

Operating & Maintenance Manual

JEC JRZL Series

Rotary Lobe Pump



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Description

This manual contains installation, operation, assembly, disassembly and repair instructions for the JEC ZL series rotary lobe pumps.

JEC rotary lobe pumps are positive-displacement pumps with non-contact rotors and **EHEDG** (European Hygienic Equipment Design Group) certified.

JEC ZL series lobe pump design combines unique front-loading mechanical seal, O-ring and lip seal for pumping efficiency. The pump's bi-wing rotor provides easy maintenance, clean ability, gentle product handling and dependability.

The ZL series pump is available with any connection type designated and may be mounted with the inlet/outlet connections in a horizontal or vertical orientation.

The pump should be coupled to an electric-motor assembly properly specified to give the desired performance for the required application.



Safety Instructions

Think Safety

1. Do not operate the pump with safety devices (if fitted) or guards removed.
2. Only qualified personnel should operate this pump.
3. Do not start the pump until all personnel are clear.
4. Never attempt to carry out service or maintenance procedures whilst the pump is in motion.
5. Do not run the pump with the Front Cover removed.
6. Before any work is carried out on the pump, the power to the prime mover must be isolated and suitable precautions taken to ensure the power is not restored until it is safe to do so.
7. Ensure that no internal pressure exists within the pumping chamber or inter-connecting pipe-work before carrying out any maintenance work.

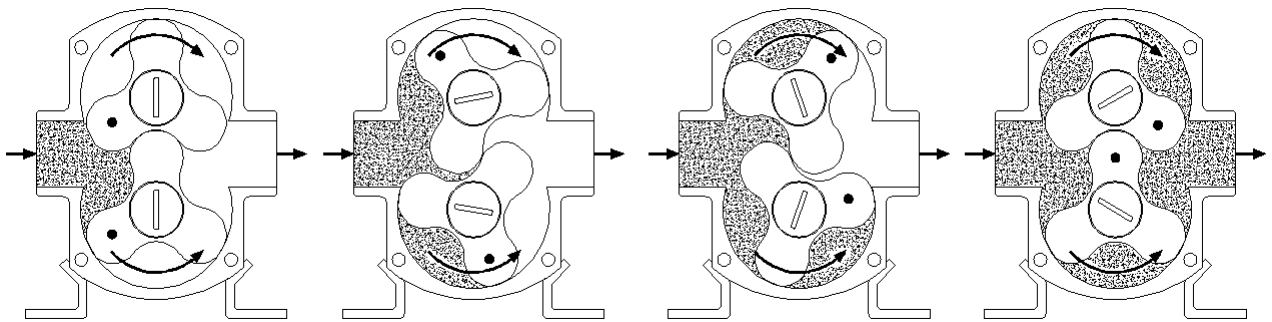
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Description of Pump

Principle of Operation

The pumps are of the positive displacement rotary type with lobed rotors. The volume at the inlet increases when the rotors rotate and the product is drawn into the pump. It is then transported in the space between the lobes and the periphery of the pump housing to the discharge side. The volume between the rotors is reduced here and the product is forced out through the outlet.



Direction of Rotation

The direction of flow is dictated by the direction of rotation of the drive shaft. Reversing the direction of rotation will reverse the flow direction. Top and bottom shaft drive

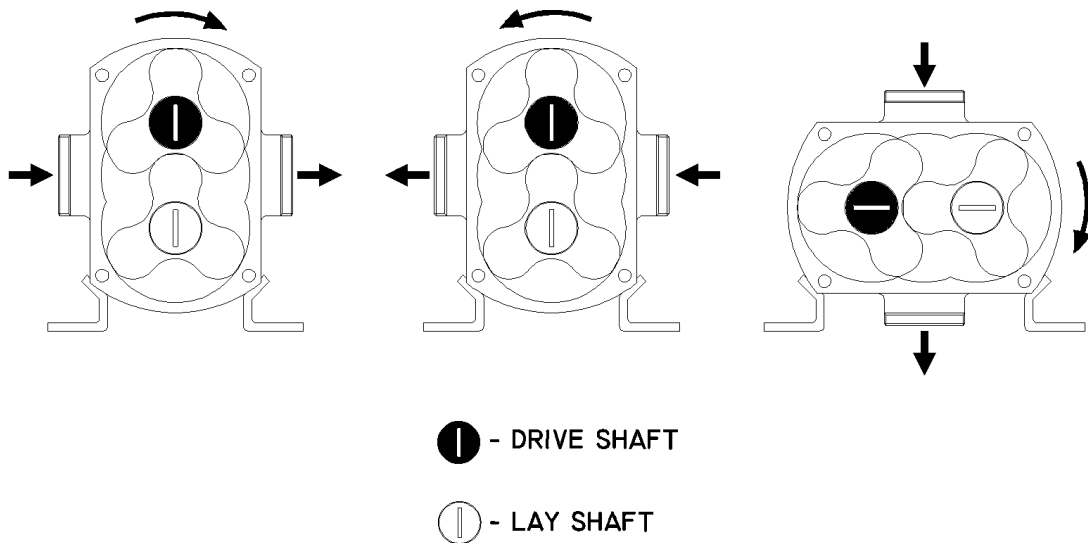


Figure 1

Technical Information

Specifications

ZL Series	Model No.	Displacement			Standard Connection Size		Max. Differential Pressure		Max. Speed
		Liters/rev	Int Gal/100rev	US Gal/100rev	mm	Inches	BAR	PSI	Rev/min
100	ZL110-005-20	0.05	1.10	1.32	25	1	20	300	1000
	ZL115-012-12	0.12	2.64	3.17	40	1.5	12	175	800
	ZL120-021-08	0.21	4.61	5.54	50	2	8	115	800
200	ZL220-041-12	0.41	9.01	10.81	50	2	12	175	700
	ZL225-062-08	0.62	13.63	16.35	65	2.5	8	115	700
300	ZL330-102-12	1.02	22.42	26.90	80	3	12	175	600
	ZL340-144-08	1.44	31.65	37.98	100	4	8	115	600
400	ZL440-227-12	2.27	49.90	59.88	100	4	12	175	500
	ZL450-334-08	3.34	73.42	88.10	150	5	8	115	500

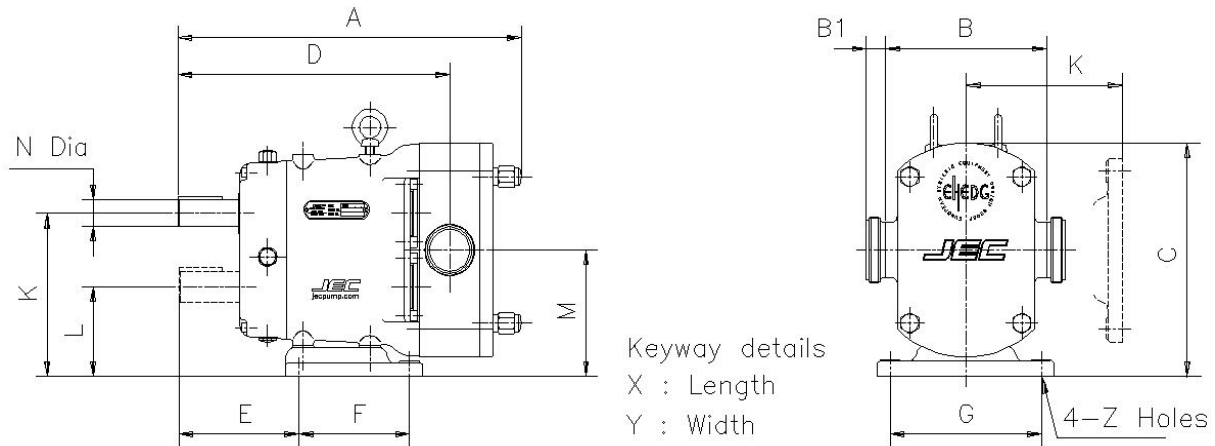
Materials of Construction

Primary Product contact	AISI 316
Gear Box	Cast Iron Stainless steel/option
Gasket (O-ring)	NBR EPDM, VITON, PTFE /option
Shaft Sleeve	Ceramic
Surface Finish for Product Contact surfaces (Ra)	0.8 μm /32 μin
Surface Finish for Shaft Sleeve surfaces (Ra)	0.1 μm /4 μin

Shaft Seals

Seal Types	Mechanical Seal
Mechanical Seal Material	Double mechanical Seal, O-ring, Lip Seal /option Tungsten Carbide Silicon Carbide/option
O-ring Material	NBR EPDM, VITON/option
Lip Seal Material	PTFE

Pump Dimensions



Model no.	Dimension															
	A	B	C	D	E	F	G	I	K	L	M	N	X	Y	Z	
ZL110-005-20	255	152	200	218	96	84	134	12	141	77	109	23	30	8	9	
ZL115-012-12	264	152	200	222	96	84	134	12	141	77	109	23	30	8	9	
ZL120-021-08	284	152	200	230	96	84	134	12	141	77	109	23	30	8	9	
ZL220-041-12	386	188	264 .5	305	129	132	180	15	185	101	143	32	50	10	11	
ZL225-062-08	406	188	264 .5	315	129	132	180	15	185	101	143	32	50	10	11	
ZL330-102-12	533	242	347 .5	390	159	160	242	22	243 .5	128 .5	186	45	60	14	13	
ZL340-144-08	546	242	347 .5	402	159	160	242	22	243 .5	128 .5	186	45	60	14	13	
ZL440-227-12	674	324	458	506	199	210	320	30	324	170	247	55	87	14	15	
ZL450-334-08	709	324	458	523	199	210	320	30	324	170	247	55	87	14	15	

Dimensions in millimeters

Model no.	Dimension B1						Weight	Volume
	Ports	ISO	BS	DIN	SMS	FLANGE	KG	CBM
ZL110-005-20	1"	20	26	30	20	30	12	0.01
ZL115-012-12	1 ½"	20	26	30	20	30	19	0.01
ZL120-021-08	2"	22	26	30	20	30	23	0.01
ZL220-034-12	2"	26	26	35	24	35	45	0.03
ZL225-052-08	2 ½"	26	26	35	24	35	51	0.03
ZL330-102-12	3"	28	26	40	24	40	91	0.06
ZL340-144-08	4"	28	26	40	24	40	103	0.06
ZL440-227-12	4"	28	26	54	35	54	180	0.15
ZL450-334-08	5"	28	26	54	35	54	210	0.15

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:

- Power sources, such as electric, air and hydraulic should be installed by trained and authorized personnel only. Installations must comply with all applicable codes and standards.
- Close to liquid source to keep suction piping to a minimize head loss due to friction.
- Low in relation to product supply to provide maximum static suction head.
- The pump and drive will be accessible for inspection, cleaning and maintenance.
- Adequate ventilation is provided for drive cooling.

Start-up Check List

1. Check that piping and pump are clean and free of foreign material, such as welding slag, gaskets, etc. Do not use pump to flush system.
2. Check to see that pump and drive are tight and leak-free. Where possible, check system with “non-hazardous” fluid.
3. Check that all guards are in place and secure.
4. See that all valves are open on discharge system, and that free flow path is open to destination.
5. See that all valves are open on inlet side, and that fluid can reach pump.
6. Check direction of pump and drive rotation (jogging is recommended).
7. Start pump drive. Where possible, start at slow speed, or jog.

“Do not rotate the shafts with the cover removed. Rotors and housing could be damaged.”

Recommended Preventive Maintenance

Recommended Seal Maintenance

Visually inspect the shaft seal regularly for leakage.

Annually replace the shaft seal under normal conditions.

Replace the shaft 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) during shaft seal replacements.

Lubrication

The pump will be supplied oil filled with Omala 150 of the Shell or equivalent. The oil level should be maintained in the center of the oil window on the side of the gear housing. The oil should be primal changed after 200 hours of operation and be changed every 4000 hours under normal conditions.

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 or bearing wear.

Recommended Torque values:

*Front cover nuts	100 ft-lbs	*Rotor bolts	60 ft-lbs
*Gear/rotor housing bolts	100 ft-lbs	*Gear lock nuts	140 ft-lbs

Maintenance

General

WARNING

The pump, when operating, can cause SEVERE INJURY to anyone in contact with the rotating parts. Turn off the energy source and LOCK OUT before dismantling pump. Use a locking device for which only the person doing the dismantling has the key.

Tool Required:

- Special tool for rotor bolt
- Spanner
- Allen wrench set
- Torque wrench
- 1/2" plastic dowel
- Soft Hammer
- Feeler gauge
- Depth Micrometer

Pump Housing Disassembly

Drain all products 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.

Reference numbers are listed in part list refer to the section view on pages 18-19

Loosen and remove the four-cover dome nuts (26) from the cover. Remove the cover (4). If it is stuck, tap on the cover with a soft hammer. Remove the cover O-ring (42).



Figure 3



Figure 2

Remove rotor-retaining bolts (6). Use the special tool supplied with pump. To remove rotor-retaining bolts, place the plastic dowel between the rotors as shown in Figure 3. Turn the first rotor bolt (6) counter-clockwise.



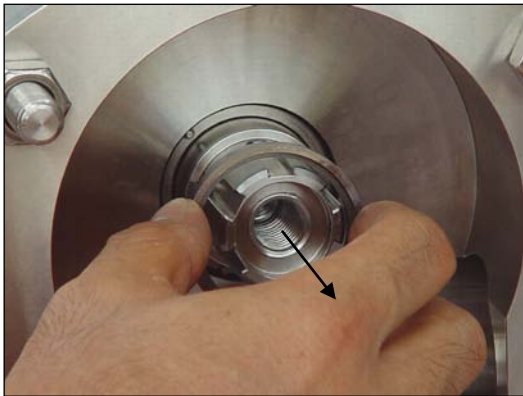
Remove the rotor bolts and spring washers.

Figure 4



Figure 5

The rotors can be removed from the pump housing (3) by pulling straight. If it is stuck tight, alternately tap on the back of the inlet and outlet ports with soft hammer as shown in Figure 8. Handle the rotors with care to avoid damage.



The seal ring can be replaced without remove the pump housing (3) and any pipe line by pulling straight.

Figure 6

Remove the four housing nuts (25) securing the pump housing to the gearbox.



Figure 7



Figure 8

Slide the pump housing away from the gear box. In this time, handle the shims (50) with care to avoid lost and damage. If the housing is stuck, alternately tap on the back of the inlet and outlet ports with a soft hammer.



Figure 9

Please handle the shims with care to avoid lost and damage when assemble and disassemble.



Figure 10



Figure 11



Figure 12

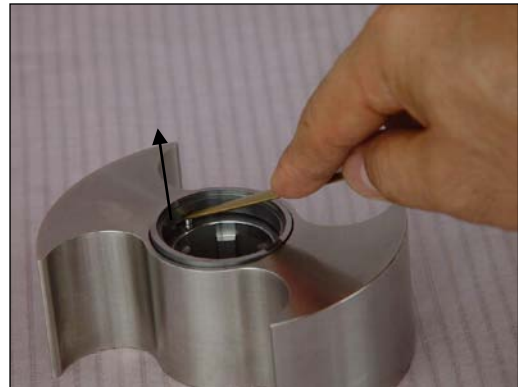
Clean and examine all of the pump components for damage. Replace damaged components as required. JEC recommends replacing all of the wetted elastomers during reassembly.

If you want replace the seal ring only, you can ease dismantle pull it off from pump housing just after removed rotors without dismantle the pump housing. And new one pushes in to pump housing.

The seal ring can be easy removed from rotor use such like a small screw driver (-) or a pin as shown in Figure 13.

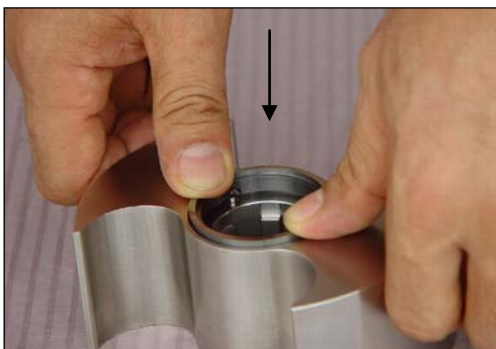


Figure 13



Pull the sea seal ring off from the rotor (5).

Figure 14



With the rotor lying face down on a table and push downward to press the seal ring in to the rotor in Figure 15.

Figure 15

Seal Assembly

Inspect each piece of your seal replacement kit for damage before installing them.

Place the pump housing face down on a table, put new seal in to the pump housing and bolts tighten. (Figure 16, 17)

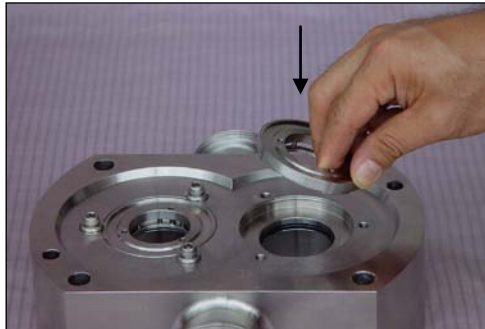


Figure 16

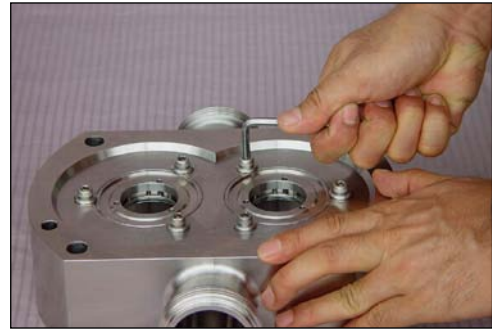


Figure 17

Pump Housing Assembly

Before install the pump housing (3) to the gearbox make sure that cleaning on the surface of pump housing and gear box and check to the shim plate between pump housing and gear box. And Install the pump housing (3) onto the gear box (1) and secure the four housing set nuts (6)

When install the ceramic shaft sleeve onto the pump shaft fit care in to pin as shown in Figure 18.

Assemble a rotor onto shaft engaging the shallow groove with small spline in rotor and seal side first in to the shaft.



Figure 18



Place the plastic dowel between the rotors as shown in Figure 10. Tighten the first rotor bolt with a special tool to the recommended torque. To tighten the second rotor place the plastic dowel on the opposite side of the rotor and tighten the second rotor bolt to the proper torque.

Install the cover (4) and tighten the dome nuts (26).

Figure 19

Use feeler gauges and depth micrometer to verify the back and redial clearances between the rotors and the housing. A depth gauge should be used to verify the front clearance.

Rotor Clearance

CAUTION

Rotor clearance must be precisely maintained to provide maximum pumping efficiency, yet prevent contact between rotors, rotor housing, and front cover during operation. If pumping efficiency is below expectations, or if parts contact has occurred during operation (Within rated differential pressure), check, rotor clearances and adjust if incorrect.

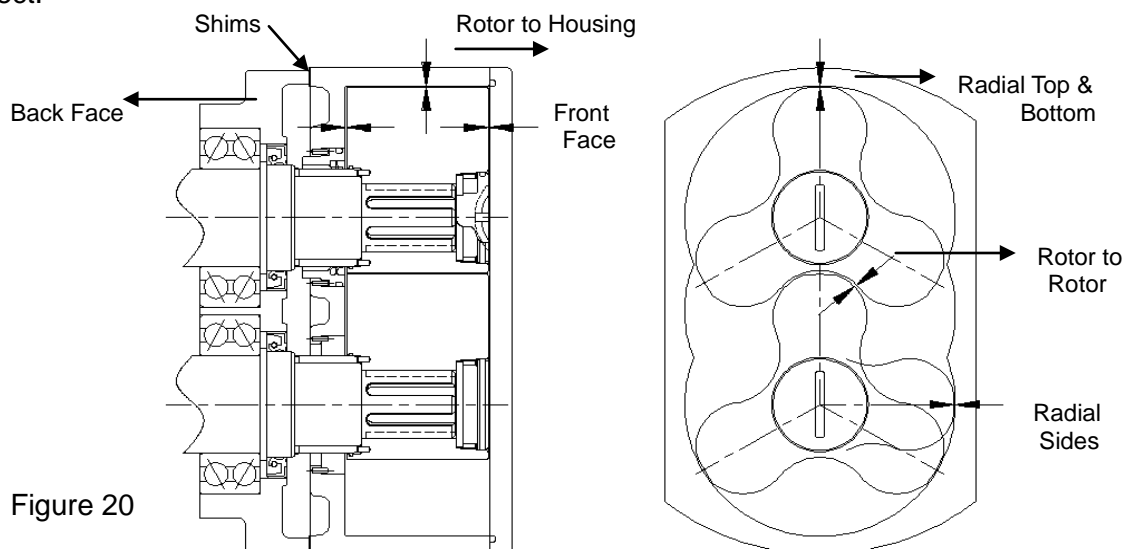


Figure 20

Standard Rotor Clearances					
Model	Back Face	Front Face	Radial Sides	Radial Top & Bottom	Rotor to Rotor
ZL110-005-20	0.15	0.15	0.15	0.12	0.12
ZL115-012-12	0.15	0.15	0.27	0.12	0.15
ZL120-021-08	0.15	0.15	0.3	0.15	0.15
ZL220-040-12	0.2	0.2	0.3	0.15	0.2
ZL225-062-08	0.2	0.2	0.4	0.2	0.2
ZL330-102-12	0.3	0.3	0.4	0.2	0.3
ZL340-144-08	0.3	0.3	0.5	0.3	0.3
ZL440-227-12	0.45	0.45	0.55	0.3	0.4
ZL450-334-08	0.45	0.45	0.7	0.45	0.4

Rotor clearances in millimeters

There are two areas of rotor clearances as illustrated following:

- Rotor tip clearance – not adjustable set by manufacturer
- Front and back face clearance – adjustable by shim

Rotor width and body depth are fixed at manufacture. Therefore, with the correct rotor size selected, the only maintenance adjustment that can be made is the proportion of front and rear clearance. Measure the front clearance as follows:

1. The rotor to rotor housing back face clearance is maintained by the shim plate (60).
2. Check that the rotor housing is tight to gearbox (1). And check the rotor bolts (6) are tight.
3. Measure the clearance between the back face of the pump housing and the back of the rotor with a filler gauge. Check the reading with the recommended back face clearance.
4. If incorrect, adjust by adding or removing shim plates (60) from behind the pump housing.
5. Check each rotor and adjust as necessary.

Rotor Timing

Rotor timing must be precisely maintained to provide maximum pumping efficiency, yet prevent contact between rotors during operation. If pumping efficiency is below expectations, or if rotors contact during operation (within rated differential pressure), check rotor timing and adjust if incorrect. Also check rotor timing after any gearbox dismantling when the gears are removed and/or replaced.

Check Rotor timing as follows:

2. Assemble each rotor in its normal location on the drive shaft and the idle shaft. Assemble each rotor bolt and tighten hand tight.
3. Rotate the shafts 30 degrees and measure gap as illustrated by arrows. Rotate the shafts 60 degrees the opposite direction and measure gap as illustrated.
4. The Rotors are correctly timed when the gap measured at both locations are equal. If the gap is unequal, adjust the timing as follows.

5. Rotor timing is determined by the relative location of the two helical gears (18) on the shafts. Gear spacers (13) are used to adjust the location and the timing. When adjusting timing, move only one of the two gears.

6. Place the wooden dowel between the rotors.
7. Bend away the tab of the lock washer (20) on one shaft. Loosen the lock nut and temporarily insert shim stock between the gear and gear spacer. Tighten the lock nut, reassemble the rotor in its correct location, and recheck rotor timing.

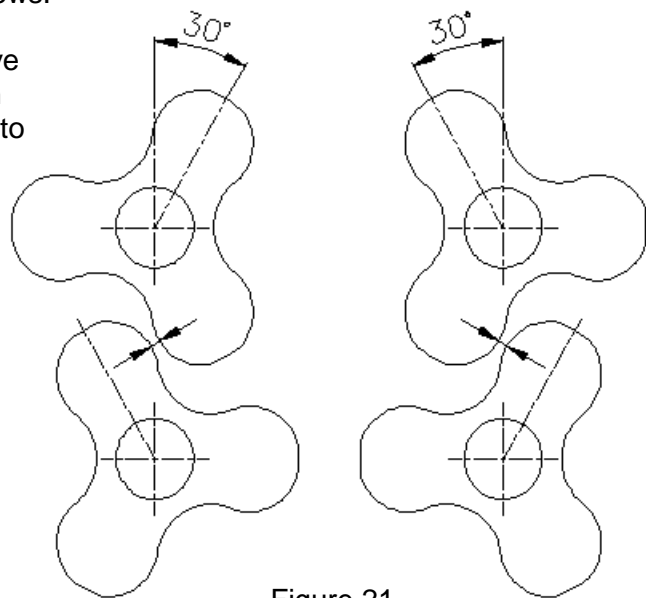


Figure 21

- * If Rotor timing is correct, remove the gear and replace added other spacer or add a shim equal in thickness to the shim stock temporarily added. Reassembly the gear and gear nut, tighten to the correct torque, and check rotor timing again to confirm that it is correct.
 - * If rotor timing is incorrect, but closer to equal than original measurement, repeat previous step adding addition shim stock.
 - * If rotor timing is incorrect and more unequal than original measurement, remove temporary shim stock from one shaft and add instead to the other shaft.
8. Repeat above procedures until the timing gap is equal after gear spacers are in place and gear nuts are tightened to correct torque.
 9. Reassemble pump.

Shaft and Bearing Replacement

WARNING

The pump, when operating, can cause SEVERE INJURY to anyone in contact with the rotating parts. Turn off the energy source and LOCK OUT before dismantling pump. Use a locking device for which only the person doing the dismantling has the key.

Tools required for Bearing Replacement

- Liquid gasket
- Bearing heater

Gearbox Disassembly

Remove the oil drain plug (36) and drain the oil.

Remove the gear box cover bolts (33) from the rear cover (2).

Pull the rear cover off the drive shaft extension. If the cover stuck use a soft hammer carefully to loosen it. Heavy hitting the hammer may be cause damage to rear cover and dowel (28).

Remove the rear cover oil seal (22) from the rear cover and discard.

Remove the liquid or paper gasket from the rear cover.

Straighten the locking tab of the bearing lock washer. Reinstall the rotors (5) on the drive and idle shafts. Lock the rotor with a plastic dowel. Remove the lock nut (19) and lock nut washer from the drive shaft (7) and idle shaft (8).

Pull the two gears (18) off the pump shafts. Remove the gear keys (14).

Remove the front bearing set bolt (32).

Place the gearbox (1), wet end down, on an arbor press.

Protect the shaft ends with a wood block and press the drive and idle shaft out of the gearbox.

Remove the rear bearing assemblies (17) from the rear cover (2) and discard.

Heat the front bearing (16) on the drive and idle shafts until they expand and drop off. Remove the bearing from the pump shafts.

Gearbox Assembly

Place the rotor (5) on a flat surface. Lubricate the front and rear bearing areas of the drive and idle shafts with oil. Insert the shafts into the rotor splines, for support. Heat the front bearing to 250°F. Place the bearing over the shaft, after the bearing cooled.

Lubricate and install the front bearing oil seals (21).

Place the gearbox over the shafts.

Position the gearbox (1) with wet end up. Insert the front bearing with shaft perpendicularly to the gearbox. There should be a tight sliding fit between the gearbox and the bearing outer rings. Press or soft hammer could be used.

Place the front bearing set bolt and washer and tightened.

Lubricate and install the rear cover oil seal (22) into the rear cover (2).

Rear bearing assemblies (17) insert into the rear cover. There should be tight sliding fit.

Heat the inner ring of the rear bearing to 250°F. Place the inner ring over the shafts with the flange end sliding over the shaft first.

Place the spacer (13) over the shafts.

Lubricate the gear area of the shaft and the face of the lock washer, with oil.

Position both shaft gear keys (14) to the 12:00 position.

Place the gear, lock washer (20) and lock nut (19) onto the shafts and hand tighten.

After the gears are installed, turn the shafts to make sure they turn freely and that the rotors (5) are timed correctly.

Use a spanner wrench to tighten the gear lock nut on the drive shaft. You can install the rotors to hold the shafts in place while you tighten the nut.

Measure rolling torque with no load on bearing. Set the torque wrench to zero while rotating, this will remove the load caused by the lip seal.

The bearing locknut should be tightened until the rolling torque on the shaft measures the values in the following table.

Tighten the locknut (19) on the idle shaft, following the previous steps.

Measure the shaft endplay to be sure it is zero. If the endplay is not zero, repeat the tightening steps. To repeat these steps, the locknut (19) will have to be backed off and the bearing will have to be tapped to remove the loadings.

Install the liquid gasket to rear cover (2) and mount the rear cover assembly over the drive shaft extension onto the gearbox.

Fill the oil reservoir with oil to the middle of the oil wind

Troubleshooting

Problem	Cause	Solution
Pump not turning	<p>Interruption of electrical power</p> <p>Key sheared or missing.</p> <p>Coupler or belts are not connected.</p> <p>Pump shaft or gears sheared.</p> <p>Wrong rotation.</p> <p>Relief valve not properly adjusted.</p>	<p>Reset circuit breaker, check fuses.</p> <p>Replace.</p> <p>Replace or adjust.</p> <p>Replace.</p> <p>Reverse.</p> <p>Adjust valve.</p>
Pump not priming	<p>Valve closed in suction lines.</p> <p>Suction line clogged or restricted.</p> <p>Air leak in connections or seal.</p> <p>Pump speed too slow.</p> <p>Suction line does not remain flooded.</p> <p>Air lock.</p> <p>Excessive clearances in pump.</p> <p>NIPA low.</p>	<p>Open valve.</p> <p>Clear suction line.</p> <p>Repair leak.</p> <p>Increase speed.</p> <p>Install foot valve.</p> <p>Bleed suction line.</p> <p>Replace out of tolerance parts</p> <p>Increase suction pressure</p>
Insufficient flow	<p>Speed too low.</p> <p>Air leak.</p>	<p>Adjust speed as required.</p> <p>Repair leak.</p>
Noisy operation	<p>Cavitations.</p> <p>Viscous product.</p> <p>High vapor pressure, high temp.</p> <p>Leaks in piping or pump.</p> <p>Dissolved gas in product.</p> <p>Mechanical noise.</p> <p>Excessive weight from piping, pump body distorted.</p> <p>Excessive discharge pressure.</p> <p>Worn bearing.</p> <p>Worn gears.</p> <p>Rotor-to-rotor contact.</p>	<p>Increase NIPA.</p> <p>Slow pump, reduce product.</p> <p>Reduce temperature.</p> <p>Repair leaks.</p> <p>Reduce discharge pressure.</p> <p>Check tolerances.</p> <p>Support piping.</p> <p>Reduce discharge pressure.</p> <p>Replace bearing.</p> <p>Replace gears</p> <p>Time rotors, replace twisted shafts, replace worn gears.</p>
Pump overloads	<p>Viscosity of product higher than expected.</p> <p>Higher pressure than expected.</p>	<p>Reduce pump speed, increase piping size,</p> <p>Reduce pump speed, increase pipe size,</p>
Play between gears	<p>Worn gear teeth.</p> <p>Gear loose on shaft.</p>	<p>Replace gear.</p> <p>Inspect gear key, keyway and shaft. If all are undamaged, retighten the gear retaining nut.</p> <p>Check for backlash.</p>

NIPA: Net Inlet Pressure Available at Pump

Section view

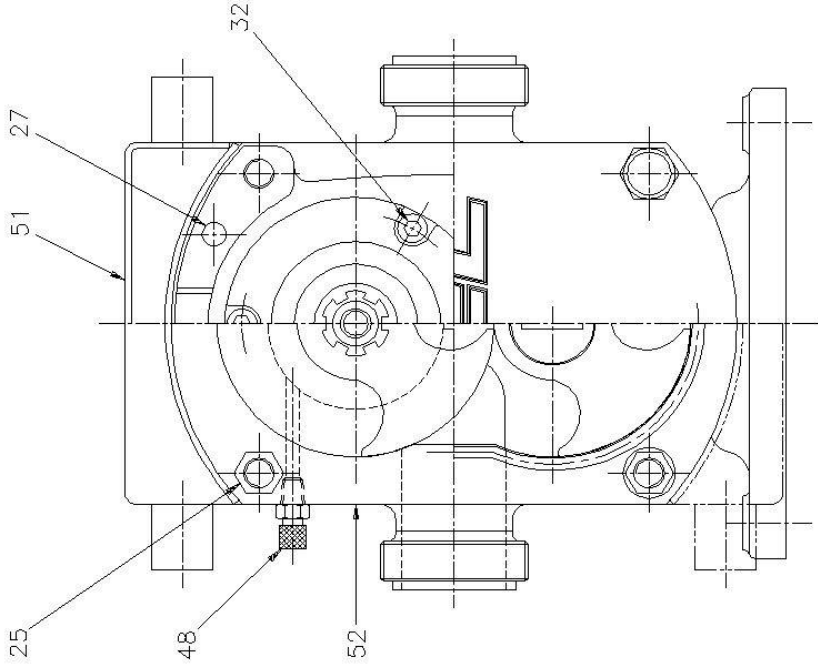


Figure 22

