotor bolt counter-clockwise with the appropriate wrench.

c) Remove the rotor bolt (51) and rotor cap (30) with o-rings (29 and 50) from the first rotor.

d) Repeat instructions a - c for the second rotor.

e) The rotors (28) and rotor o-rings (27) can now be removed from the pump housing (25) by pulling straight out as shown in *Figure 11*. Handle the rotors with care to avoid damage.

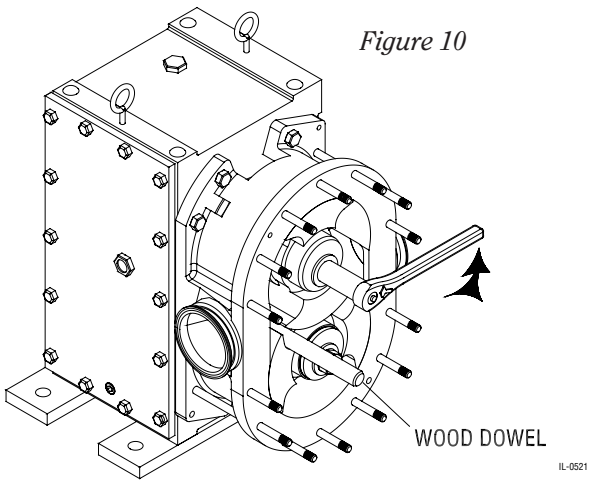


Figure 10

Inspect the rotors and pump housing for signs of wear. If wear is present, see the trouble-shooting guide (page 52) for possible solutions.

Remove the pump housing

a) Loosen the hex head housing bolts (24) with the appropriate wrench.

b) Now carefully pull the pump housing away from the gearbox (11) as shown in *Figure 12*. You may need to alternately tap on the sides of the pump housing near the inlet and outlet ports with the soft face hammer until the housing pins (23 and 49) separate from the gearbox.

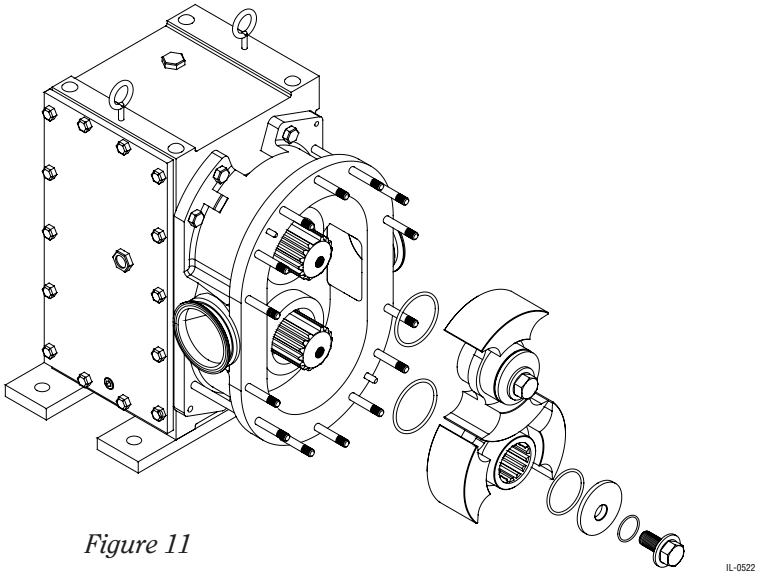
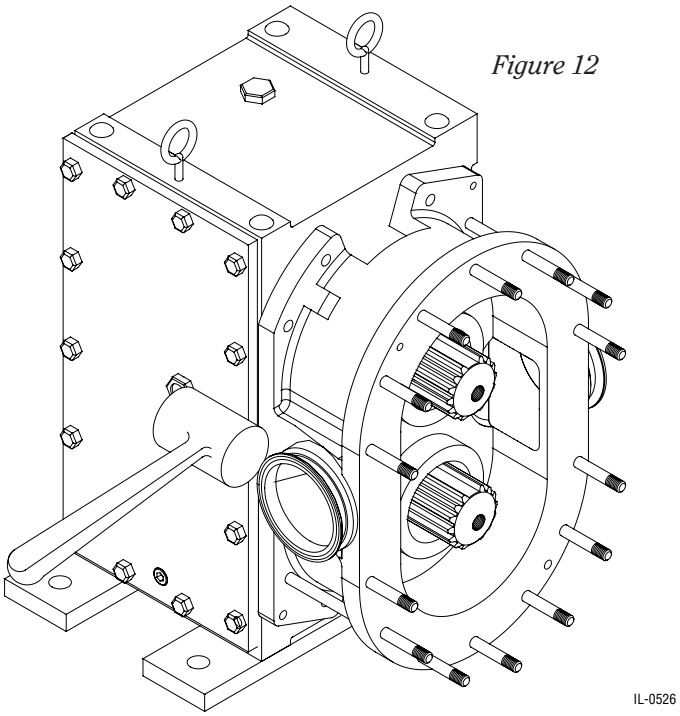


Figure 11

You are now ready to remove the seal components from the pump housing.

Figure 12



Mechanical Seal Cartridge Removal

a) Place the pump housing (25) face down as shown in *Figure 13*.

b) Loosen the seal housing screws (60) with the 4 mm Allen wrench.

c) Remove the seal housing screws, seal cartridges (62) and seal housing o-rings (64 and 63 for aseptic) as shown in *Figure 13*.

d) Remove the two rotating seal rings (55) and rotating seal o-rings (54) from the pump shaft.

If replacing the cartridge with a new cartridge proceed to the 'Seal Cartridge Installation' section on page 14.

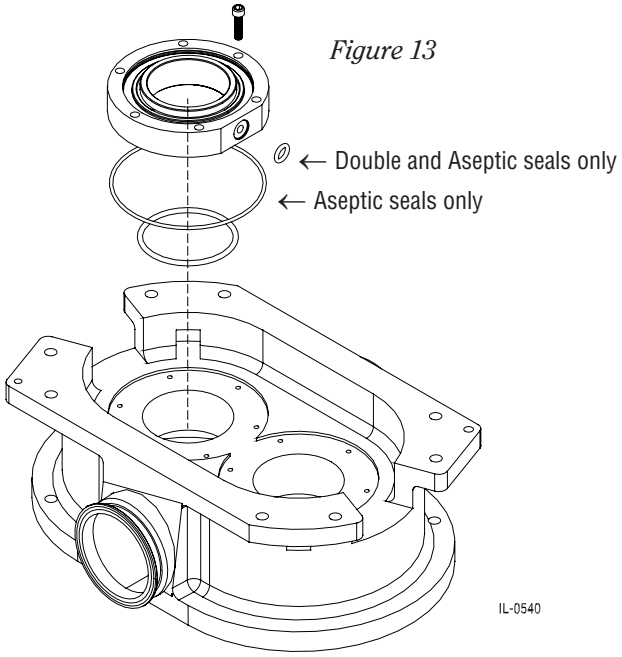


Figure 13

Disassembly of Seal Cartridge for Mechanical Seals

Place all of the seal parts on a clean work area and disassemble one cartridge at a time.

a) Place the seal cartridge (62), with the seal face up, onto the seal assembly tool or press.

b) Insert the seal compressor disc onto the seal face.

c) Use the seal assembly tool to compress the seal so that all of the pressure is off the seal retaining ring (56).

d) Use the flat-faced screwdriver to pry the seal retaining ring (56) out of the seal housing.

e) Remove the seal cartridge from the seal assembly tool.

f) Use your fingers to gently press the seal elements out of the seal housing (62).

g) Remove the outer (58) and inner (65) seal springs and the outer stationary seal o-ring (61).

h) The seal housing should be cleaned to prepare it for reassembly.

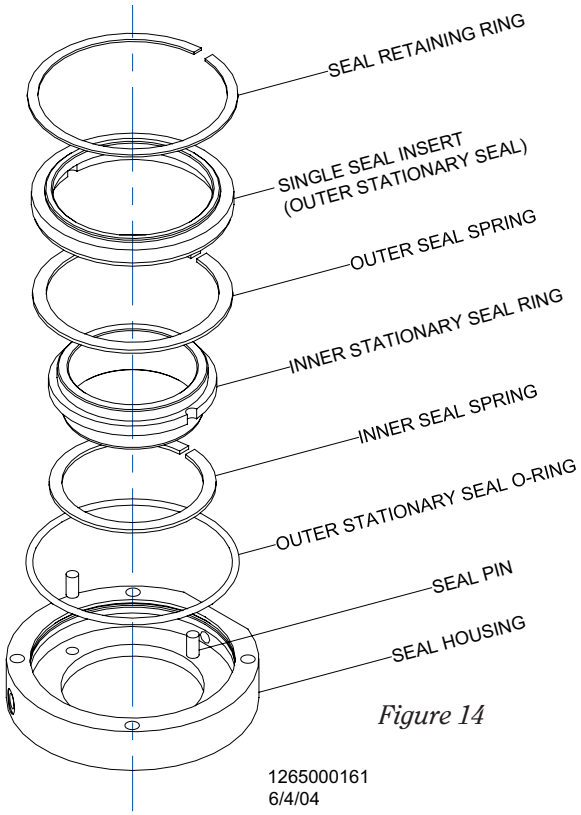


Figure 14

Assembly of Seal Cartridge

Assemble the cartridges one at a time.

a) Lubricate the new outer stationary seal o-ring (61) and slightly stretch.

b) Fit the outer stationary seal o-ring into its groove inside the seal housing (62).

c) Place the inner (65) and outer (58) seal springs into the seal housing.

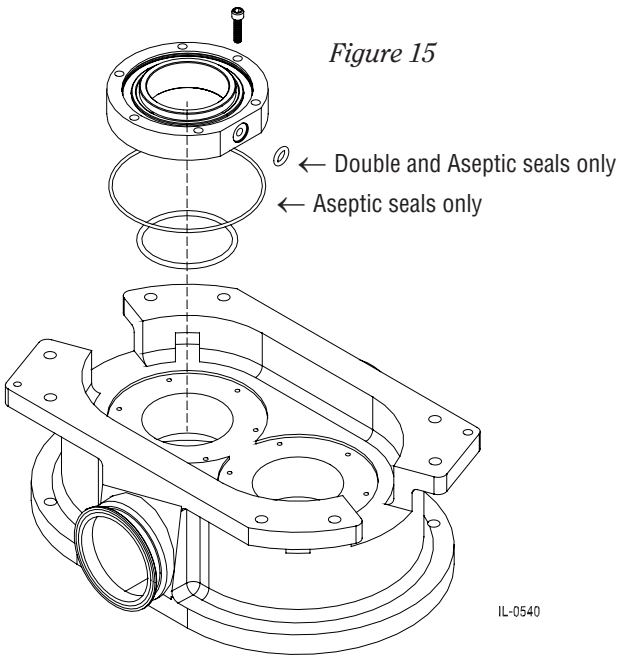
d) Set the seal housing on the seal assembly tool.

e) Place the new inner stationary seal (59) into the seal housing.

f) *Single mechanical seal:* Lubricate the outer edge of the single seal insert (57) and place into the seal housing. Be sure to fit the notches around the pins.

Double mechanical seal: Lubricate the outer edge of the outer stationary seal (67) and place into the seal housing. Be sure to fit the notches around the pins.

Figure 15



g) Set the seal retaining ring (56) on top of the seal housing.

h) Push down on the outer stationary seal until it is past the seal retaining ring groove.

i) Use your fingers to fit the seal retaining ring into place.

Seal Cartridge Installation

a) Place the pump housing (25) face down as shown in *Figure 15*.

b) Install the new inner stationary seal o-rings (64) into the grooves in the seal housing.

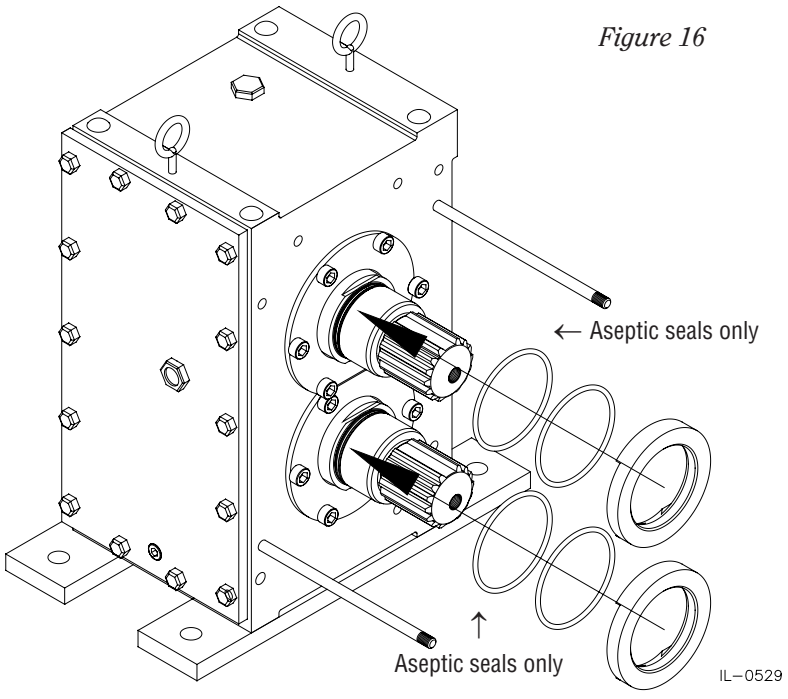
c) Install the seal housing o-rings (64* and 63 for aseptic seals) into the new seal cartridges.

d) Install one of the new seal cartridges onto the pump housing with the flat side toward the middle as shown.

e) Insert the seal housing screws (60) through the holes in the seal cartridges and tighten with the appropriate Allen wrench.

f) *Double mechanical seal only,* place the new small seal housing o-ring (69) into the groove on the secured seal cartridge.

Figure 16



g) Install the other new seal cartridge onto the pump housing by repeating instructions d and e.

g) Next lubricate and install the two new rotating seal o-rings (54) into the first groove on the pump shaft as shown in *Figure 16*.
Aseptic seal only, lubricate and install the four rotating seal o-rings.

**Note: FKL 250 and 400 models have 64 a and b.*

i) Finally, install the two new rotating seal rings (55) onto the shaft. The rotating seal ring will fit into the grooves on the shaft and interlock with the shaft. If you can rotate the seal ring, it is not properly seated.

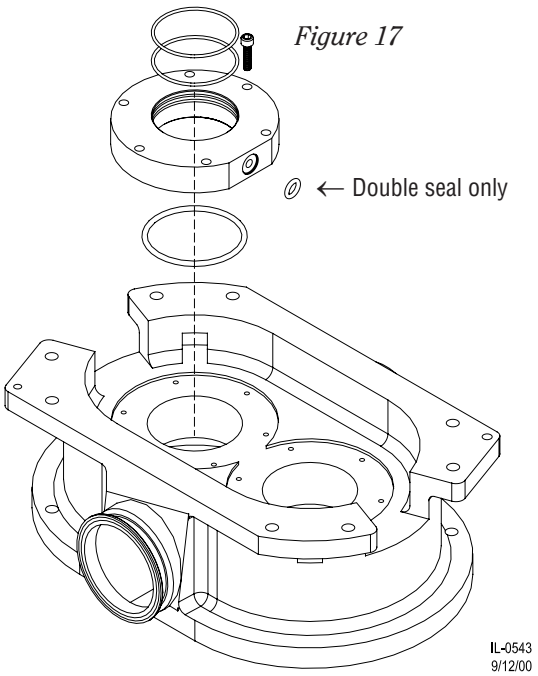


Figure 17

Seal Disassembly For O-Ring Seals

a) Place the pump housing (25) face down as shown.

b) Loosen the seal housing screws (60) with the 4 mm Allen wrench.

c) Remove the seal housing screws, o-ring seal cartridges and inner o-rings (64) as shown in *Figure 17*.

d) Remove the seal o-rings (70) from the seal housings (71 or 72) with the flat screwdriver.

Inspect the pump shafts in the area in which the o-ring seals ride. Clean any o-ring or product residue off the pump shafts. If the shafts are worn excessively they must be replaced.

You are now ready to install the new seal components.

Seal Assembly For O-Ring Seals

a) Place the pump housing (25) face down as shown in *Figure 17*.

b) Install the new inner stationary seal o-rings (64) into the grooves in the seal housing.

c) Install the new seal o-rings (70) into the o-ring seal housings. Do not lubricate the o-rings before installing.

d) Install one of the seal housings onto the pump housing with the flat side toward the middle as shown.

e) Insert the seal housing screws (60) through the holes in the o-ring seal housing and thread into the pump housing. Tighten with the appropriate Allen wrench.

f) Double o-ring seals only, place the new small seal housing o-ring (69) into the groove on the secured o-ring seal housing.

g) Install the other o-ring seal housing onto the pump housing by repeating instructions e and f.

h) Lubricate the pump shafts with a food grade lubricant compatible with the o-rings. Lubricate the shafts where the o-rings will slide.

i) You are now ready to install the pump housing onto the gearbox. Install the pump housing while slowly rotating the shaft.

Pump Head Assembly

Note: Any debris between the gearbox and housing will affect the gap. Make sure the gearbox front face and pump housing surfaces are clean.

a) Carefully slide the pump housing (25) over the pump shafts and onto the gearbox (11). Make sure that the housing is positioned so that the smaller pin (23) slides into the smaller bushing (13) on the gearbox and the larger pin (49) slides into the larger bushing (43). The long housing studs (14) will help to align the pump housing in the proper position.

b) Secure the pump housing with the hex head housing bolts (24) and tighten with the appropriate wrench. On the FKL 25 use six 18mm long bushings over the six housing studs and install the cover nuts to hold the housing in place during assembly.

c) Install the new rotor o-rings (27) into the groove on the back of the rotor hub.

d) Now slide the rotor with one dot on the drive shaft and the rotor with two dots on the idle shaft. Note: when sliding the rotor onto the shaft, the o-ring should be facing the pump housing.

e) Align the rotors with the pump shaft so that the large spline teeth on the rotor slide into the missing teeth on the pump shaft.

f) Place the new rotor cap o-rings (29) into the groove on the rotor caps (30).

g) Install the rotor caps over the rotor. Rotate the rotor cap so that the hole in the rotor cap lines up with the threaded hole in the pump shaft.

h) Install the new rotor bolt o-rings (50) into the groove in the rotor bolt (51).

i) Now thread the rotor bolt through the rotor cap into the pump shaft.

j) To tighten the rotor bolt, place the wooden dowel between the rotors as shown in *Figure 18*. Tighten the first rotor bolt with the appropriate wrench to the torque specified in Table A2, page 5.

k) Tighten the second rotor bolt, place the wooden dowel between the rotors as shown in *Figure 19*. Tighten the second rotor bolt clockwise with the appropriate wrench to the torque specified in Table A2, page 5.

Figure 18

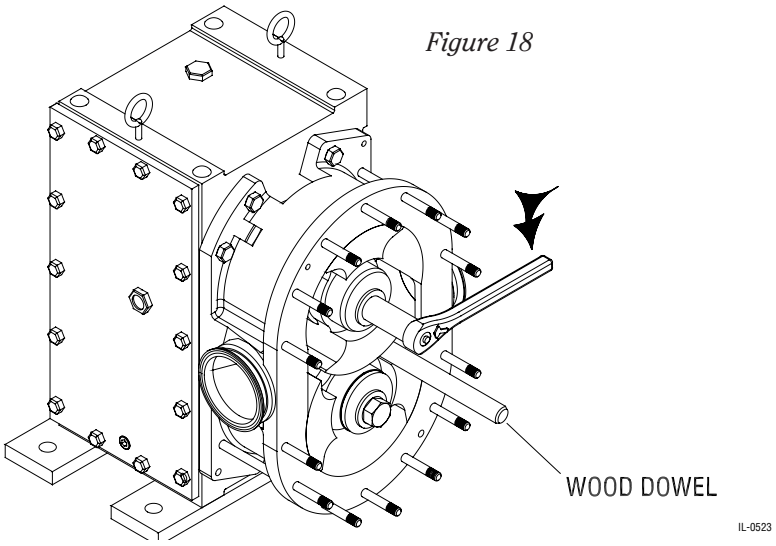
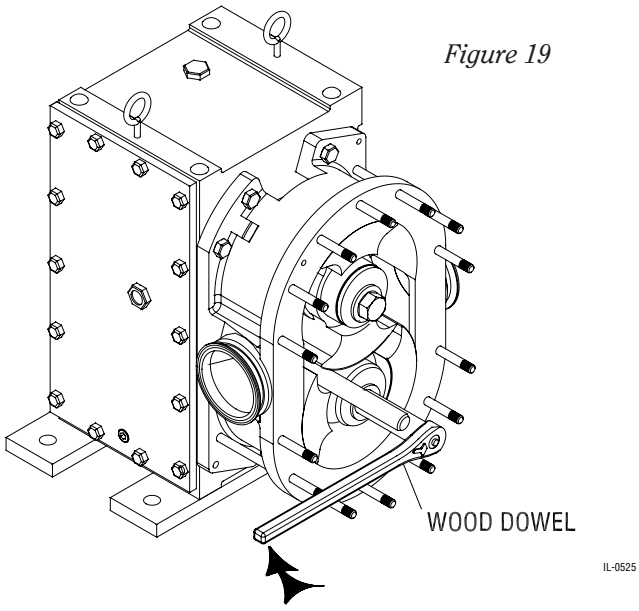


Figure 19



Verify Rotor Clearances

With the rotors installed, you should check the clearances around the rotor to ensure that the pump was assembled properly. Use feeler gauges to verify the back and radial clearance between the rotors and the housing. Use a depth micrometer to verify the front face clearance (see *Table A3*, page 6). If the gap is incorrect, please see Setting the Rotor Gap section on page 19 (for the FKL 25, 75,150, 250 & 400 Series) or page 29 (for FKL 50). Rotate the input shaft to verify that the pump turns freely. If the gap is correct and the pump turns freely continue Pump Assembly (below).

a) Install the pump cover o-ring (31) onto the pump cover (32).

b) Install the pump cover. Make sure the threaded end of the forcing screws are flush with the inside face of the pump cover.

For Jacketed Cover - install the jacketed cover, replace the jacketed cover o-ring and then continue with instructions below.

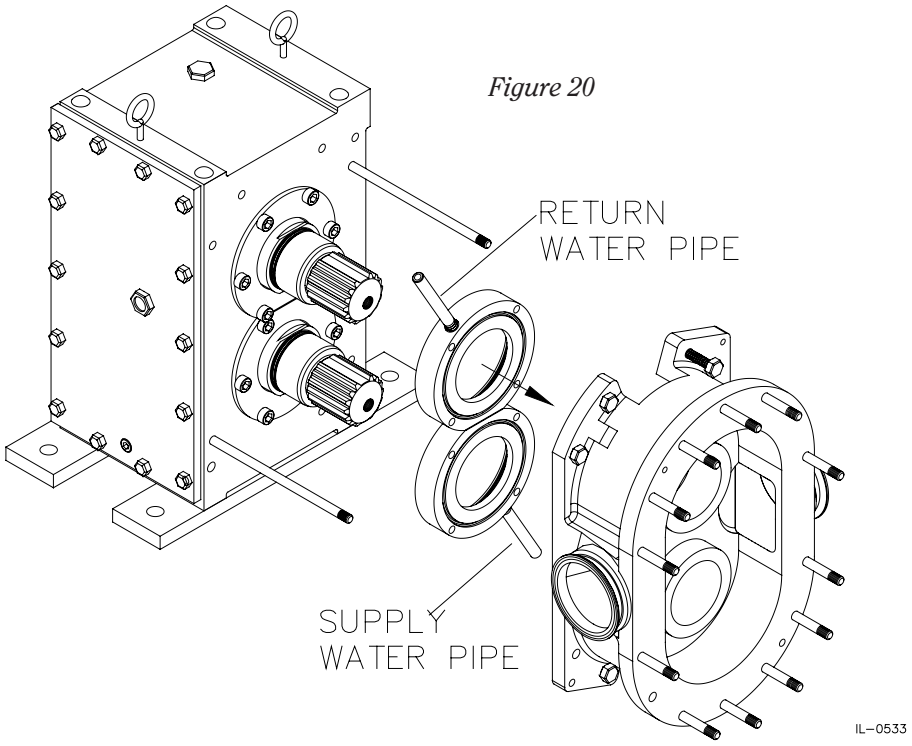
c) Secure the pump cover with the cover nut washers (52) and cover nuts (53). Tighten with the appropriate wrench to the torque specified in Table A2, page 5.

d) Replace all shaft guards.

e) Reconnect the inlet and outlet piping.

f) Install the seal flush piping as shown in *Figure 20*.

Figure 20



g) Replace the seal flush supply and return lines to your pump if the pump is equipped with a double mechanical or double o-ring product seal.

h) Verify that all valves on the suction and discharge side of the pump are open. You are now ready to start the pump.

Bearing and/or Shaft Replacement for the FKL 25, 75, 150, 250 & 400 Series

CAUTION! Begin all pump maintenance by disconnecting the energy source to the pump. Observe all lock out/tag out procedures as outlined by ANSI Z244.1-1982 and OSHA 1910.147 to prevent accidental start-up and injury.

For Bearing and/or Shaft Replacement for the FKL 50 Series see page 24-29.

Tools Required for Gearbox Disassembly:

Arbor press
3/8" Allen wrench
Screwdriver (small flat blade)
1" diameter wooden dowel
Soft-faced hammer
Hammer (standard steel)
Brass rod
Bearing heater
Shim stock packet (order from Fristam prior to disassembly)
Torque wrench

Indicating torque wrench Tools Required for Specific Pump Model:

	FKL 25	FKL 75, 150 & 250	FKL 400
Gearbox cover bolts	13 mm wrench	17 mm wrench	17 mm wrench
Bearing cap screws	5 mm Allen wrench	6 mm Allen wrench	8 mm Allen wrench

Spanner wrench required for the bearing lock nut for specific pump model:

FKL 25	FKL 75	FKL 150	FKL 250	FKL 400
M35	M50	M55	M75	M85

Gearbox Disassembly

To start the gearbox disassembly, complete the Pump Head Disassembly on pages 11-12.

a) Remove the oil drain plug (38) with the 3/8" Allen wrench and drain the oil.

b) Use the appropriate wrench to remove the gearbox cover bolts (39). Then remove the gearbox cover (37) and gearbox cover gasket (34).

c) Loosen and remove the bearing cap screws with the appropriate Allen wrench.

d) Remove the bearing caps (2 and 3).

e) Remove the bearing cap o-rings (4) from both bearing caps and the rear oil seal (5) from the drive shaft bearing cap (2).

f) Install the rotors (28) onto the pump shafts (14 and 48). Secure the rotors from turning by placing the wooden dowel between them as shown in *Figure 21*.

g) Straighten the bent tab on the bearing lock nut washer (8) on both the drive and idle pump shafts with the screwdriver.

h) Loosen the bearing lock nut (6) from both shafts using the spanner wrench.

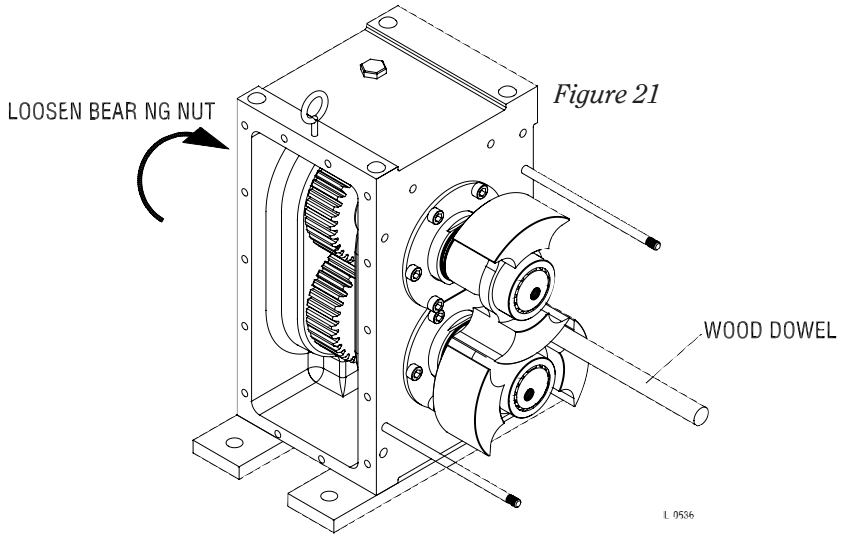


Figure 21

i) Remove the bearing lock nuts, bearing lock nut washers and rotors from both pump shafts.

j) Place the gearbox (11) on an arbor press with the spline ends of the shafts facing down as shown in *Figure 22*. Press on the shafts, one at a time, to remove them from the gearbox. Make sure to support the shafts so that they do not fall and get damaged. Also, be sure to remove the rear bearing inner race, rear gear spacer and the gear before pressing the other shaft. Press the inner bearing races off both pump shafts. Note: do not press on the outer bearing cage. Set the pump shafts aside.

k) Remove the gears (41) from the gearbox. The outer races of both front and rear bearings can now be tapped out of the gearbox with a hammer and brass rod. Note that the front outer races may have stayed on the shafts.

You are now ready to reassemble the gearbox.

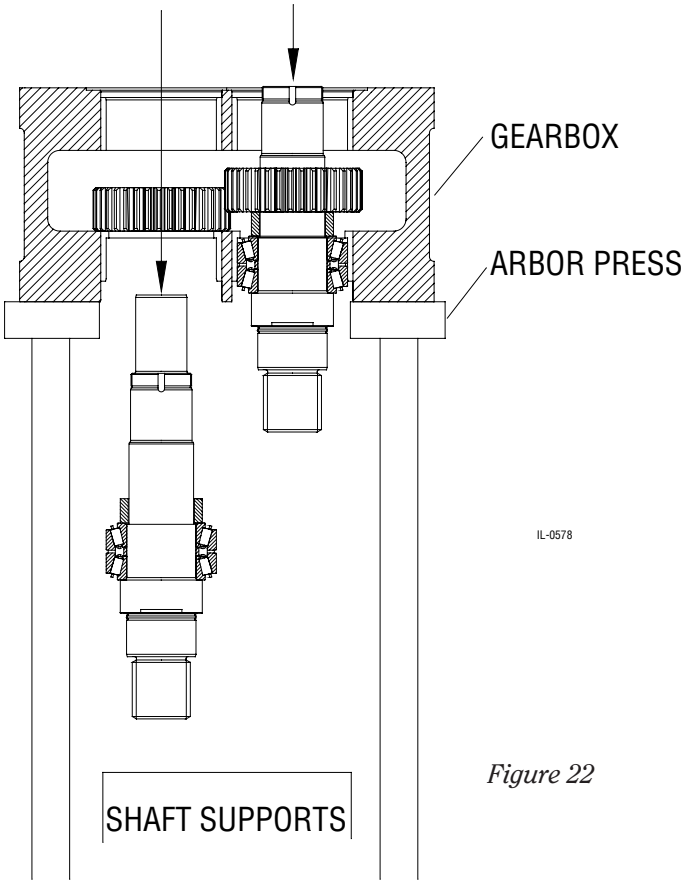


Figure 22

Gearbox Assembly

Note: The front and rear bearing assemblies are matched sets. Do not separate pieces.

Also, for ease of installation, install the idle shaft first. If you are not sure about shaft location, the drive shaft will always be located in the same bore on the gearbox. To locate the correct bore, stand facing the pump end of the gearbox with the gearbox cover on your left side. The drive shaft will be in the top bore position.

Assemble front bearings onto shafts

Cover the coupling area of the drive shaft with tape, to protect it. Lightly grease the front bearing step on the pump shafts (14 & 48).

a) Press the front bearing cone on the shaft. Use a hose clamp or tape to hold the cups and outer spacer together (*Figure 24*).

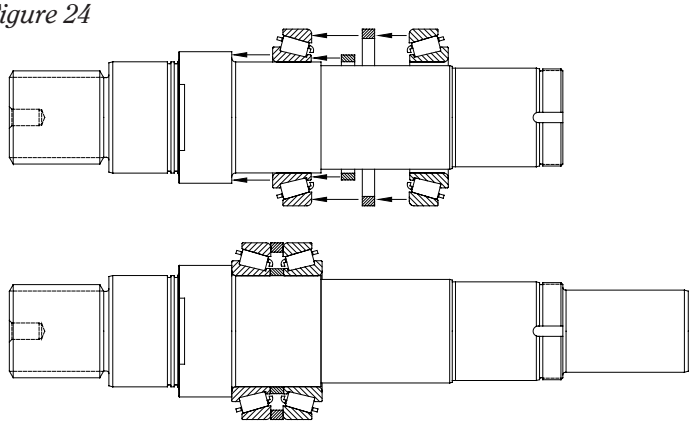
b) Install the inner bearing spacer and outer cup assembly over the bearing on the shaft.

c) Press the other bearing cone on the shaft.

d) Remove the hose clamp or tape

e) Install the front gear spacer on the shaft.

Figure 24



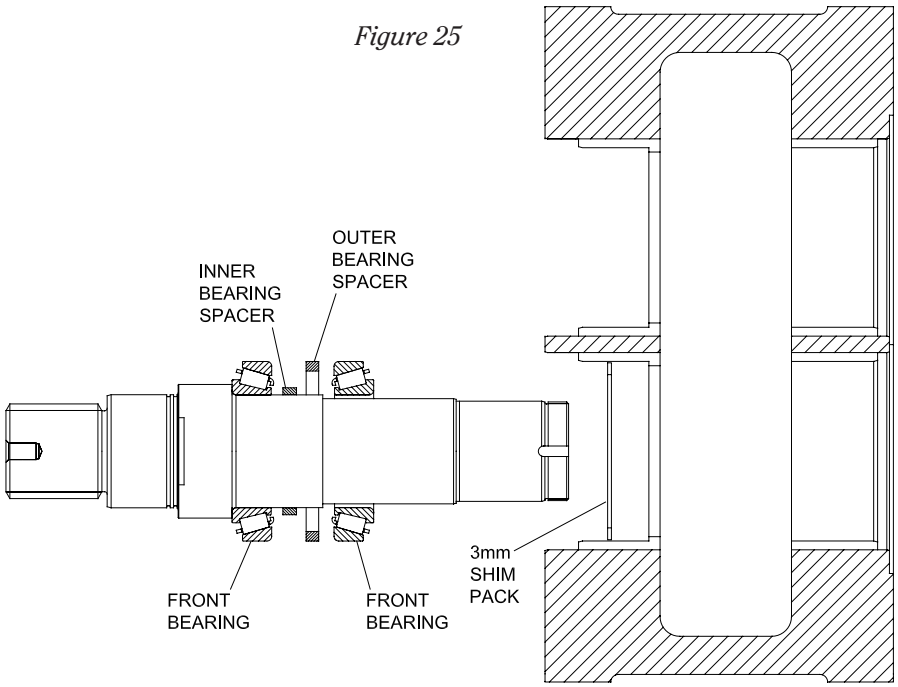
Setting the Rotor Gap

Clean and inspect the gearbox (11).

a) Lightly coat the front and rear bearing bores with oil. *Note that before you install the outer race for the front bearings, you must place the shims in the bottom of the bore of the gearbox as shown in Figure 25 and 26.* For new shafts, use 0.100" of shim and for used shafts use 0.120" of shim.

b) Install the pump shafts into the correct bores. Secure them in position using the front bearing caps (20), be sure to tighten the bearing cap screws (1) to the appropriate torque.

Figure 25



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c) Carefully slide the pump housing (25) over the pump shafts and onto the gearbox (11). Make sure that the housing is positioned so that the small pin (23) slides into the small bushing (13) on the gearbox and the large pin (49) slides into the large bushing (43). The long housing studs (15) will help to align the pump housing in the proper position.

d) Secure the pump housing with the hex head housing bolts (24). Note: On the FKL 25 use six 18mm long bushings over the six housing studs and install the cover nuts to hold the housing in place during assembly. Tighten with the appropriate wrench.

e) Slide the rotors (28) into the pump housing (25) with the rotor o-ring groove toward the back of the pump housing. It is not necessary to have the rotor o-rings installed at this time.

f) Align the rotors with the pump shaft so that the missing spline teeth on the rotor slides into the missing teeth on the pump shaft.

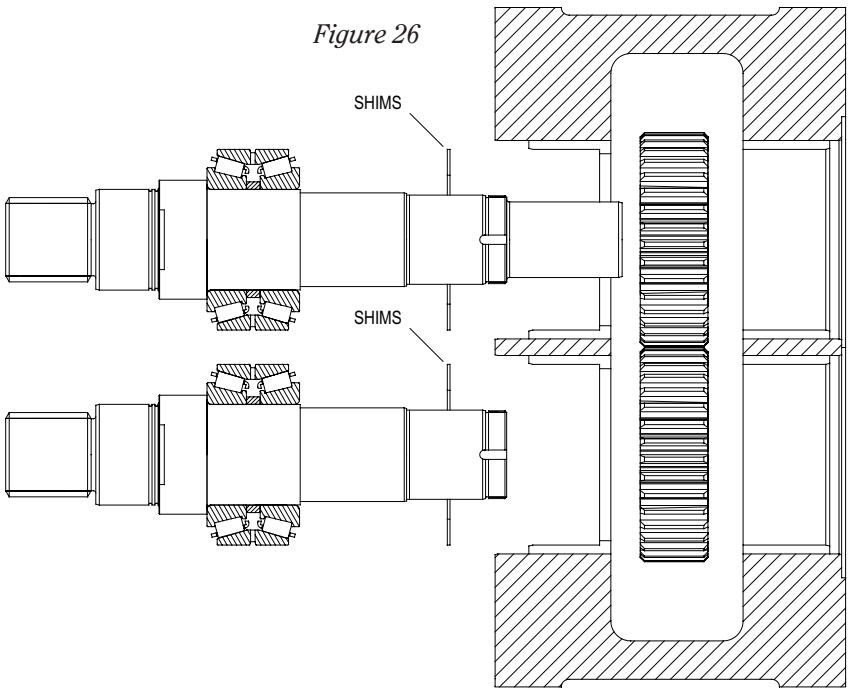
g) Place the rotor caps (30) over the rotor.

h) Rotate the rotor cap so that the hole in the rotor cap lines up with the threaded hole in the pump shaft and thread the rotor bolt (51) through the rotor cap into the pump shaft.

i) Place the wooden dowel between the rotors as shown in *Figure 27*.

j) Tighten the first rotor bolt with the appropriate wrench to the torque specified in Table A2, page 5.

Figure 26



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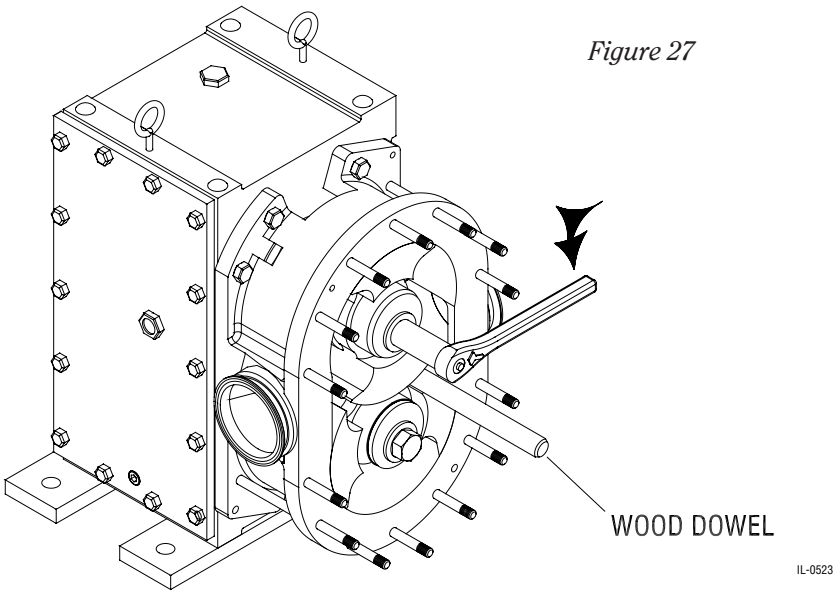
k) Now place the wooden dowel between the rotors as shown in *Figure 27*.

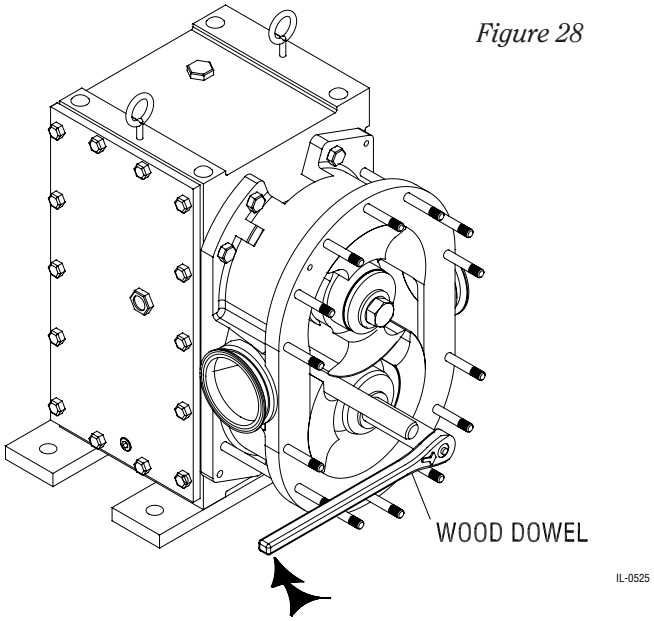
l) Tighten the second rotor bolt clockwise with the appropriate wrench to the torque specified in Table A2, page 53. Rotate the input shaft to verify that the pump turns freely.

Figure 27



With the rotors installed, you may check the rotor gap. Use feeler gauges to verify the back clearance between the rotors and the housing (see *Table A3*, page 54). You need to do this for both shafts. The values for each shaft may, and probably will, be different. Subtract the clearance value that you measure from the clearance value that is listed in the table. This will give you the amount of shim material that you must remove. This can be accomplished by removing the shims currently in the pump and using a combination of the shims that were acquired from Fristam.

Figure 28



Once you have your rotor to housing measurements, you can remove the rotors (28), pump housing (25) and remove both pump shafts (14 and 48) from the gearbox (11). You will also need to remove the outer races for the front bearings to remove the current shims and replace them with the shim values that you have determined for each shaft.

Install the Gearbox

Once the shims are determined, you can reassemble the gearbox. Lightly oil the pump shafts on the step for the gears (41). Install the shafts, one at a time, into the gearbox (11). Remember that the idle shaft (48) will be in the bottom bore as seen from the pump side of the gearbox with the gearbox cover on the left.

a) Slide the front gear spacer (42) onto the shaft.

b) Deburr and install the gear key (47) into the shaft.

c) Place one of the gears (41), with the part number facing the bearing lock nut end of the gearbox, into the gearbox.

d) Install the shaft through the front bearing bore of the gearbox and through the gear.

e) Use the front bearing cap to pull the shaft into the gearbox, with the aid of two bolts and some washers.

f) Slide the gear against the front bearing spacer.

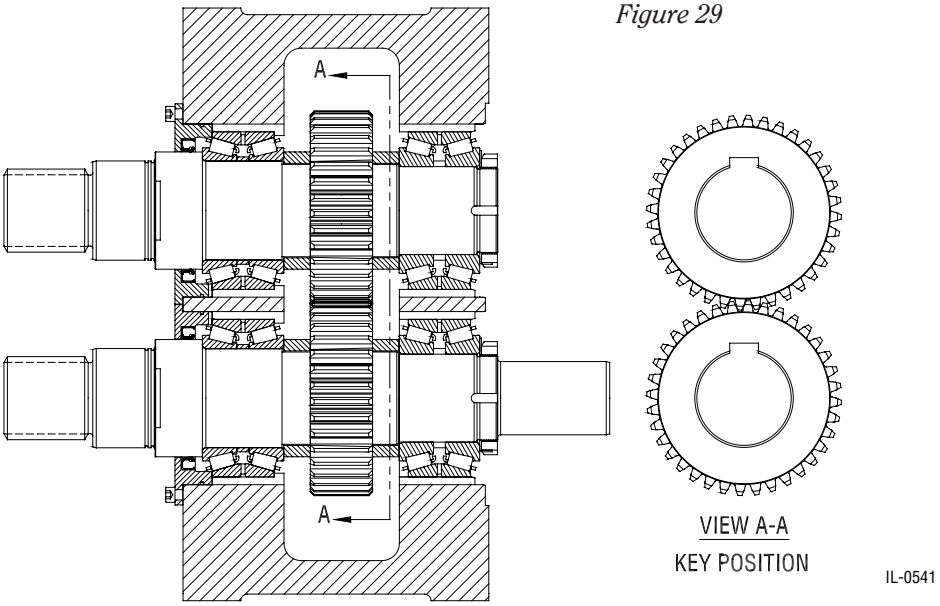
g) Repeat steps a - f with the other shaft. Be sure to align the key ways to 12 o'clock as shown in *Figure 29*.

h) Slide the rear bearing spacer onto the shafts.

i) Install the front o-ring bearing caps (20) and tighten to the specified torque. Check to see that the keyways can still be aligned at the 12 o'clock position, as shown in *Figure 29*.

j) Install the rotors (28) onto the pump's shafts. Turn the rotors to make sure they spin freely. If they hit, the timing is off. To fix the timing you will need to remove one gear, realign them and then test again.

Figure 29



INSTALL THE REAR BEARING ASSEMBLIES (35) ONTO EACH SHAFT.

Lightly grease the rear bearing (35) step on the pump shafts (14 & 48).

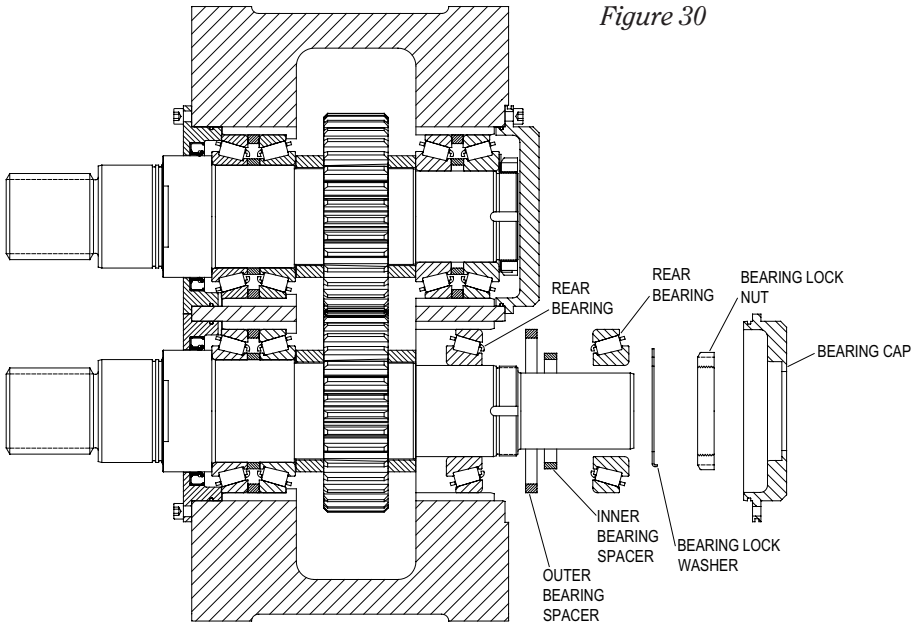
a) Press the rear bearing cone onto the shaft.

b) Install the inner bearing spacer, bearing cup, outer spacer and the other cup (Figure 30).

c) Press the other rear bearing cone onto the shaft.

Position the gearbox on the arbor press, one shaft at a time, to press the bearings into place. Be sure to use the appropriate pressing tube and never exceed the maximum force.

Figure 30



a) Install the lock nut washer (8) and lock nut (6) and hand-tighten the nut.

b) Place a wooden dowel between the rotors as shown in *Figure 31* and tighten the bearing lock nuts to the appropriate torque, shown in Table A2, page 5.

c) After the bearing nut is tightened on both shafts, use a dial indicator to check that there is no end-play on either shaft, as shown in *Figure 32*.

d) Install the new rear oil seal (5) into the drive shaft bearing cap (2).

e) Install the new bearing cap o-rings (4) into the o-ring grooves in bearing caps (2 and 3).

f) Install the bearing caps onto the gearbox. Secure with the bearing cap screws (1) and tighten with the appropriate Allen wrench.

g) Place the new gearbox cover gasket (34) and gearbox cover (37) on the gearbox and secure with the gearbox cover bolts (39). Tighten to the torque specified in Table A2, page 5.

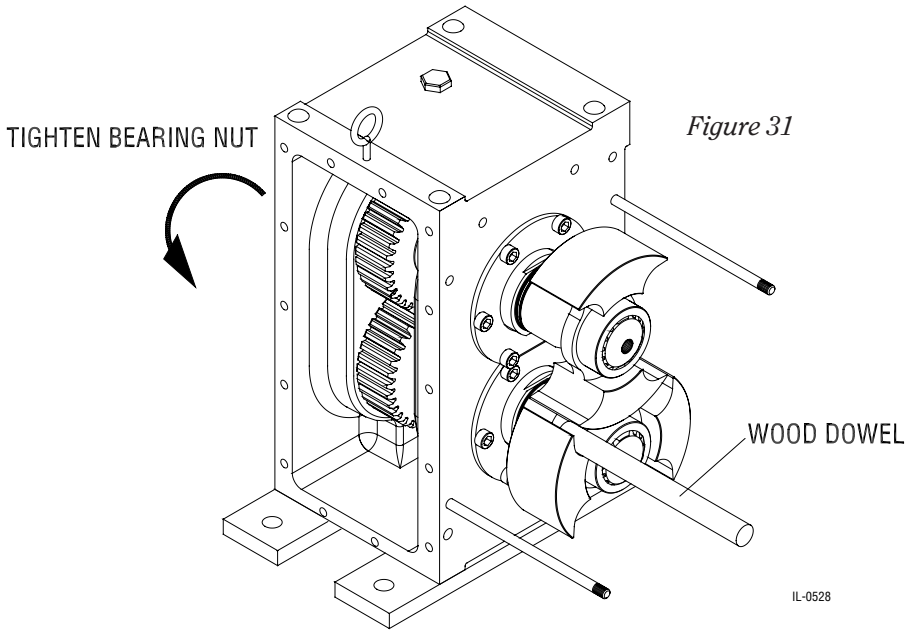


Figure 31

h) Re-install the oil drain plug (38) and vent plug (10) onto the gearbox. Fill the gearbox with oil to the center of the oil sight glass (36).

Once the gearbox is assembled, the pump head can be assembled (pages 16) and the rotor to housing clearances can be checked. Make any necessary adjustments as required.

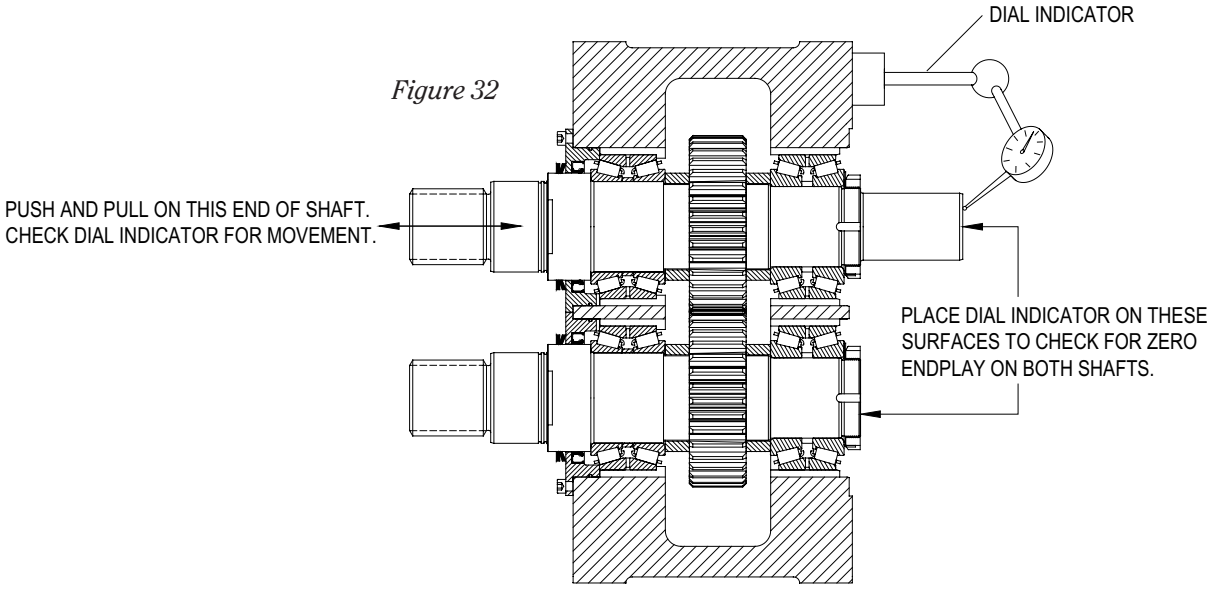


Figure 32

Bearing and/or Shaft Replacement for FKL 50 Series

CAUTION! Begin all pump maintenance by disconnecting the energy source to the pump. Observe all lock out/tag out procedures as outlined by ANSI Z244.1-1982 and OSHA 1910.147 to prevent accidental start-up and injury.

For the FKL 25, 75, 150, 250 and 400 Series Bearing and/or Shaft Replacement instructions see pages 18-23.

Tools Required for Gearbox Disassembly:

5 mm Allen wrench
13 mm wrench
3/8" Allen wrench
Snap ring pliers (with straight and 90° pins)
Spanner wrench (for M45 lock nut)
Arbor press
Screwdriver (small flat blade)
1" diameter wooden dowel
Soft-faced hammer
Hammer (standard steel)
Brass rod
Bearing heater
Shim stock packet (order from Fristam prior to disassembly)
Torque wrench
Indicating torque wrench

Gearbox Disassembly

To start the gearbox disassembly, complete the Pump Head Disassembly on pages 11-12.

a) Remove oil drain plug (38) with the 3/8" Allen wrench and drain the oil.

b) Remove the gearbox cover bolts (39) with the 13 mm wrench and remove the gearbox cover (37) and gearbox cover gasket (34).

c) Remove the bearing cap screws with the 5 mm Allen wrench, then remove the bearing caps (2 and 3).

d) Remove the bearing cap o-rings (4) from both bearing caps and the rear oil seal (5) from the drive shaft bearing cap (2).

e) Remove the gear snap rings (40A) from the groove in both shafts with the 90° snap ring pliers.

f) Install the rotors (28) onto the pump shafts (14 and 48). Secure the rotors from turning by placing the wooden dowel between them as shown in *Figure 33*.

g) Straighten the bent tab on the bearing lock nut washer (8) on both shafts with the screwdriver.

h) Loosen the bearing lock nut (6) from both shafts using the spanner wrench.

i) Remove the bearing lock nuts, bearing lock nut washers, bearing spacers (8A) and rotors from both pump shafts.

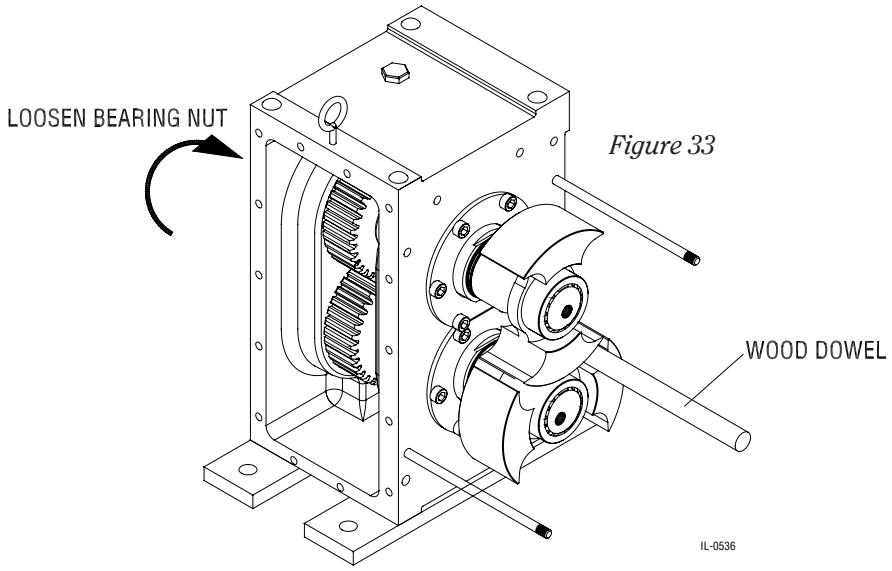


Figure 33

j) Place the gearbox (11) on an arbor press with the spline ends of the shafts facing down as shown in *Figure 34*. Press on both shafts to remove them from the gearbox until you hear a click. This will be the sound of the snap ring falling into the groove of the shaft behind the bearing lock nut thread.

k) Pull the inner race of both rear bearings out of the gearbox.

l) Remove the snap rings (40A) from the pump shafts (14 and 48) with the straight snap ring pliers. Make sure to support the shafts so that they do not fall and get damaged. The front oil seals (18) will come out of the gearbox with the shafts.

m) Press the inner bearing races off both pump shafts as shown in *Figure 35*. Note: do not press on outer bearing cage. Set pump shafts aside.

n) Remove the gears (41) from the gearbox. The outer races of both front and rear bearings can now be tapped out of the gearbox with a hammer and brass rod.

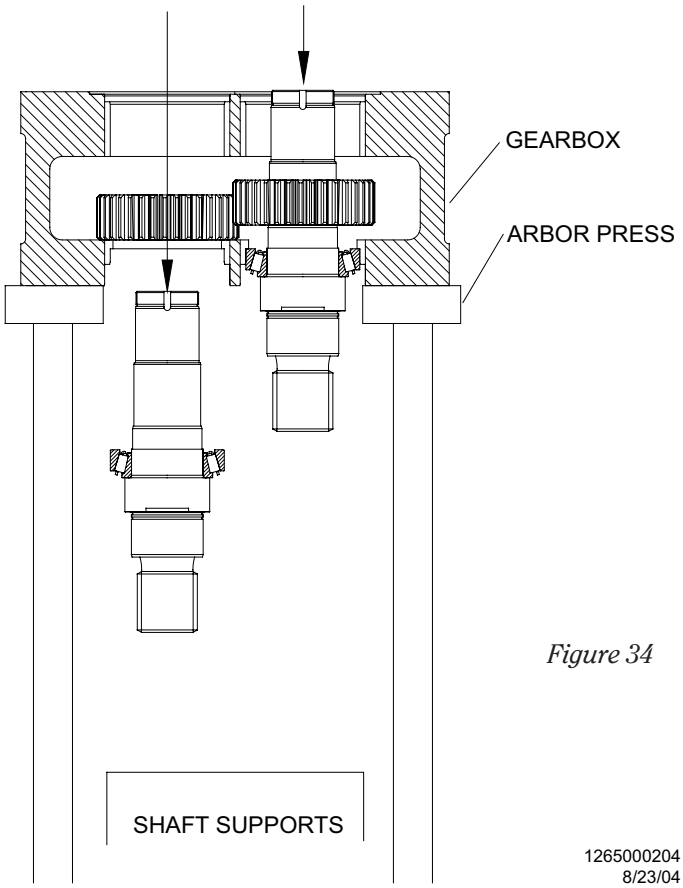


Figure 34

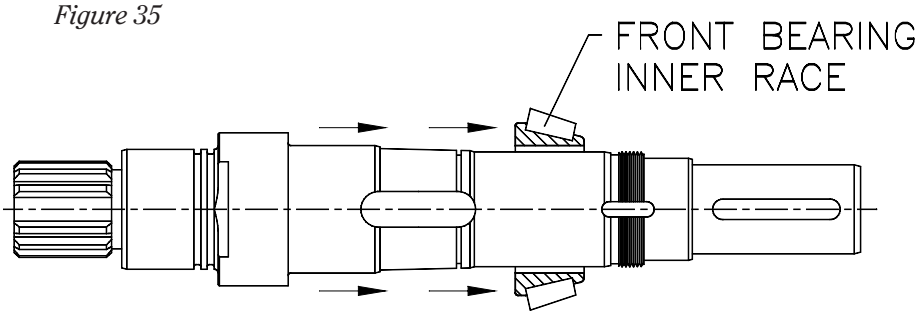
Gearbox Assembly

Note: For ease of installation, install the idle shaft first. If you are not sure about shaft location, the drive shaft will always be located in the same bore on the gearbox. To locate the correct bore, stand facing the gearbox with the gearbox cover on your left side. The drive shaft will be in the top bore position.

Assemble front bearings onto shafts

Cover the coupling area of the drive shaft with tape, to protect it. Lightly oil the pumps shafts (14 and 48) on the step for the front bearings (17). Assemble the bearings one shaft at a time.

Figure 35



a) Heat the inner race of the front bearings to no more than 300°F and quickly slide on the shaft.

b) Let the inner races cool and then use a piece of 0.02 mm shim stock to check if the bearing is properly seated against the step on both shafts.

c) If the inner race has moved, use a piece of mild steel pipe that only touches the inner race of the bearing to seat the bearing cone against the shaft step. Slide the pipe over the shaft so it is seated on the inner race of the bearing cone and use the Arbor press or a hammer to gently move the inner race into place.

Insert the outer bearing races

Lightly grease the front and rear bearing bores. Insert the outer races of the front and rear bearings into the gearbox as shown in *Figure 35*. Ideally these races should be pressed in using an Arbor press and an old bearing race ground down to slide freely in the bearing bore. If this is not possible, a soft drive rod (wood or brass) may be used to install the outer races. *Note: before you install the outer race for the front bearings, you must place the shims in the bottom of the bore of the gearbox as shown in Figure 36.* For new shafts, use 0.100" of shim and for used shafts use 0.120" of shim. (Older style gearboxes will require no shims with a new shaft and 0.020" of shim with a used shaft.)

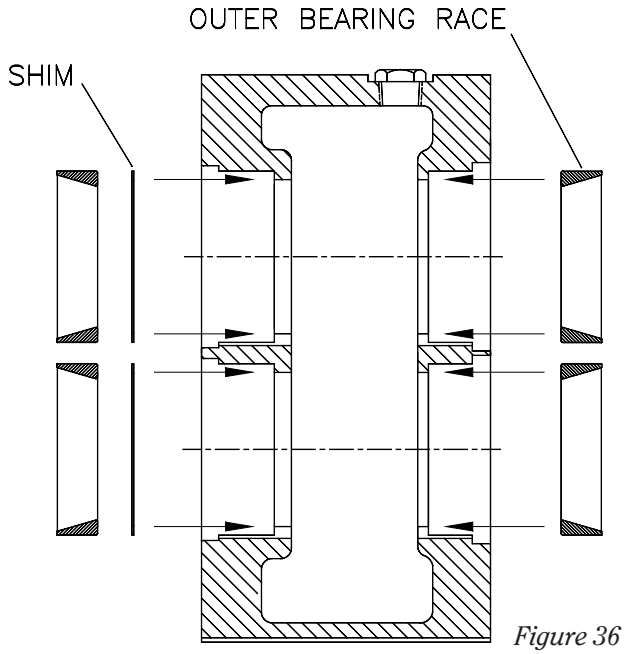


Figure 36

Install the Gearbox

Lightly oil the pump shafts on the step for the gears (41). Install the shafts, one at a time, into the gearbox. Remember that the drive shaft (14) will be in the top bore as seen from the pump side of the gearbox with the gearbox cover on the left.

a) Deburr and install the gear key (47) into the shaft.

b) Place one of the gears (41), with the part number facing the bearing lock nut end of the gearbox, into the gearbox.

c) Install the shaft through the front bearing bore of the gearbox and through the gear.

d) Slide the gear against the shoulder of the shaft.

e) Install the gear snap ring (40A), to secure the gear to the pump shaft, with the straight snap ring pliers (*Figure 37*).

Note: the part numbers on both gears must face the same direction or timing will be off.

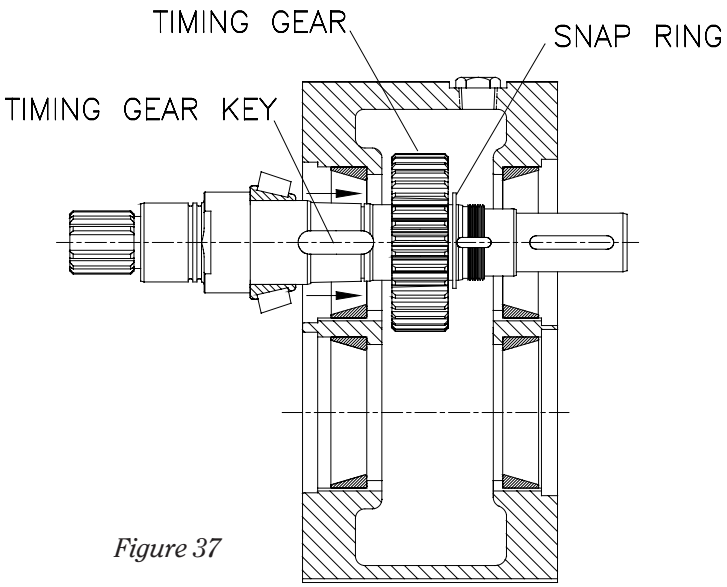


Figure 37

f) Heat the inner race of the rear bearing to no more than 300°F and quickly slide on the shaft (*Figure 38*). Hold the bearing in place for a few seconds so the bearing has a chance to cool.

g) Install the bearing spacer (8A), the bearing lock nut washer (8) and the bearing lock nut (6) onto the shaft (*Figure 38*). Hand tighten the nut with the spanner wrench.

h) Repeat steps A – G with the other shaft. Be sure to align the key ways to 12 o'clock as shown in *Figure 39* and also be sure that the part numbers on both gears face the bearing lock nut end of the gearbox. This will ensure proper timing.

i) Install the rotors (28) onto the shafts (14 & 48).

j) Place a wooden dowel between the rotors, as shown in *Figure 40* and tighten the bearing lock nut on the drive shaft with the spanner wrench until a rolling torque of 7 in-lbs is reached. Use an indicating torque wrench.

k) Tighten the idle shaft with the spanner wrench until the rolling torque (measured on the drive shaft) is doubled.

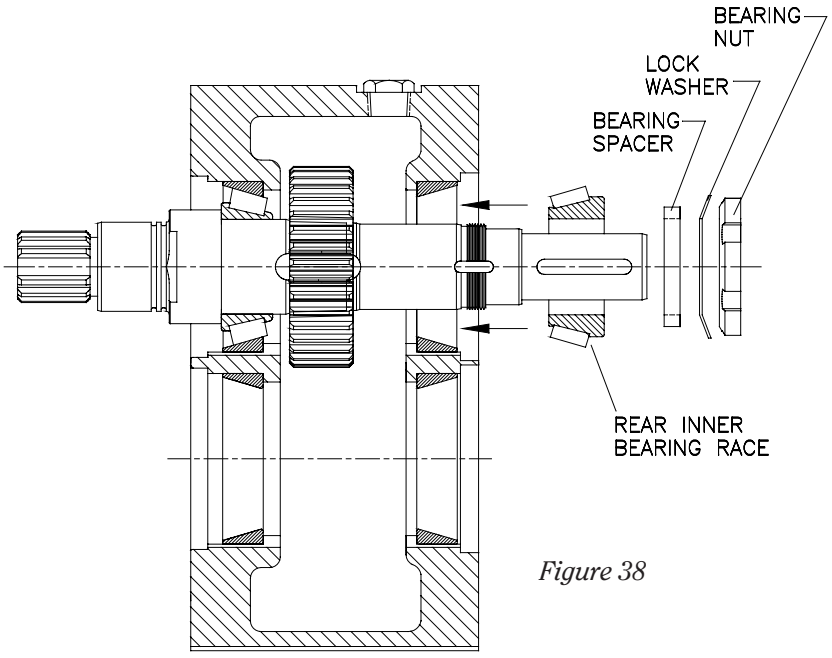


Figure 38

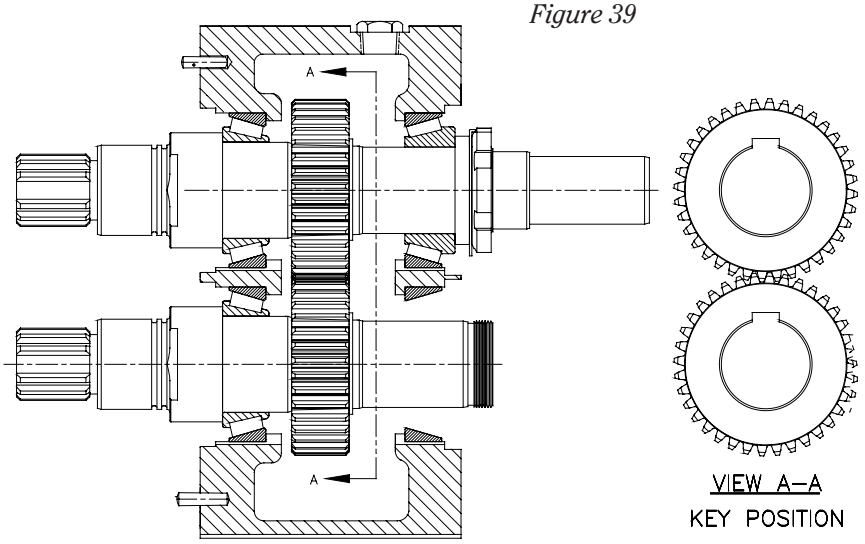


Figure 39

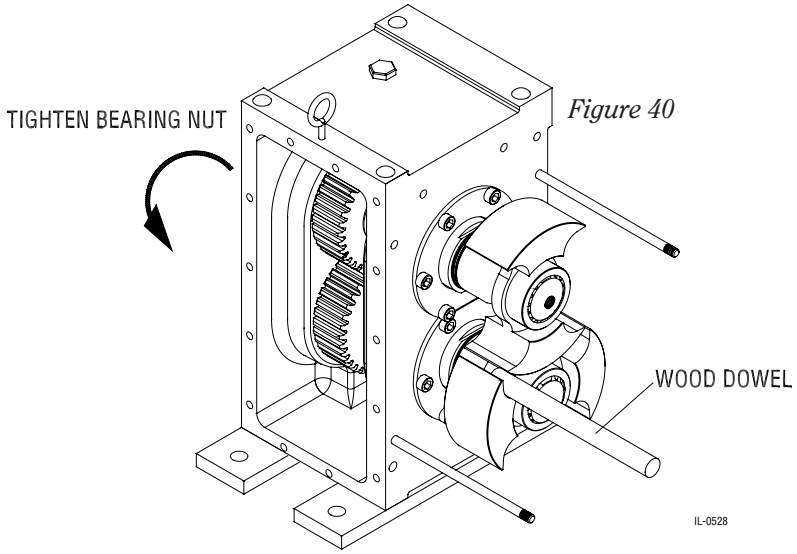


Figure 40

l) Use a rolling torque wrench to check that there is preload on the bearing (*Figure 41*). The rolling torque should be 7 in-lbs. if it is not, tighten or loosen the bearing locknut as needed.

m) Turn the rotors to check the timing. If the timing is off, one shaft will have to be removed and then reinstalled.

n) Install the new rear oil seal (5) into the drive shaft bearing cap (2).

o) Install the new bearing cap o-rings into the o-ring grooves in the bearing caps (2 & 3).

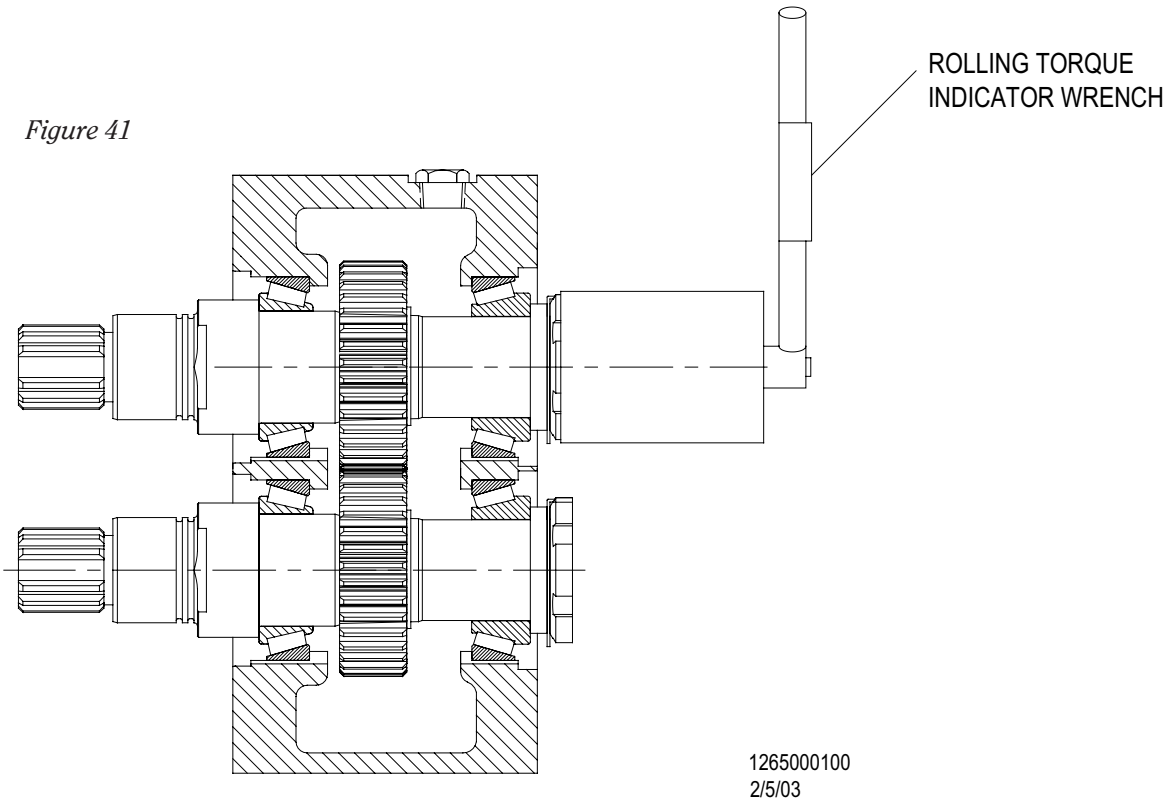
p) Install the bearing caps onto the gearbox. Secure with the bearing cap screws and tighten to the specified torque (Table A2, page 53).

q) Lightly oil the outside edge of the two front oil seals and press into the front bearing bores of the gearbox.

r) Place the new gearbox cover gasket and gearbox cover on the gearbox and secure with the gearbox cover bolts. Tighten to the torque specified in Table A2, page 5.

s) Re-install the oil drain plug and vent plug onto the gearbox. Fill the gearbox with oil to the center of the oil sight glass.

Figure 41



Setting the Rotor Gap

With the bearings properly assembled, you are now ready to set the rotor gap. This is accomplished by placing shims between the front bearings (17) and gearbox (11) as shown in *Figure 42*.

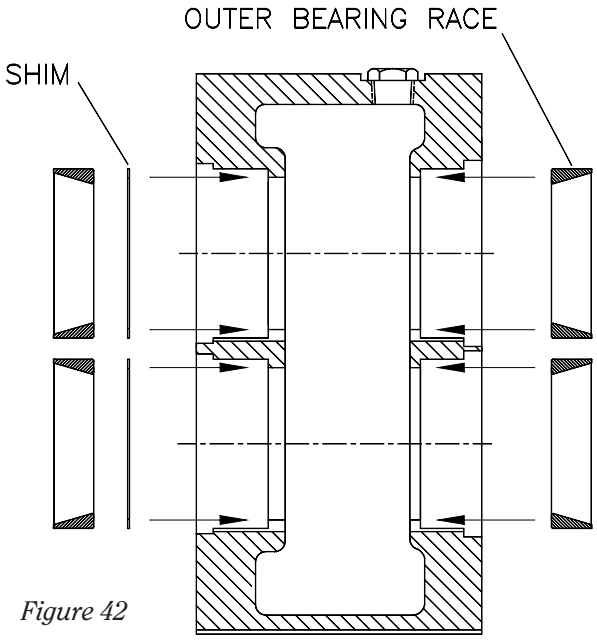


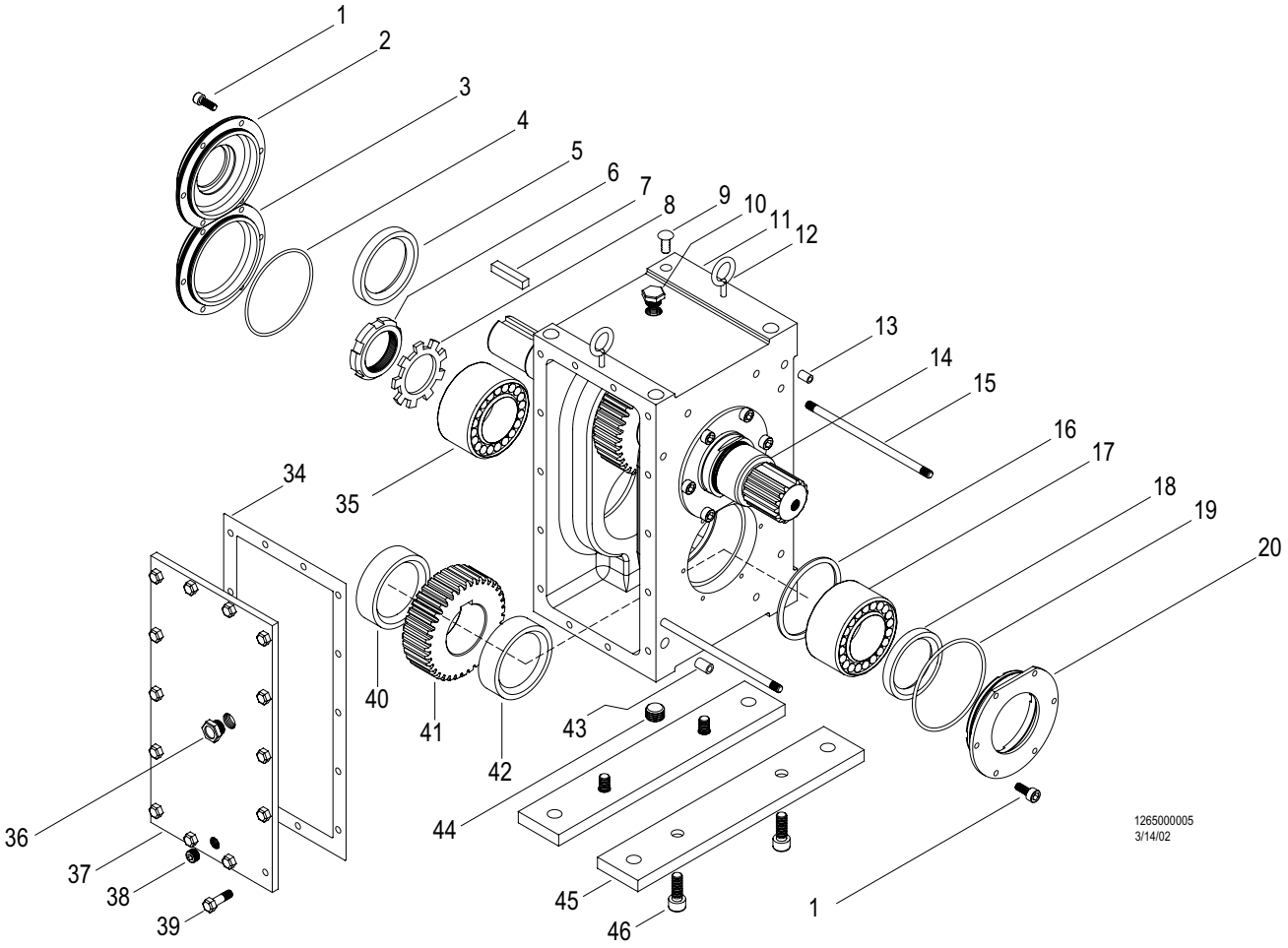
Figure 42

To check the rotor gap, the pump housing and rotors need to be installed. Follow the Pump Head Assembly instructions on page 13. The o-rings are not necessary for these measurements.

With the rotors installed, you may now check the rotor gap. Use feeler gauges to verify the back clearance between the rotors and the housing (see *Table A3,* page 6). You need to do this for both shafts, the values for each shaft may and probably will be different. Subtract the clearance value that you measure from the clearance value that is listed in the table. This will give you the amount of shim material that you must remove. This can be accomplished by removing the shims currently in the pump and using a combination of the shims that were supplied with the new shafts.

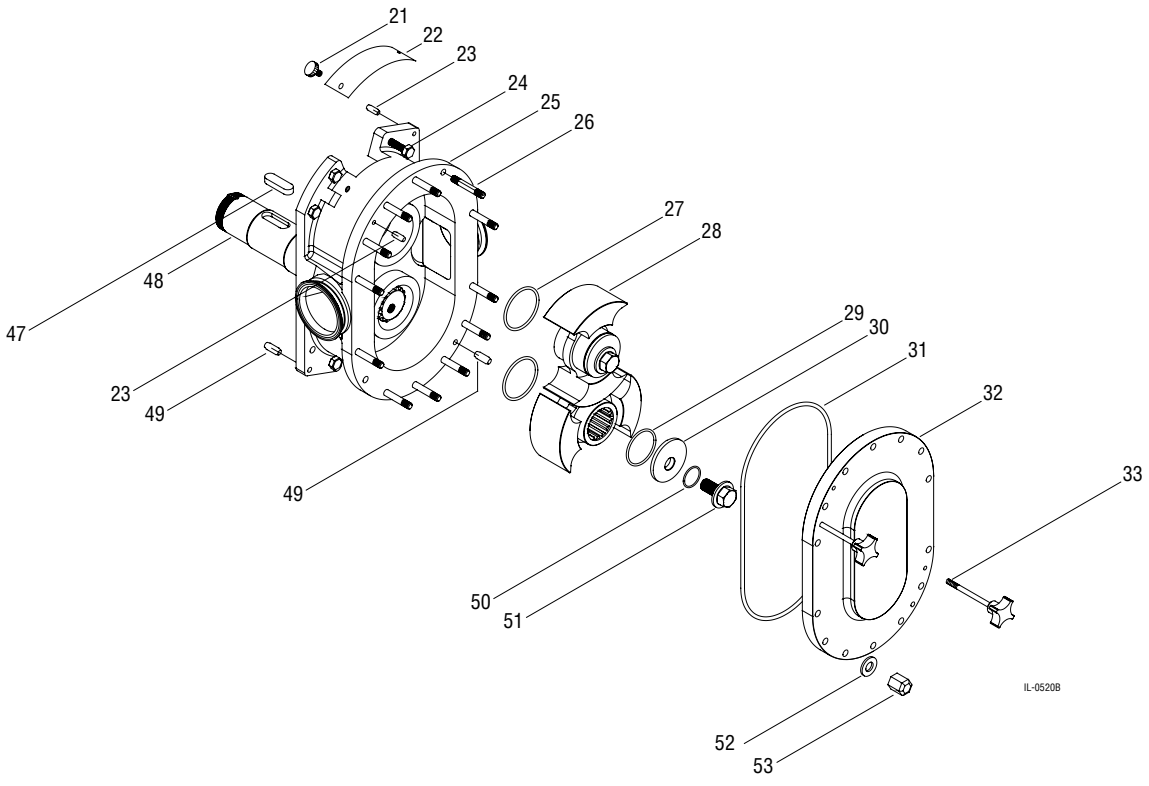
Once you have your rotor to housing measurements, you can remove the rotors (28), pump housing (25) and remove both pump shafts (14 and 48) from the gearbox (11). You will also need to remove the outer races for the front bearings to remove the current shims and replace them with the shim values that you have determined for each shaft. Once the shims are installed you can reassemble the pump per the instructions in the Gearbox Assembly (pages 25) section.

Once the gearbox is assembled, the pump head can be assembled (page 16) and the rotor to housing clearances can be checked. Make any necessary adjustments as required.



FKL (25, 75, 150, 250 & 400) Exploded View

1. Bearing cap screw
1. bearing cap screw
2. Bearing cap (drive shaft)
3. Bearing cap (idle shaft)
4. Bearing cap o-ring
5. Rear oil seal
6. Bearing lock nut
7. Coupling key
8. Bearing lock nut washer
9. Plastic cap plug
10. Vent plug
11. Gearbox
12. Eyebolt
13. Small mounting pin bushing
14. Drive shaft
15. Housing stud
16. Gapping shim
17. Front bearing assembly
18. Front oil seal
19. Front bearing cap o-ring
20. Front bearing cap
21. Guard nut
22. Housing guard
23. Small mounting pin
24. Hex head housing bolt
25. Pump housing
26. Housing stud
27. Rotor o-ring
28. Rotor (standard)
29. Rotor cap o-ring
30. Rotor cap
31. Cover o-ring
32. Pump cover
33. Forcing screw
34. Gearbox cover gasket
35. Rear bearing assembly
36. Oil sight glass
37. Gearbox cover
38. Oil drain plug
39. Gearbox cover bolt
40. Gear spacer (rear)
41. Gear
42. Gear spacer (front)
43. Large mounting pin bushing
44. Pipe plug
45. Mounting strap
46. Mounting strap screw
47. Gear key
48. Idle shaft
49. Large mounting pin
50. Rotor bolt o-ring
51. Rotor bolt
52. Cover nut washer
53. Cover nut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FKL 25 Part Numbers

Item No.	Description	Qty.	Part No.
1	Bearing cap screw	16	1101000048
2	Rear bearing cap (drive shaft)	1	1304000010
3	Rear bearing cap (idle shaft)	1	1304000011
4	Bearing cap o-ring (buna)	2	1180000241
5	Rear oil seal	1	1812000013
6	Bearing lock nut	2	1306000006
7	Coupling key	1	1315000013
8	Bearing lock nut washer	2	1104000019
9	Plastic cap plug	8	1248000002
10	Vent plug	1	1248000013
11	Gearbox	1	1310600045
12	Eyebolt	1	1101000072
13	Small mounting pin bushing	1	1224000002
14	Drive shaft	1	1372600014
15	Housing stud (long)	6	1103000035
16*	Gapping shim (0.050")	4	1373000031
16	Gapping shim (0.020")	2	1373000032
16	Gapping shim (0.010")	0	1373000033
16	Gapping shim (0.002")	0	1373000034
17	Front bearing assembly	2	1173000013
18	Front oil seal	2	1812000014
19	Front bearing cap o-ring	2	1180000241
20	Front bearing cap	2	1304000012
21	Guard nut	4	1102000000
22	Housing guard	2	1936000047
23a	Small mounting pin	2	1891000015
23b	Small mounting pin	2	1891000016
24	Hex head housing bolt	2	1101000040
25	Pump housing (1 1/2" clamp fittings)	1	1656610000
26	Housing stud	-	-
27	Rotor o-ring (viton)	2	1180000243
27	Rotor o-ring (epdm)	2	1180000244
28	Rotor (standard)	2	1657630000
28	Rotor (high-temperature)	2	1657630001
28	Rotor (chocolate)	2	1657630002
29	Rotor cap o-ring (viton)	2	1180000243
29	Rotor cap o-ring (epdm)	2	1180000244
30	Rotor cap	2	1104000027
31	Cover o-ring (buna - standard)	1	1180000165
31	Cover o-ring (viton)	1	1180000167
31	Cover o-ring (epdm)	1	1180000166

Item No.	Description	Qty.	Part No.
32	Pump cover	1	1656620000
33	Forcing screw	2	1018000012
34	Gearbox cover gasket	1	1181000059
35	Rear bearing assembly	2	1173000013
36	Oil sight glass	1	1248000019
37	Gearbox cover	1	1367000004
38	Oil drain plug	2	1248000012
39	Gearbox cover bolt	8	1101000011
40	Gear spacer (rear)	2	1224000021
41	Gear	2	1365000003
42	Gear spacer (front)	2	1224000021
43	Large mounting pin bushing	1	1224000004
44	Oil drain plug (plastic)	1	1248000011
45	Mounting strap	2	1925000000
46	Mounting strap screw	4	1101000029
47	Gear key	2	1315000014
48	Idle shaft	1	1372600015
49a	Large mounting pin	2	1891000018
49b	Large mounting pin	2	1891000019
50	Rotor bolt o-ring (viton)	2	1180000085
50	Rotor bolt o-ring (epdm)	2	1180000188
51	Rotor bolt	2	1102000001
52	Cover nut washer	6	1104000000
53	Cover nut	6	1103000032

*Quantities may vary

FKL 75 Part Numbers

Item No.	Description	Qty.	Part No.
1	Bearing cap screw	16	1101000032
2	Rear bearing cap (drive shaft)	1	1304000013
3	Rear bearing cap (idle shaft)	1	1304000014
4	Bearing cap o-ring (viton)	2	1180000232
5	Rear oil seal	1	1812000016
6	Bearing lock nut	2	1306000005
7	Coupling key	1	1315000026
8	Bearing lock nut washer	2	1104000018
9	Plastic cap plug	8	1248000004
10	Vent plug	1	1248000013
11	Gearbox	1	1310600047
12	Eyebolt	2	1101000073
13	Small mounting pin bushing	1	1224000004
14	Drive shaft (o-ring seal)	1	1372600016
15	Housing stud (long)	2	1103000039
16*	Gapping shim (0.050")	4	1373000027
16	Gapping shim (0.020")	2	1373000028
16	Gapping shim (0.010")	0	1373000029
16	Gapping shim (0.002")	0	1373000030
17	Front bearing assembly	2	1173000014
18	Front oil seal	2	1812000015
19	Front bearing cap o-ring	2	1180000232
20	Front bearing cap	2	1304000016
21	Guard nut	4	1102000000
22	Housing guard	1	1936000034
23a	Small mounting pin	1	1891000019
23b	Small mounting pin	1	1891000021
24	Hex head housing bolt	6	1101000046
25	Pump housing (2.5" clamp fittings)	1	1660610000
25	Rectangular inlet pump housing	1	1660610001
25	Aseptic pump housing	1	1660610004
26	Housing stud	6	1103000037
27	Rotor o-ring (viton)	2	1180000014
27	Rotor o-ring (epdm)	2	1180000063
28	Rotor (standard)	2	1661630000
28	Rotor (high-temperature)	2	1661630001
28	Rotor (chocolate)	2	1661630002
29	Rotor cap o-ring (viton)	2	1180000014
29	Rotor cap o-ring (epdm)	2	1180000063
30	Rotor cap	2	1104000028

Item No.	Description	Qty.	Part No.
31	Cover o-ring (buna - standard)	1	1180000593
31	Cover o-ring (viton)	1	1180000592
31	Cover o-ring (epdm)	1	1180000594
32	Pump cover	1	1660620000
32	Rectangular inlet pump cover	1	1660620001
32	Aseptic pump cover	1	1660620002
33	Forcing screw	2	1018000012
34	Gearbox cover gasket	1	1181000060
35	Rear bearing assembly	2	1173000015
36	Oil sight glass	1	1248000019
37	Gearbox cover	1	1367000005
38	Oil drain plug (metal)	2	1248000012
39	Gearbox cover bolt	12	1101000133
40	Gear spacer (rear)	2	1224000024
41	Gear	2	1365000004
42	Gear spacer (front)	2	1224000023
43	Large mounting pin bushing	1	1224000006
44	Oil draid plug (plastic)	1	1248000011
45	Mounting strap	2	1925000002
46	Mounting strap screw	4	1101000033
47	Gear key	2	1315000029
48	Idle shaft (o-ring seal)	1	1372600017
49a	Large mounting pin HSG	1	1891000023
49b	Large mounting pin CVR	1	1891000024
50	Rotor bolt o-ring (viton)	2	1180000085
50	Rotor bolt o-ring (epdm)	2	1180000188
51	Rotor bolt	2	1102000001

*Quantities may vary

FKL 150 Part Numbers

Item No.	Description	Qty.	Part No.
1	Bearing cap screw	18	1101000032
2	Rear bearing cap (drive shaft)	1	1304000002
3	Rear bearing cap (idle shaft)	1	1304000003
4	Rear bearing cap o-ring (buna)	2	1180000148
5	Rear oil seal	1	1812000012
6	Bearing lock nut	2	1306000005
7	Coupling key	1	1315000026
8	Bearing lock nut washer	2	1104000018
9	Plastic cap plug	8	1248000004
10	Vent plug	1	1248000013
11	Gearbox	1	1310600048
12	Eyebolt	2	1101000163
13	Small mounting pin bushing	1	1224000004
14	Drive shaft	1	1372600018
15	Housing stud (long)	2	1103000029
16*	Gapping shim (0.050")	4	1373000027
16	Gapping shim (0.020")	2	1373000028
16	Gapping shim (0.010")	0	1373000029
16	Gapping shim (0.002")	0	1373000030
17	Front bearing assembly	2	1173000016
18	Front oil seal	2	1812000011
19	Front bearing cap o-ring	2	1180000148
20	Front bearing cap	2	1304000001
21	Guard nut	4	1102000000
22	Housing guard	2	1936000035
23	Top mounting pin	2	1891000041
24	Hex head housing bolt	6	1101000037
25	Pump housing (3" clamp fittings)	1	1668610000
25	Rectangular inlet pump housing	1	1668610001
25	Aseptic pump housing	1	1668610004
26	Housing stud (short)	6	1103000027
27	Rotor o-ring (viton)	2	1180000115
27	Rotor o-ring (epdm)	2	1180000205
28	Rotor (standard)	2	1669630000
28	Rotor (high-temperature)	2	1669630001
28	Rotor (chocolate)	2	1669630002
29	Rotor cap o-ring (viton)	2	1180000115
29	Rotor cap o-ring (epdm)	2	1180000205
30	Rotor bolt washer	2	1080000042

Item No.	Description	Qty.	Part No.
31	Cover o-ring (buna)	1	1180000595
31	Cover o-ring (viton)	1	1180000254
31	Cover o-ring (EPDM)	1	1180000596
32	Pump cover	1	1658620000
33	Forcing screw	2	1018000012
34	Gearbox cover gasket	1	1181000057
35	Rear bearing	2	1173000008
36	Oil sight glass	1	1248000019
37	Gearbox cover	1	1367000000
38	Oil drain plug (metal)	2	1248000012
39	Gearbox cover bolt	10	1101000022
40A	Gear snap ring	2	1148000001
41	Gear	2	1365000005
43	Bottom mounting pin bushing (8)	1	1224000004
44	Oil drain plug (plastic)	1	1248000011
45	Mounting strap	2	1925000001
46	Mounting strap screw	4	1101000029
47	Gear key	2	1315000030
48	Idle shaft	1	1372600001
48	Idle shaft	1	1372600013
49a	Bottom mounting pin (8)	1	1891000018
49b	Bottom mounting pin (8)	1	1891000020
50	Rotor bolt o-ring (viton)	2	1180000085
50	Rotor bolt o-ring (EPDM)	2	1180000188
51	Rotor bolt	2	1102000001
52	Cover nut washer	4	1104000002
53	Cover nut	4	1103000018

*Quantities may vary

part numbers are for new rotor bolt design on the FKL 150, 250 & 400 as of November 2002.

FKL 250 Part Numbers

Item No.	Description	Qty.	Part No.
1	Bearing cap screw	24	1101000032
2	Rear bearing cap (drive shaft)	1	1304000005
3	Rear bearing cap (idle shaft)	1	1304000006
4	Bearing cap o-ring (buna)	2	1180000214
5	Rear oil seal	1	1812000009
6	Bearing lock nut	2	1306000004
7	Coupling key	1	1315000025
8	Bearing lock nut washer	2	1104000017
9	Plastic cap plug	8	1248000004
10	Vent plug	1	1248000013
11	Gearbox	1	1310600049
12	Eyebolt	2	1101000163
13	Small mounting pin bushing	1	1224000004
14	Drive shaft	1	1372600020
15	Housing stud (long)	2	1103000025
16*	Gapping shim (0.050")	4	1373000023
16	Gapping shim (0.020")	2	1373000024
16	Gapping shim (0.010")	0	1373000025
16	Gapping shim (0.002")	0	1373000026
17	Front bearing assembly	2	1173000017
18	Front oil seal	2	1812000008
19	Front bearing cap o-ring	2	1180000214
20	Front bearing cap	2	1304000004
21	Guard nut	4	1102000000
22	Housing guard	2	1936000033
23a	Small mounting pin	1	1891000041
23b	Small mounting pin	1	1891000022
24	Hex head housing bolt	6	1101000037
25	Pump housing	1	1670610000
25	Rectangular inlet pump housing	1	1670610001
25	Aseptic pump housing	1	1670610003
26	Housing stud (short)	12	1103000027
27	Rotor o-ring (viton)	2	1180000212
27	Rotor o-ring (epdm)	2	1180000213
28	Rotor (standard)	2	1671630000
28	Rotor (high-temperature)	2	1671630001
28	Rotor (chocolate)	2	1671630002
29	Rotor cap o-ring (viton)	2	1180000212
29	Rotor cap o-ring (epdm)	2	1180000213
30	Rotor bolt washer assembly	2	1080000043

Item No.	Description	Qty.	Part No.
31	Cover o-ring (buna - standard)	1	1180000586
31	Cover o-ring (viton)	1	1180000587
31	Cover o-ring (epdm)	1	1180000588
32	Pump cover	1	1670620000
33	Forcing screw	2	1018000013
34	Gearbox cover gasket	1	1181000053
35	Rear bearing assembly	2	1173000018
36	Oil sight glass	1	1248000019
37	Gearbox cover	1	1367000001
38	Oil drain plug (Metal)	2	1248000012
39	Gearbox cover bolt	14	1101000133
40	Gear spacer (rear)	2	1224000016
41	Gear	2	1365000001
42	Gear spacer (front)	2	1224000016
43	Large mounting pin bushing	1	1224000006
44	Oil drain plug	1	1248000011
45	Mounting strap	2	1925000004
46	Mounting strap screw	4	1101000033
47	Gear key	2	1315000024
48	Idle shaft	1	1372600021
49a	Large mounting pin	1	1891000044
49b	Large mounting pin	1	1891000026
50	Rotor bolt o-ring (viton)	2	1180000398
50	Rotor bolt o-ring (epdm)	2	1180000399
51	Rotor bolt	2	1102000010
52	Cover nut washer	20	1104000002
53	Cover nut	14	1103000018

*Quantities may vary

part numbers are for new rotor bolt design on the FKL 150, 250 & 400 as of November 2002.

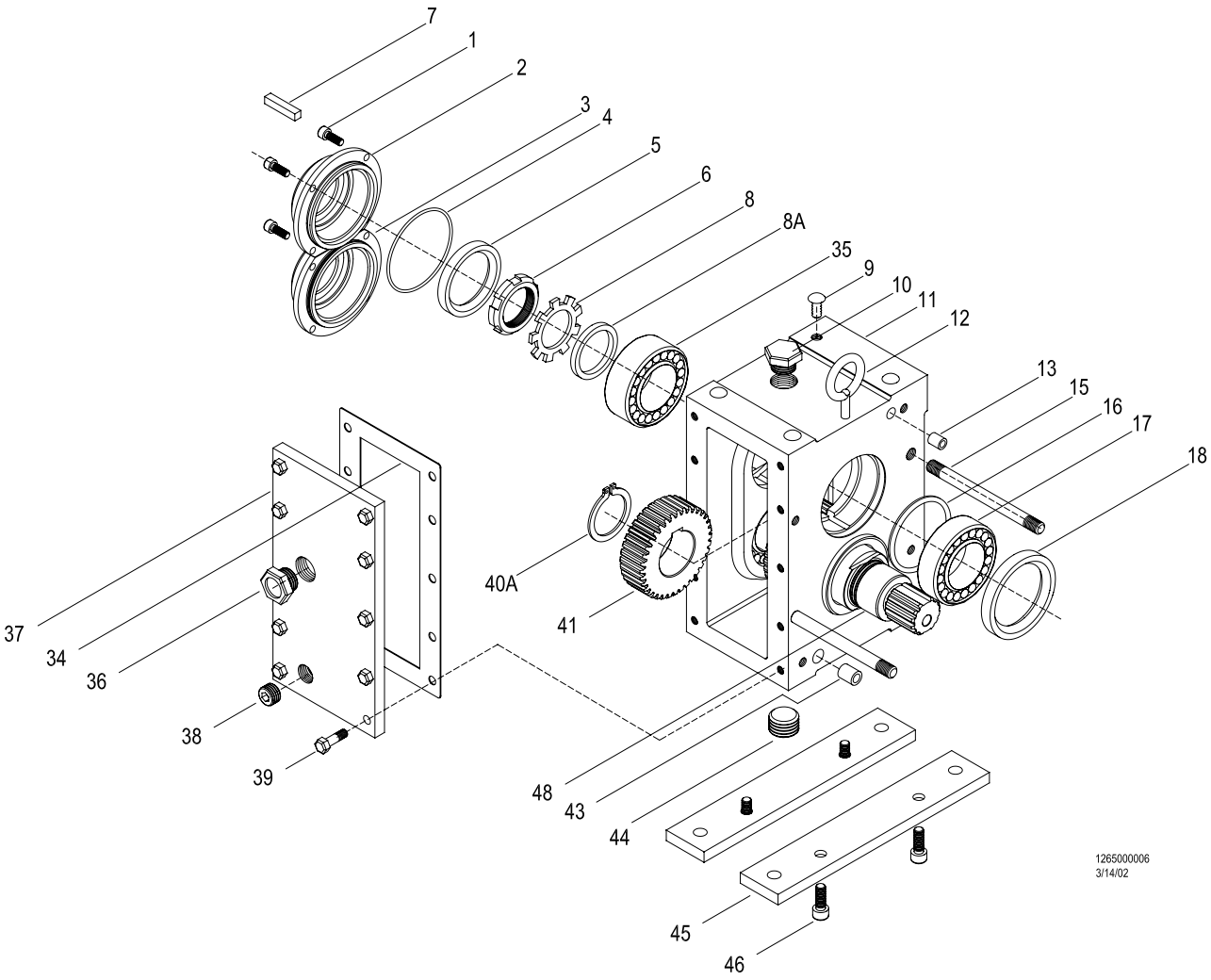
FKL 400 Part Numbers

Item No.	Description	Qty.	Part No.
1	Bearing cap screw	24	1101000036
2	Rear bearing cap (drive shaft)	1	1304000009
3	Rear bearing cap (idle shaft)	1	1304000008
4	Bearing cap o-ring (buna)	2	1180000246
5	Rear oil seal	1	1812000011
6	Bearing lock nut	2	1306000007
7	Coupling key	1	1315000028
8	Bearing lock nut washer	2	1104000020
9	Plastic cap plug	6	1248000020
10	Vent plug	1	1248000013
11	Gearbox	1	1310600050
12	Eyebolt	2	1101000152
13	Small mounting pin bushing	1	1224000006
14	Drive shaft	1	1372600006
15	Housing stud (long)	4	1103000031
16*	Gapping shim (0050")	4	1373000035
16	Gapping shim (0.020")	2	1373000036
16	Gapping shim (0.010")	0	1373000037
16	Gapping shim (0.002")	0	1373000038
17	Front bearing assembly	2	1173000019
18	Front oil seal	2	1812000010
19	Front bearing cap o-ring	2	1180000238
20	Front bearing cap	2	1304000007
23a	Small mounting pin	1	1891000045
23b	Small mounting pin	1	1891000046
24	Hex head housing bolt	8	1101000037
25	Pump housing (6" flange fitting)	1	1672610000
25	Rectangular inlet pump housing	1	1672610001
25	Aseptic pump housing	1	1672610004
26	Housing stud (short)	12	1103000033
27	Rotor o-ring (viton)	2	1180000234
27	Rotor o-ring (epdm)	2	1180000235
28	Rotor (standard)	2	1673630000
28	Rotor (high-temperature)	2	1673630001
28	Rotor (chocolate)	2	1673630002
29	Rotor cap o-ring (viton)	2	1180000234
29	Rotor cap o-ring (epdm)	2	1180000235
30	Rotor bolt washer	2	1080000044

Item No.	Description	Qty.	Part No.
31	Cover o-ring (buna - standard)	1	1180000021
31	Cover o-ring (viton)	1	1180000026
31	Cover o-ring (epdm)	1	1180000152
32	Pump cover	1	1672620000
33	Forcing screw	2	1018000013
34	Gearbox cover gasket	1	1181000058
35	Rear bearing assembly	2	1173000017
36	Oil sight glass	1	1248000019
37	Gearbox cover	1	1367000003
38	Oil drain plug	2	1248000012
39	Gearbox cover bolt	14	1101000133
40	Gear spacer (rear)	2	1224000020
41	Gear	2	1365000002
42	Gear spacer (front)	2	1224000019
43	Large mounting pin bushing	1	1224000008
44	Oil drain plug	1	1248000011
45	Mounting strap	2	1925000005
46	Mounting strap screw	4	1101000039
47	Gear key	2	1315000027
48	Idle shaft	1	1372600007
49a	Large mounting pin	1	1891000049
49b	Large mounting pin	1	1891000048
50	Rotor bolt o-ring (viton)	2	1180000398
50	Rotor bolt o-ring (epdm)	2	1180000399
51	Rotor bolt	2	1102000010
52	Cover nut washer	24	1104000002

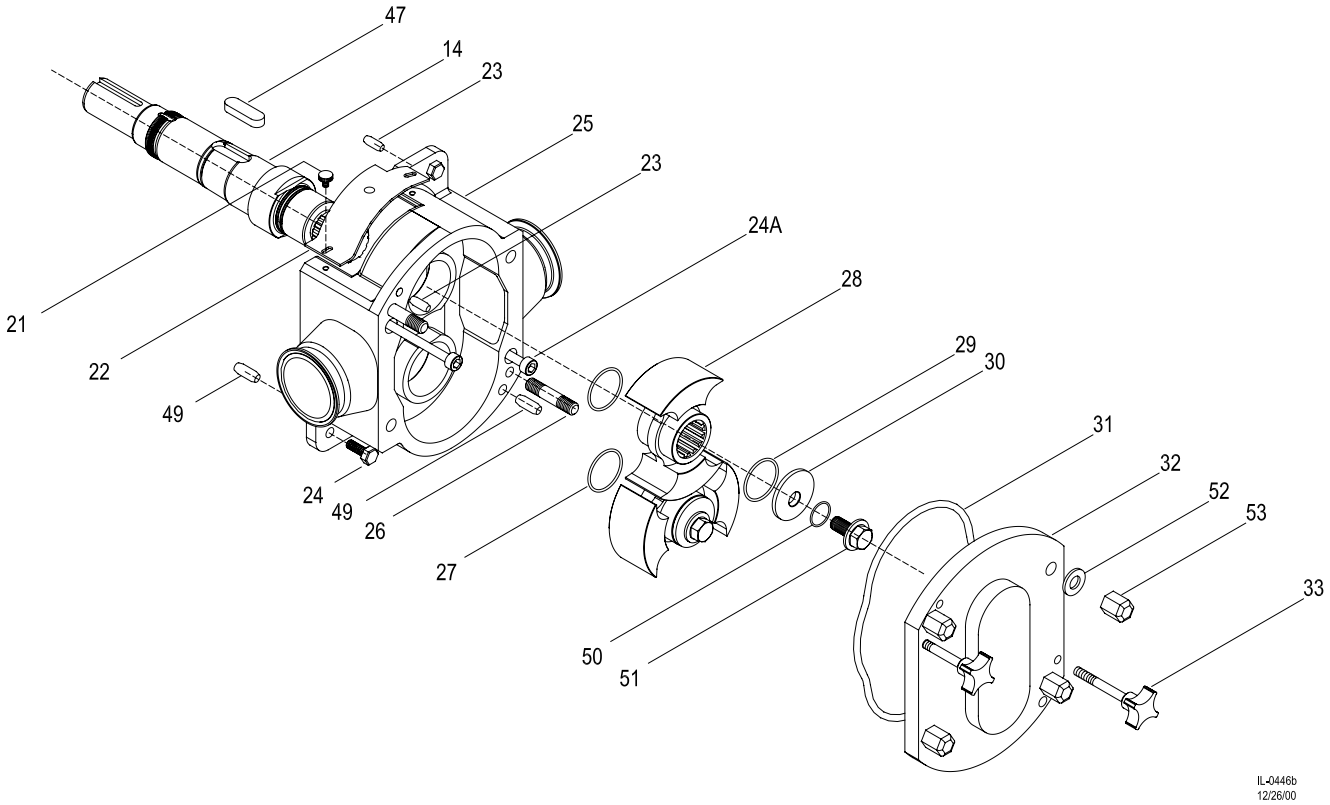
*Quantities may vary

part numbers are for new rotor bolt design on the FKL 150, 250 & 400 as of November 2002.



FKL 50 Exploded View

1. Bearing cap screw
2. Bearing cap (drive shaft)
3. Bearing cap (idle shaft)
4. Bearing cap o-ring
5. Rear oil seal
6. Bearing lock nut
7. Coupling key
8. Bearing lock nut washer
8A. Bearing spacer
9. Plastic cap plug
10. Vent plug
11. Gearbox
12. Eyebolt
13. Top mounting pin bushing
14. Drive shaft
15. Housing stud (long)
16. Gapping shim
17. Front bearing assembly
18. Front oil seal
21. Guard nut
22. Housing guard
23. Small mounting pin
24. Hex head housing bolt
24A. Socket head housing screw
25. Pump housing
26. Housing stud (short)
27. Rotor o-ring
28. Rotor (standard)
29. Rotor cap o-ring
30. Rotor cap
31. Cover o-ring
32. Pump cover
33. Forcing screw
34. Gearbox cover gasket
35. Rear bearing assembly
36. Oil sight glass
37. Gearbox cover
38. Oil drain plug
39. Gearbox cover bolt
40A. Gear snap ring
41. Gear
43. Bottom mounting pin bushing
44. Pipe plug
45. Mounting strap
46. Mounting strap screw
47. Gear key
48. Idle shaft
49. Bottom mounting pin
50. Rotor bolt o-ring
51. Rotor bolt
52. Cover nut washer
53. Cover nut


47
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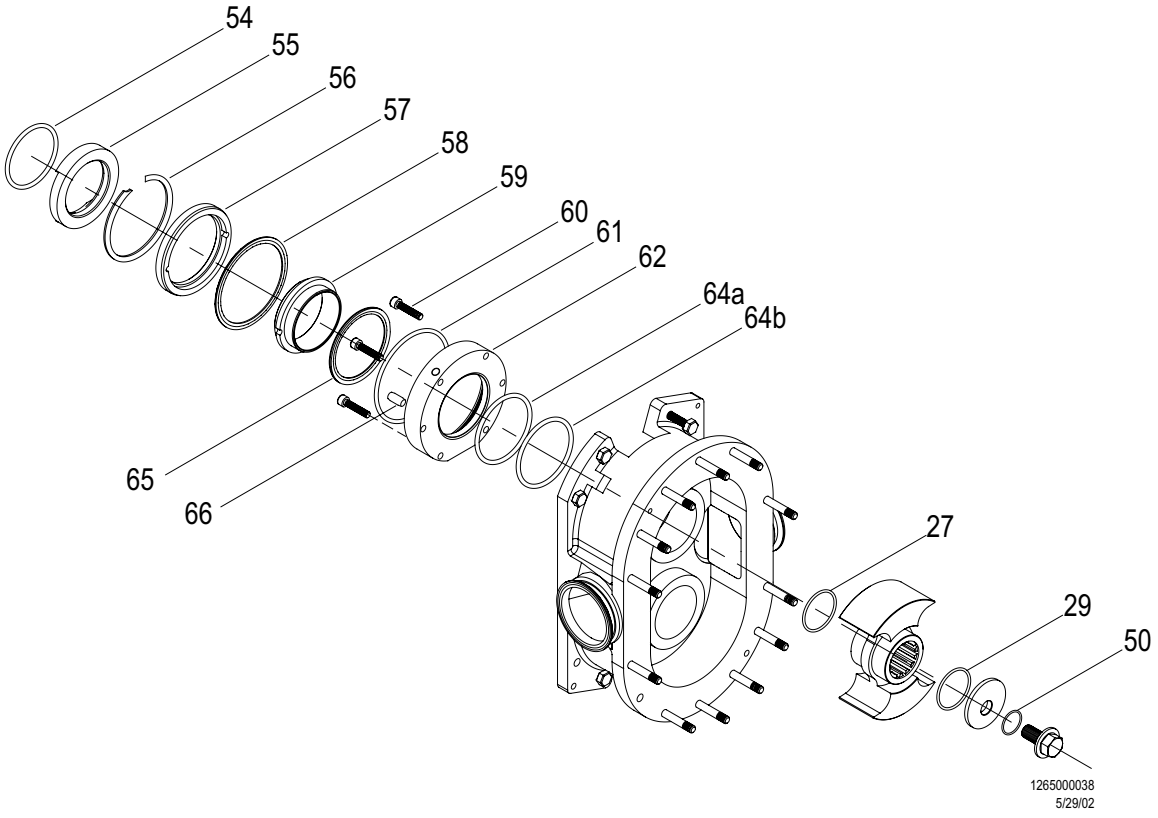
IL-0446b
12/26/00

FKL 50 Part Numbers

Item No.	Description	Qty.	Part No.
1	Bearing cap screw	8	1101000016
2	Bearing cap (drive shaft)	1	1304000000
3	Bearing cap (idle shaft)	1	1304000015
4	Bearing cap o-ring (buna)	2	1180000317
5	Rear oil seal	1	1812000006
6	Bearing lock nut	2	1306000002
7	Coupling key (5/16")	1	1315000011
8	Bearing lock nut washer	2	1104000021
8A	Bearing spacer	2	1224000022
9	Plastic cap plug	8	1248000002
10	Vent plug	1	1248000013
11	Gearbox	1	1310600046
12	Eyebolt	1	1101000072
13	Top mounting pin bushing (6)	1	1224000002
14	Drive shaft	1	1372600000
14	Drive shaft	1	1372600012
15	Housing stud (long)	2	1103000023
16	Gapping shim	4	1373000019
16	Gapping shim	2	1373000020
16	Gapping shim		1373000021
16	Gapping shim		1373000022
17	Front bearing	2	1173000007
18	Front oil seal	2	1812000017
21	Guard nut	4	1102000000
22	Housing guard - single seal	2	1936000028
22	Housing guard - double seal	2	1936000027
23a	Top mounting pin (6)	1	1891000015
23b	Top mounting pin (6)	1	1891000017
24	Hex head housing bolt	2	1101000054
24A	Socket head housing screw	2	1101000023
25	Pump housing with 2-1/2" clamp fittings	1	1658610000
26	Housing stud (short)	2	1103000037
27	Rotor o-ring (viton)	2	1180000120
27	Rotor o-ring (EPDM)	2	1180000183
28	Rotor (standard)	2	1659630000
28	Rotor (high-tempature)	2	1659630001
28	Rotor (chocolate)	2	1659630002
29	Rotor cap o-ring (viton)	2	1180000120
29	Rotor cap o-ring (EPDM)	2	1180000183
30	Rotor cap	2	1104000024

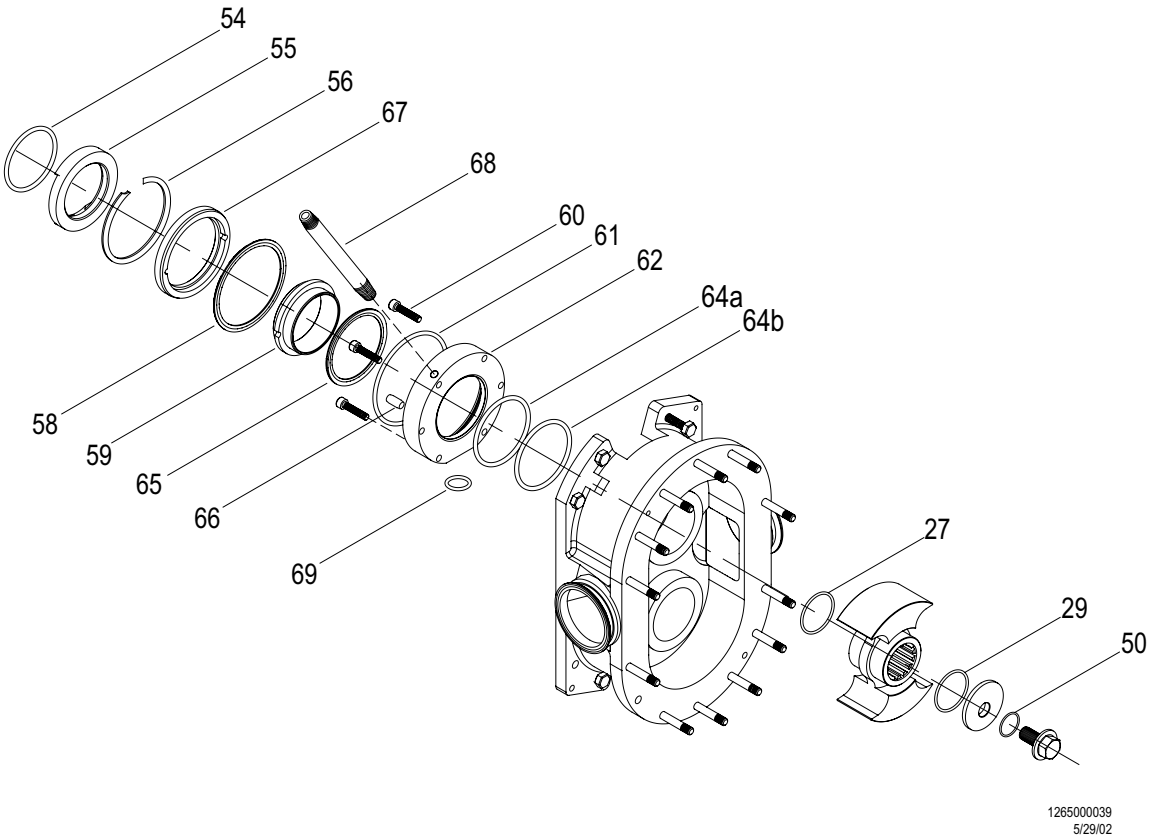
Item No.	Description	Qty.	Part No.
31	Cover o-ring (buna)	1	1180000595
31	Cover o-ring (viton)	1	1180000254
31	Cover o-ring (EPDM)	1	1180000596
32	Pump cover	1	1658620000
33	Forcing screw	2	1018000012
34	Gearbox cover gasket	1	1181000057
35	Rear bearing	2	1173000008
36	Oil sight glass	1	1248000019
37	Gearbox cover	1	1367000000
38	Oil drain plug (metal)	2	1248000012
39	Gearbox cover bolt	10	1101000022
40A	Gear snap ring	2	1148000001
41	Gear	2	1365000005
43	Bottom mounting pin bushing (8)	1	1224000004
44	Oil drain plug (plastic)	1	1248000011
45	Mounting strap	2	1925000001
46	Mounting strap screw	4	1101000029
47	Gear key	2	1315000030
48	Idle shaft	1	1372600001
48	Idle shaft	1	1372600013
49a	Bottom mounting pin (8)	1	1891000018
49b	Bottom mounting pin (8)	1	1891000020
50	Rotor bolt o-ring (viton)	2	1180000085
50	Rotor bolt o-ring (EPDM)	2	1180000188
51	Rotor bolt	2	1102000001
52	Cover nut washer	4	1104000002

FKL Single Mechanical Seal



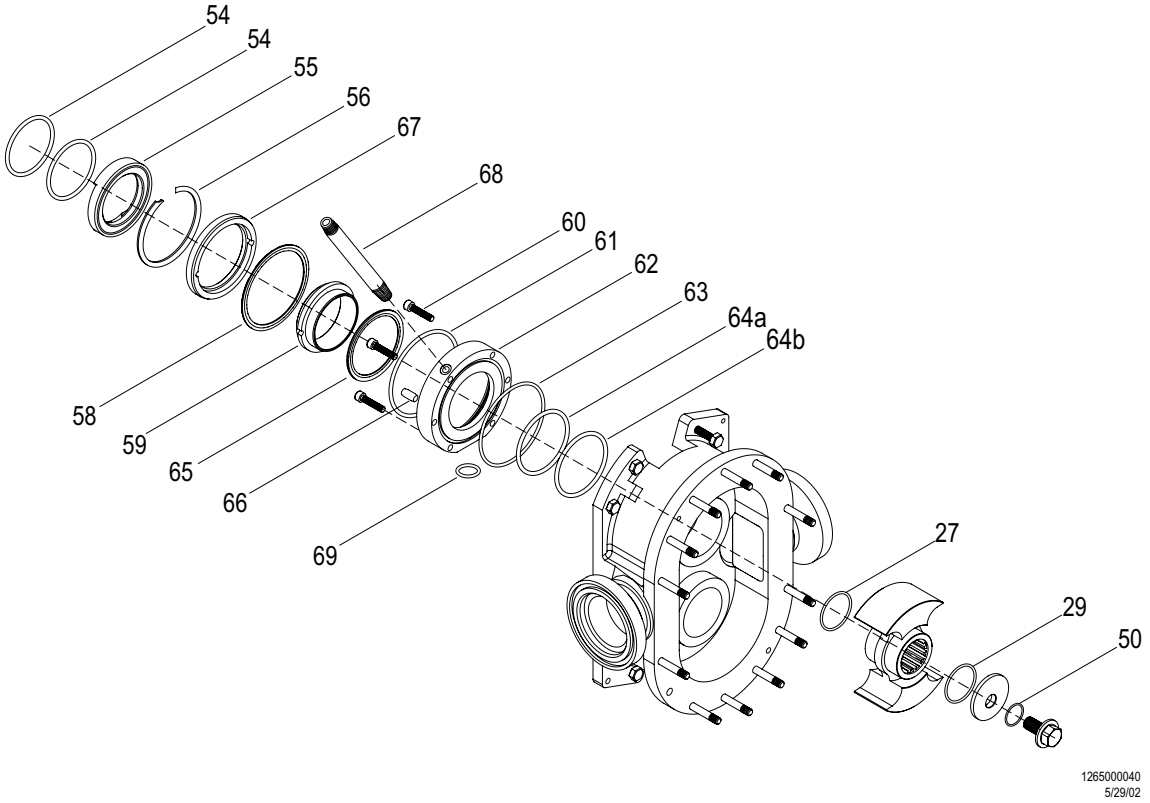
Item No.	*Description*
54	Rotating seal o-ring
55	Rotating seal ring
56	Seal retaining ring
57	Single seal insert
58	Outer seal spring
59	Inner stationary seal ring
60	Seal housing screw
61	Outer stationary seal o-ring
62	Seal housing
64a	Inner stationary seal o-ring
64b	Inner stationary seal o-ring (FKL 250 and 400 models only)
65	Inner seal spring
66	Seal pin

FKL Double Mechanical Seal



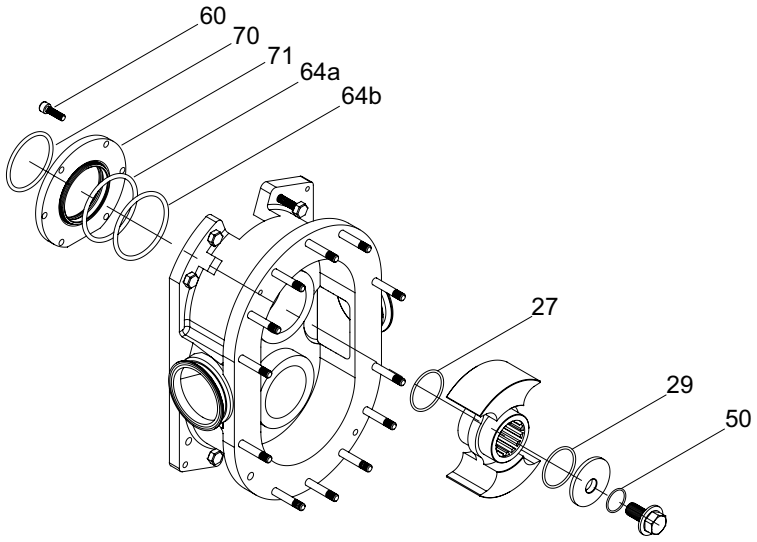
Item No.	*Description*
54	Rotating seal o-ring
55	Rotating seal ring
56	Seal retaining ring
58	Outer seal spring
59	Inner stationary seal ring
60	Seal housing screw
61	Outer stationary seal o-ring
62	Seal housing
64a	Inner stationary seal o-ring
64b	Inner stationary seal o-ring (FKL 250 and 400 models only)
65	Inner seal spring
66	Seal pin
67	Outer stationary seal ring
68	Water pipe
69	Small seal housing o-ring

FKL Aseptic Double Mechanical Seal



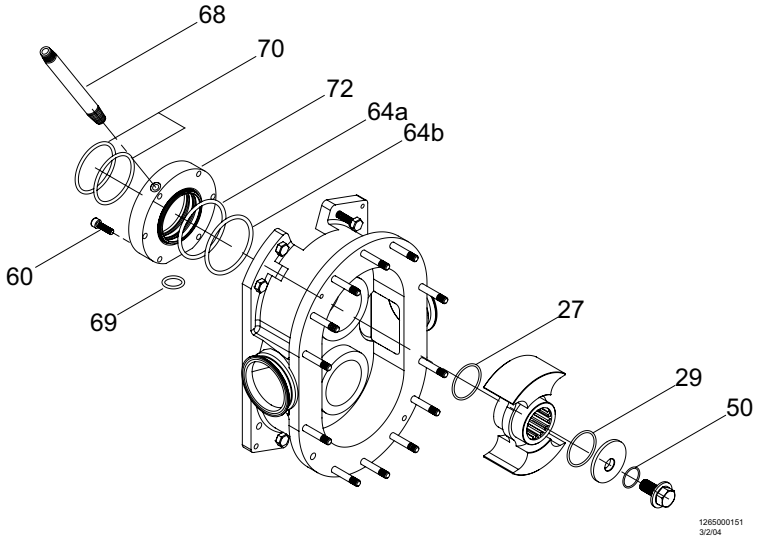
Item No.	*Description*
54	Rotating seal o-ring
55	Aseptic rotating seal ring
56	Seal retaining ring
58	Outer seal spring
59	Inner stationary seal ring
60	Seal housing screw
61	Outer stationary seal o-ring
62	Aseptic seal housing
63	Seal housing o-ring
64a	Inner stationary seal o-ring
64b	Inner stationary seal o-ring (FKL 250 and 400 models only)
65	Inner seal spring
66	Seal pin
67	Outer stationary seal ring
68	Water pipe
69	Small seal housing o-ring

FKL Single O-ring Seal



Item No.	*Description*
60	Seal housing screw
64a	Inner stationary seal o-ring
64b	Inner stationary seal o-ring (FKL 250 & 400 only)
70	Seal o-ring
71	Seal housing

FKL Double O-ring Seal



Item No.	*Description*
60	Seal housing screw
64a	Inner stationary seal o-ring
64b	Inner stationary seal o-ring (FKL 250 & 400 only)
68	Water pipe
69	Small seal housing o-ring
70	Seal o-ring

FKL 25 Seal Part Numbers

Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000243
54	Rotating seal o-ring (EPDM)	2	1180000244
55	Rotating seal ring (FR SS*)	2	1810600075
55	Rotating seal ring (SiC)	2	1810600085
56	Seal retaining ring	2	1148000018
58	Outer seal spring	2	1820000037
59	Inner stationary seal ring (carbon)	2	1815600058
59	Inner stationary seal ring (SiC)	2	1815600057
60	Seal housing screw	8	1101000030
61	Outer stationary seal o-ring (viton)	2	1180000256
61	Outer stationary seal o-ring (epdm)	2	1180000255
62	Seal housing	2	1845000010
64	Inner stationary seal o-ring (viton)	2	1180000030
64	Inner stationary seal o-ring (epdm)	2	1180000247
65	Inner seal spring	2	1820000038
66	Seal pin	2	1891000011
67	Outer stationary seal ring (carbon)	2	1815600059
68	Water pipe	2	1910000002
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (epdm)	1	1180000291

Single Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000243
54	Rotating seal o-ring (EPDM)	2	1180000244
55	Rotating seal ring (FR SS*)	2	1810600075
55	Rotating seal ring (SiC)	2	1810600085
56	Seal retaining ring	2	1148000018
57	Single seal insert	2	1815600019
58	Outer seal spring	2	1820000037
59	Inner stationary seal ring (carbon)	2	1815600058
59	Inner stationary seal ring (SiC)	2	1815600057
60	Seal housing screw	8	1101000030
61	Outer stationary seal o-ring (viton)	2	1180000256
61	Outer stationary seal o-ring (epdm)	2	1180000255
62	Seal housing	2	1845000010
64	Inner stationary seal o-ring (viton)	2	1180000030
64	Inner stationary seal o-ring (epdm)	2	1180000247
65	Inner seal spring	2	1820000038
66	Seal pin	2	1891000011

Double O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	8	1101000041
64	Inner stationary seal o-ring (viton)	2	1180000030
64	Inner stationary seal o-ring (EPDM)	2	1180000247
68	Water pipe	2	1910000002
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (EPDM)	1	1180000291
70	Seal o-ring (viton)	2	1180000206
70	Seal o-ring (epdm)	2	1180000220
72	Seal housing	2	1845000011

Single O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	8	1101000041
64	Inner stationary seal o-ring (viton)	2	1180000030
64	Inner stationary seal o-ring (EPDM)	2	1180000247
70	Seal o-ring (viton)	2	1180000206
70	Seal o-ring (epdm)	2	1180000220
71	Seal housing	2	1845000012

FR SS = chrome oxide coated stainless steel*

FKL 50 Seal Part Numbers

Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000032
54	Rotating seal o-ring (EPDM)	2	1180000187
55	Rotating seal ring (SS)	2	1810600057
55	Rotating seal ring (SiC)	2	1810600036
56	Seal retaining ring	2	1148000014
58	Outer seal spring	2	1820000018
59	Inner stationary seal ring (carbon)	2	1815600049
59	Inner stationary seal ring (SiC)	2	1815600050
60	Seal housing screw	8	1101000030
61	Outer stationary seal o-ring (viton)	2	1180000186
61	Outer stationary seal o-ring (EPDM)	2	1180000296
62	Seal housing	2	1845000000
64	Inner stationary seal o-ring (viton)	2	1180000014
64	Inner stationary seal o-ring (EPDM)	2	1180000063
65	Inner seal spring	2	1820000017
66	Seal pin	4	1891000009
67	Outer stationary seal ring (carbon)	2	1815600071
68	Water pipe	2	1910000010
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (EPDM)	1	1180000291
Single Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000032
54	Rotating seal o-ring (EPDM)	2	1180000187
55	Rotating seal ring (SS)	2	1810600057
55	Rotating seal ring (SiC)	2	1810600036
56	Seal retaining ring	2	1148000014
57	Single seal insert	2	1815600020
58	Outer seal spring	2	1820000018
59	Inner stationary seal ring (carbon)	2	1815600049
59	Inner stationary seal ring (SiC)	2	1815600050
60	Seal housing screw	8	1101000030
61	Outer stationary seal o-ring (viton)	2	1180000186
61	Outer stationary seal o-ring (EPDM)	2	1180000296
62	Seal housing	2	1845000000
64	Inner stationary seal o-ring (viton)	2	1180000014
64	Inner stationary seal o-ring (EPDM)	2	1180000063
65	Inner seal spring	2	1820000017
66	Seal pin FKL 50	4	1891000009

Aseptic Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (EPDM)	4	1180000160
55	Aseptic rotating seal ring (FR SS*)	2	1810600079
56	Seal retaining ring	2	1148000014
58	Outer seal spring	2	1820000018
59	Inner stationary seal ring (carbon)	2	1815600049
60	Seal housing screw	8	1101000030
61	Outer stationary seal o-ring (epdm)	2	1180000296
62	Aseptic seal housing	2	1845000023
63	Seal housing o-ring (epdm)	2	1180000185
64	Inner stationary seal o-ring (epdm)	2	1180000063
65	Inner seal spring	2	1820000017
66	Seal pin	4	1891000009
67	Outer stationary seal ring (carbon)	2	1815600071
68	Water pipe	2	1910000010
69	Small seal housing o-ring (epdm)	1	1180000291

Double O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	8	1101000030
64	Inner stationary seal o-ring (viton)	2	1180000014
64	Inner stationary seal o-ring (EPDM)	2	1180000063
68	Water pipe	2	1910000010
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (EPDM)	1	1180000291
70	Seal o-ring (viton)	4	1180000044
70	Seal o-ring (EPDM)	4	1180000168
72	Seal housing	2	1845000002
Single O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	8	1101000031
64	Inner stationary seal o-ring (viton)	2	1180000014
64	Inner stationary seal o-ring (EPDM)	2	1180000063
70	Seal o-ring (viton)	2	1180000044
70	Seal o-ring (EPDM)	2	1180000168
71	Seal housing	2	1845000001

FKL 75 Seal Part Numbers

Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000275
54	Rotating seal o-ring (EPDM)	2	1180000276
55	Rotating seal ring (FR SS*)	2	1810600076
55	Rotating seal ring (SiC)	2	1810600077
56	Seal retaining ring	2	1148000019
58	Outer seal spring	2	1820000040
59	Inner stationary seal ring (carbon)	2	1815600060
59	Inner stationary seal ring (SiC)	2	1815600061
60	Seal housing screw	8	1101000034
61	Outer stationary seal o-ring (viton)	2	1180000148
61	Outer stationary seal o-ring (epdm)	2	1180000161
62	Seal housing	2	1845000015
64	Inner stationary seal o-ring (viton)	2	1180000253
64	Inner stationary seal o-ring (epdm)	2	1180000278
65	Inner seal spring	2	1820000039
66	Seal pin	4	1891000013
67	Outer stationary seal ring (carbon)	2	1815600062
68	Water pipe	2	1910000010
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (epdm)	1	1180000291

Single Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000275
54	Rotating seal o-ring (EPDM)	2	1180000276
55	Rotating seal ring (FR SS*)	2	1810600076
55	Rotating seal ring (SiC)	2	1810600077
56	Seal retaining ring	2	1148000019
57	Single seal insert	2	1815600021
58	Outer seal spring	2	1820000040
59	Inner stationary seal ring (carbon)	2	1815600060
59	Inner stationary seal ring (SiC)	2	1815600061
60	Seal housing screw	8	1101000034
61	Outer stationary seal o-ring (viton)	2	1180000148
61	Outer stationary seal o-ring (epdm)	2	1180000292
62	Seal housing	2	1845000015
64	Inner stationary seal o-ring (viton)	2	1180000148
64	Inner stationary seal o-ring (epdm)	2	1180000161
65	Inner seal spring	2	1820000039
66	Seal pin	4	1891000013

Aseptic Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (epdm)	4	1180000276
55	Aseptic rotating seal ring (FR SS*)	2	1810600080
56	Seal retaining ring	2	1148000019
58	Outer seal spring	2	1820000040
59	Inner stationary seal ring (carbon)	2	1815600060
60	Seal housing screw	8	1101000034
61	Outer stationary seal o-ring (epdm)	2	1180000292
62	Aseptic seal housing	2	1845000024
63	Seal housing o-ring (epdm)	2	1180000292
64	Inner stationary seal o-ring (epdm)	2	1180000278
65	Inner seal spring	2	1820000039
66	Seal pin	4	1891000013
67	Outer stationary seal ring (carbon)	2	1815600062
68	Water pipe	2	1910000010
69	Small seal housing o-ring (epdm)	1	1180000291

Double O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	8	1101000030
64	Inner stationary seal o-ring (viton)	2	1180000253
64	Inner stationary seal o-ring (EPDM)	2	1180000278
68	Water pipe	2	1910000010
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (epdm)	1	1180000291
70	Seal o-ring (viton)	2	1180000233
70	Seal o-ring (epdm)	2	1180000366
72	Seal housing	2	1845000016

Single O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	8	1101000041
64	Inner stationary seal o-ring (viton)	2	1180000253
64	Inner stationary seal o-ring (EPDM)	2	1180000278
70	Seal o-ring (viton)	2	1180000233
70	Seal o-ring (epdm)	2	1180000366
71	Seal housing	2	1845000017

FR SS = chrome oxide coated stainless steel*

FKL 150 Seal Part Numbers

Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000112
54	Rotating seal o-ring (EPDM)	2	1180000286
55	Rotating seal ring (FR SS*)	2	1810600066
55	Rotating seal ring (SiC)	2	1810600067
56	Seal retaining ring	2	1148000016
58	Outer seal spring	2	1820000022
59	Inner stationary seal ring (carbon)	2	1815600051
59	Inner stationary seal ring (SiC)	2	1815600054
60	Seal housing screw	12	1101000030
61	Outer stationary seal o-ring (viton)	2	1180000225
61	Outer stationary seal o-ring (epdm)	2	1180000298
62	Seal housing	2	1845000006
64	Inner stationary seal o-ring (viton)	2	1180000231
64	Inner stationary seal o-ring (epdm)	2	1180000282
65	Inner seal spring	2	1820000021
66	Seal pin	2	1891000009
67	Outer stationary seal ring (carbon)	2	1815600073
68	Water pipe	2	1910000001
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (epdm)	1	1180000291

Single Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000112
54	Rotating seal o-ring (EPDM)	2	1180000286
55	Rotating seal ring (FR SS*)	2	1810600066
55	Rotating seal ring (SiC)	2	1810600067
56	Seal retaining ring	2	1148000016
57	Single seal insert	2	1815600022
58	Outer seal spring	2	1820000022
59	Inner stationary seal ring (carbon)	2	1815600051
59	Inner stationary seal ring (SiC)	2	1815600054
60	Seal housing screw	12	1101000030
61	Outer stationary seal o-ring (viton)	2	1180000225
61	Outer stationary seal o-ring (epdm)	2	1180000298
62	Seal housing	2	1845000006
64	Inner stationary seal o-ring (viton)	2	1180000231

Aseptic Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (EPDM)	4	1180000286
55	Aseptic rotating seal ring (FR SS*)	2	1810600081
56	Seal retaining ring	2	1148000016
58	Outer seal spring	2	1820000022
59	Inner stationary seal ring (carbon)	2	1815600051
60	Seal housing screw	12	1101000030
61	Outer stationary seal o-ring (epdm)	2	1180000298
62	Aseptic seal housing	2	1845000025
63	Seal housing o-ring (epdm)	2	1180000292
64	Inner stationary seal o-ring (epdm)	2	1180000255
65	Inner seal spring	2	1820000021
66	Seal pin	2	1891000009
67	Outer stationary seal ring (carbon)	2	1815600073
68	Water pipe	2	1910000001
69	Small seal housing o-ring (epdm)	2	1180000291

Double O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	12	1101000030
63	Seal housing o-ring	2	1180000232
64	Inner stationary seal o-ring (viton)	2	1180000231
64	Inner stationary seal o-ring (EPDM)	2	1180000282
68	Water pipe	2	1910000001
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (EPDM)	1	1180000291
70	Seal o-ring (viton)	2	1180000280
70	Seal o-ring (EPDM)	2	1180000281
72	Seal housing	2	1845000007

Single O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	12	1101000041
63	Seal housing o-ring (viton)	2	1180000232
64	Inner stationary seal o-ring (viton)	2	1180000231
64	Inner stationary seal o-ring (EPDM)	2	1180000282
70	Seal o-ring (viton)	2	1180000280
70	Seal o-ring (EPDM)	2	1180000281
71	Seal housing	2	1845000008

FR SS = chrome oxide coated stainless steel*

FKL 250 Seal Part Numbers

Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000217
54	Rotating seal o-ring (EPDM)	2	1180000218
55	Rotating seal ring (FR SS*)	2	1810600042
55	Rotating seal ring (SiC)	2	1810600062
56	Seal retaining ring	2	1148000015
58	Outer seal spring	2	1820000020
59	Inner stationary seal ring (carbon)	2	1815600052
59	Inner stationary seal ring (SiC)	2	1815600053
60	Seal housing screw	12	1101000034
61	Outer stationary seal o-ring (viton)	2	1180000215
61	Outer stationary seal o-ring (epdm)	2	1180000300
62	Seal housing	2	1845000005
64a	Inner stationary seal o-ring (viton)	2	1180000052
64a	Inner stationary seal o-ring (epdm)	2	1180000219
64b	Inner stationary seal o-ring (viton)	2	1180000232
65	Inner seal spring	2	1820000019
66	Seal pin	4	1891000009
67	Outer stationary seal ring (carbon)	2	1815600072
68	Water pipe	2	1910000001
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (epdm)	1	1180000291

Single Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000217
54	Rotating seal o-ring (EPDM)	2	1180000218
55	Rotating seal ring (FR SS*)	2	1810600042
55	Rotating seal ring (SiC)	2	1810600062
56	Seal retaining ring	2	1148000015
57	Single seal insert	2	1815600023
58	Outer seal spring	2	1820000020
59	Inner stationary seal ring (carbon)	2	1815600052
59	Inner stationary seal ring (SiC)	2	1815600053
60	Seal housing screw	12	1101000034
61	Outer stationary seal o-ring (viton)	2	1180000215
61	Outer stationary seal o-ring (epdm)	2	1180000300
62	Seal housing	2	1845000005
64a	Inner stationary seal o-ring (viton)	2	1180000052
64a	Inner stationary seal o-ring (epdm)	2	1180000219

Aseptic Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (EPDM)	4	1180000218
55	Aseptic rotating seal ring (FR SS*)	2	1810600082
56	Seal retaining ring	2	1148000015
58	Outer seal spring	2	1820000020
59	Inner stationary seal ring (carbon)	2	1815600052
60	Seal housing screw	12	1101000034
61	Outer stationary seal o-ring (epdm)	2	1180000300
62	Aseptic seal housing	2	1845000026
63	Seal housing o-ring (epdm)	2	1180000299
64a	Inner stationary seal o-ring (epdm)	2	1180000219
64b	Inner stationary seal o-ring (epdm)	2	1180000292
65	Inner seal spring	2	1820000019
66	Seal pin	2	1891000009
67	Outer stationary seal ring (carbon)	2	1815600072
68	Water pipe	2	1910000001
69	Small seal housing o-ring (epdm)	1	1180000291

Double O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	12	1101000034
64	Inner stationary seal o-ring (viton)	2	1180000052
64	Inner stationary seal o-ring (EPDM)	2	1180000219
68	Water pipe	2	1910000001
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-rinepdm)	1	1180000291
70	Seal o-ring (viton)	2	1180000234
70	Seal o-ring (epdm)	2	1180000235
72	Seal housing	2	1845000009

Single O-ring Seal			
Item No.	**Description**	**Qty.**	**Part No.**
60	Seal housing screw	12	1101000035
64	Inner stationary seal o-ring (viton)	2	1180000052
64	Inner stationary seal o-ring (EPDM)	2	1180000219
70	Seal o-ring (viton)	2	1180000234
70	Seal o-ring (epdm)	2	1180000235
71	Seal housing	2	1845000003

FR SS = chrome oxide coated stainless steel*

FKL 400 Seal Part Numbers

Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000216
54	Rotating seal o-ring (EPDM)	2	1180000265
55	Rotating seal ring (FR SS*)	2	1810600074
55	Rotating seal ring (SiC)	2	1810600086
56	Seal retaining ring	2	1148000017
58	Outer seal spring	2	1820000024
59	Inner stationary seal ring (carbon)	2	1815600055
59	Inner stationary seal ring (SiC)	2	1815600056
60	Seal housing screw	12	1101000038
61	Outer stationary seal o-ring (viton)	2	1180000240
61	Outer stationary seal o-ring (EPDM)	2	1180000163
62	Seal housing	2	1845000004
64a	Inner stationary seal o-ring (viton)	2	1180000239
64a	Inner stationary seal o-ring (epdm)	2	1180000266
64b	Inner stationary seal o-ring (viton)	2	1180000225
65	Inner seal spring	2	1820000023
66	Seal pin	4	1891000010
67	Outer stationary seal ring (carbon)	2	1815600074
68	Water pipe	2	1910000001
69	Small seal housing o-ring (viton)	1	1180000293
69	Small seal housing o-ring (epdm)	1	1180000291

Single Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (viton)	2	1180000216
54	Rotating seal o-ring (EPDM)	2	1180000265
55	Rotating seal ring (FR SS*)	2	1810600074
55	Rotating seal ring (SiC)	2	1810600086
56	Seal retaining ring	2	1148000017
57	Single seal insert	2	1815600024
58	Outer seal spring	2	1820000024
59	Inner stationary seal ring (carbon)	2	1815600055
59	Inner stationary seal ring (SiC)	2	1815600056
60	Seal housing screw	12	1101000038
61	Outer stationary seal o-ring (viton)	2	1180000240
61	Outer stationary seal o-ring (EPDM)	2	1180000163
62	Seal housing	2	1845000004
64a	Inner stationary seal o-ring (viton)	2	1180000239
64a	Inner stationary seal o-ring (epdm)	2	1180000266

Aseptic Double Mechanical Seal			
Item No.	**Description**	**Qty.**	**Part No.**
54	Rotating seal o-ring (EPDM)	4	1180000265
55	Aseptic rotating seal ring (FR SS*)	2	1810600083
56	Seal retaining ring	2	1148000017
58	Outer seal spring	2	1820000024
59	Inner stationary seal ring (carbon)	2	1815600055
60	Seal housing screw	12	1110100038
61	Outer stationary seal o-ring (EPDM)	2	1180000163
62	Aseptic seal housing	2	1845000027
63	Seal housing o-ring (epdm)	2	1180000163
64a	Inner stationary seal o-ring (epdm)	2	1180000266
64b	Inner stationary seal o-ring (epdm)	2	1180000298
65	Inner seal spring	2	1820000023
66	Seal pin	4	1891000010
67	Outer stationary seal ring (carbon)	2	1815600074
68	Water pipe	2	1910000001
69	Small seal housing o-ring (EPDM)	1	1180000291

FR SS = chrome oxide coated stainless steel*

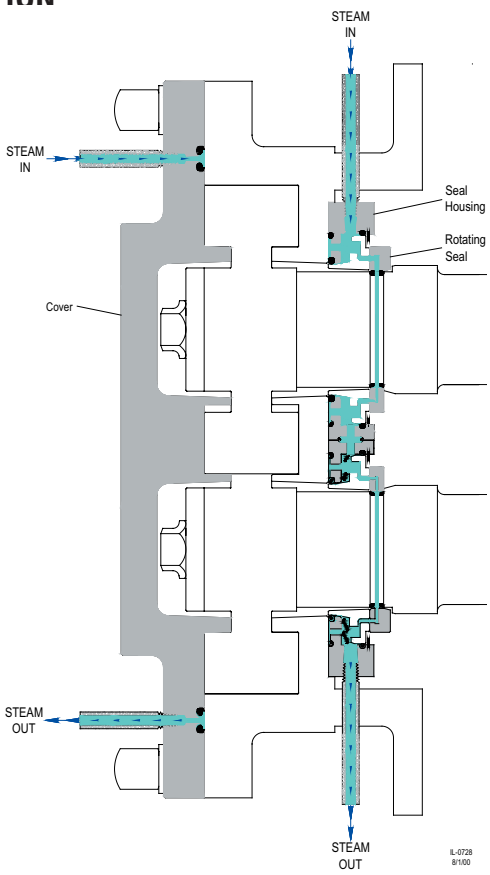
FKL Aseptic Option

Aseptic designs are available for most of the FKL models. All of the dynamic and static seals are steam traced to ensure product sterility.

Available: FKL 25 -400

Max. Pressure: 40 psi

Connections: 1/16” NPT



FKL Jacketed Cover Option

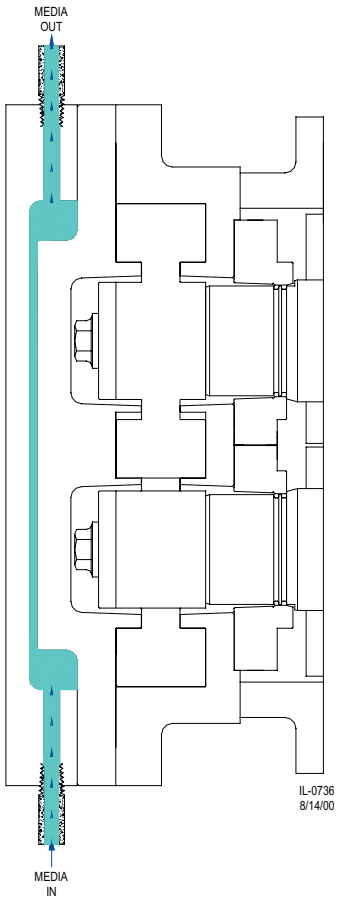
Fristam’s jacketed cover is applied directly over the existing cover. It will require longer studs and forcing screws.

Available: all models

Max. Pressure: 100 psi

Connections: 1/8” NPT - FKL 25 - 250; 1/2” NPT - FKL 400

Materials of Construction: 304 stainless steel



Troubleshooting

Fristam pumps are relatively maintenance free; however, in the event that a problem arises, the following troubleshooting chart will help you with most of your pump-related problems. If a motor or drive problem arises, please contact your local motor repair representative.

This troubleshooting chart has been prepared assuming the installed pump is suitable for the application. If you have questions about your application please contact your local pump distributor to check the system and re-evaluate the application or contact Fristam Pumps, Inc. at 1-800-841-5001 or 608-831-5001.

Problem	Cause	Solution
No product flow, pump not turning.	Power is not getting to the drive unit.	Have qualified person check power source.
	Coupler or belts are not connected, slipping or broken.	Install, adjust or repair as necessary.
	Coupler or gear key sheared.	Replace.
No product flow, pump is turning.	Pump rotation is incorrect.	Reverse rotation.
	Valve closed in suction line.	Open valve.
	Suction line clogged or restricted.	Clear suction line.
	Pump speed too slow.	Increase speed.
	Suction line does not remain flooded.	Install foot or check valve.
	Excessive clearances in pump.	Replace out of tolerance components.
	NIPA is too low.	Improve suction conditions to increase NIPA.
Insufficient flow	Speed too low.	Adjust speed as required.
Noisy operation.	Cavitation.	Improve suction conditions to increase NIPA. Slow pump down.
	Improper assembly.	Check assembly.
	Worn or damaged pump components.	Inspect and replace components as necessary.
	Excessive forces from piping,	Support piping independently.
	Excessive discharge pressure	Reduce discharge pressure.
	Pump/drive misalignment	Realign pump and drive.
Drive overload.	Viscosity of product higher than expected.	Increase drive size.
	Higher pressure than expected.	Reduce pump speed, increase piping size.

Pump Maintenance Record

Date	Service Performed	By

Pump Maintenance Record

Date	Service Performed	By

NOTICE OF TERMS, WARRANTY PROVISIONS INCLUDING DISCLAIMERS, CLAIMS AND LIMITATION OF LIABILITY

Prices and all terms and conditions of sale are established in current price sheets and are subject to change without notice. All orders are subject to acceptance by Fristam Pumps USA Limited Partnership.

Each Fristam Pumps item is warranted to be free from manufacturing defects for a period of one (1) year from the date of shipment, providing it has been used as recommended and in accordance with recognized piping practice, and providing it has not been worn out due to severe service, such as encountered under extremely corrosive or abrasive conditions.

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All claims must be in writing and mailed or delivered by purchaser within thirty (30) days after purchaser learns the facts upon which such claim is based. Any claim not made in writing and within the time period specified above shall be deemed waived.

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If any provision of this Notice is held to be invalid, such provision shall be severed and the remaining provisions shall continue to be in force.

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