



User's Manual

RX Series Pumps



Catalogue

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1 Description

This manual contains installation, operation, assembly, disassembly and repair instructions for RX Series Pumps (Models: RX01, RX02, RX2D, RX03, RX3D, RX04, RX4D, RX05, RX5D)

STURSAN RX Series bi-wing rotor pumps are positive-displacement pumps with non-contact rotors.

STURSAN RX Series bi-wing rotor design combines mechanical simplicity with pumping efficiency. The pump's bi-wing rotor provides easy maintenance, cleanability, gentle product handling and dependability. With nine pump models and a full range of options, you can match your process needs precisely.

STURSAN RX 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.

DANGER



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.

2 Technical Information

2.1 Specifications

Maximum Differential Pressure	RX01	145PSI
	RX02	130PSI
	RX2D	115PSI
	RX03, RX04, RX05	170PSI
	RX3D, RX4D, RX5D	120PSI
Maximum Inlet Pressure	100PSI	
Temperature Range	upto 350 °F	

(For temperatures over 200°F contact your local distributor or Fristam for special pump requirements).

2.2 Materials of Construction

Primary Product Contact Components	AISI 316L
Cover Gasket	Viton (standard)
Also available in	EPDM
Surface Finish for Product Contact Surfaces	32Ra (standard)

2.3 Shaft Seals

Seal Types	Single & Double Mechanical
Recommended Seal Flush Water Pressure (double seal)	1-2 PSI (60 PSI maximum)
Recommended Seal Flush Water Pressure (double seal)	3-12 gph
Stationary Seal Ring Material	Carbon
Also Available in	Silicon carbide
Rotating Seal Ring Material	Chromoxide coated stainless steel
Also Available in	Silicon carbide
O-ring material	Viton (standard)
Also Available in	EPDM and other option available

2.4 Shaft Seals

Oil Grade	
Oil Capacity - Horizontal	
RX01	(0.05 US gallons)
RX02/RX2D	(0.08 US gallons)
RX03/RX3D	(0.15 US gallons)
RX04/RX4D	(0.5 US gallons)
RX05/RX5D	(0.55 US gallons)

SAE 15W40	
Oil Capacity - Vertical	
RX01	(0.05 US gallons)
RX02/RX2D	(0.08 US gallons)
RX03/RX3D	(0.15 US gallons)
RX04/RX4D	(0.35 US gallons)
RX05/RX5D	(0.5 US gallons)



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 V dimension is shown for reference.

Table A4: Maximum Speed

RX01	RX02/RX2D	RX03/RX3D	RX04/RX4D	RX05/RX5D
1800RPM	1000RPM	800RPM	600RPM	600RPM

Table A2: Recommended torque values

	Cover/housing nuts	Rotor nut (standard)	Rotor Nut (flat cover)	Bearing Lock Nut rolling torque
RX01	5 ft-lbs	n/a	5 ft-lbs (M8)	
RX02/RX2D	15 ft-lbs	50 ft-lbs	5 ft-lbs (M8)	3 in-lbs
RX03/RX3D	30 ft-lbs	80 ft-lbs	10 ft-lbs (M10)	4 in-lbs
RX04/RX4D	45 ft-lbs	130 ft-lbs	n/a	9 in-lbs
RX05/RX5D	8 ft-lbs	180 ft-lbs	n/a	27 in-lbs

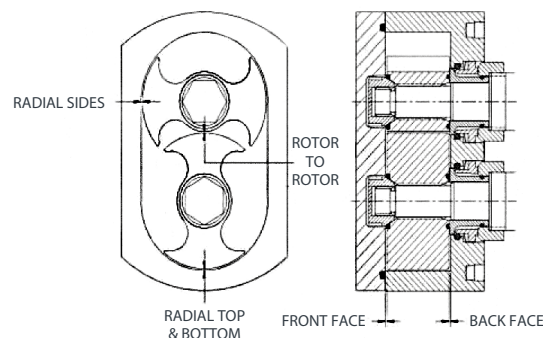


Figure 19

Table A3: Standard RX Rotor clearances

Model	Back Face	Front Face	Radial Sides	Radial Topa & Bottom	Rotor to Rotor
RX01	0.0023" - 0.0032"	0.0027" - 0.0058"	0.0036" - 0.0046"	0.0027" - 0.004"	0.0027" - 0.0048"
RX02	0.0038w - 0.0032"	0.0054" - 0.010"	0.0069" - 0.0081"	0.0044" - 0.0058"	0.0048" - 0.0064w
RX2D					
RX03	0.0054" - 0.0068"	0.007" - 0.012"	0.010" - 0.012"	0.0054" - 0.009"	0.004w - 0.008"
RX3D			0.013" - 0.014"	0.0074" - 0.011"	0.0068" - 0.010"
RX04	0.0074" - 0.010"	0.007" - 0.0012"	0.016" - 0.018"	0.006" - 0.014"	0.0074" - 0.011"
RX4D			0.019" - 0.021"	0.009" - 0.018"	0.010" - 0.015"
RX05	0.0074" - 0.010"	0.008" - 0.014"	0.018" - 0.021"	0.009" - 0.015"	0.009w - 0.014"
RX5D	0.007" - 0.010"	0.0124" - 0.0166"	0.022" - 0.024"	0.013" - 0.0185"	0.013" - 0.018"

High temperature RX Rotor clearances

Model	Back Face	Front Face	Radial Sides	Radial Topa & Bottom	Rotor to Rotor
RX01	0.0027" - 0.0036"	0.0032" - 0.0066"	0.004" - 0.007"	0.0042" - 0.0056"	0.0042" - 0.0064"
RX02	0.0046" - 0.009"	0.005" - 0.012"	0.0084" - 0.0097"	0.005" - 0.008"	0.0062" - 0.0081"
RX2D					
RX03	0.0061" - 0.011"	0.007" - 0.015"	0.011" - 0.014"	0.006" - 0.0104"	0.0063" - 0.0091"
RX3D			0.013" - 0.014"	0.0086" - 0.0111"	0.007" - 0.011"
RX04	0.010" - 0.013"	0.010" - 0.0016"	0.016" - 0.020"	0.007" - 0.0151"	0.006" - 0.014"
RX4D			0.019" - 0.023"	0.0010" - 0.019"	0.011" - 0.016"



3 Installation

3.1. Unpacking

Check the content 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.

3.2. 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.

3.3. Piping

Follow good piping practices when installing your RX 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 or if suction piping is larger than the pump inlet, use an eccentric reducer, straight side up, to prevent air pockets from forming. (Figure 2)
- 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.
- Use a check or “foot” valve on the inlet side of the pump in lift applications to keep the suction piping.

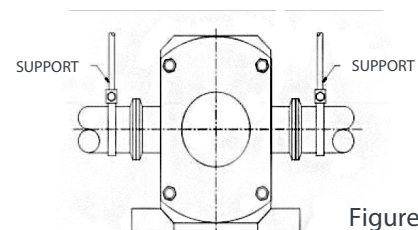


Figure 1

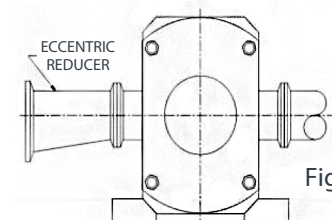


Figure 2

3.4. 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 3). 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.

3.5. 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 flange 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, 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 5). If a correction is necessary, be sure to recheck the parallel alignment.

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

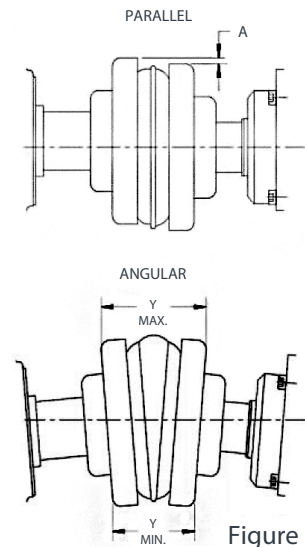


Figure 3

3.6. 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, lower head losses) can overload the motor. For technical assistance regarding operating condition changes, please contact STURSAN. Make sure that the pump is rotating in the correct direction.

3.7. Water Flush Connections

If your pump is equipped with a double mechanical seal, water must be supplied to provide cooling and lubrication. Connect supply and return lines to the water pipes supplied with product seal on your pump. See Figure 4 for the proper orientation. Use about 3-12 gallons (11-45 lph) per hour of water at 1-2 psi (0.07 - 0.14 bar).

Note: maximum pressure = 60 psi. Excessive seal pressure and/or flow rate through the product seal cavity may cause increased seal wear and shorten seal life.

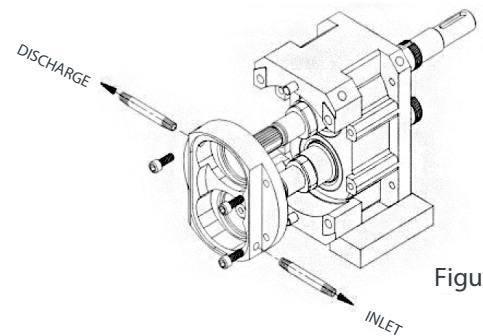


Figure 4

3.8. Unpacking

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 5) in this manual for the pump. See instructions from the drive 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. 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. Do not rotate the shafts with the cover removed. Rotors and housing could be damaged.



3.9. Cleaning Recommendations

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. Please contact your STURSAN representative for assistance.

If the process lines are to be cleaned with the pump, use a by-pass loop around the RX pump during the CIP mode to maintain pip 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.

Contact STURSAN if you have any questions.

4 Recommended Preventive Maintenance

4.1 Recommended Torque Values

Table A2, page 5.

4.2. Recommended Seal Maintenance

Visually inspect the mechanical seal regularly for leakage.

Annually replace the mechanical seal under normal conditions.

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

4.3. Elastomer Inspection

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

If the rotor nut gasket fails, the threaded hole on the rotor nut and the threads on the end of the shaft will need to be cleaned. A wire brush is recommended for cleaning these threads.

4.4. Unpacking

Gearbox - 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 4000 hours under normal conditions and every 2000 hours under severe conditions. See the oil capacity listing in the front.

Elastomers - Use a food grade lubricant on o-ring and gaskets unless otherwise specified. If using EPDM o-ring or gaskets, an oil-based lubricant can't be used.

4.5. 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.

Seal Replacement



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.

4.6. Tools required for seal replacement:

RX02/RX2D: 13 mm wrench
24 mm socket
6 mm Allen wrench
Flat cover rotor bolt tool (included w/pump)
1" socket for flat cover tool

RX04/RX4D: 19 mm wrench
41 mm socket
6 mm Allen wrench
R5/R5D: 24 mm wrench
50 mm socket

RX03/RX3D: 17 mm wrench
30 mm socket
5 mm Allen wrench
Flat cover rotor bolt tool (included w/pump)
1" socket for flat cover tool

All Models: Torque wrench
1/2" dowel
Soft-faced hammer
Small flat blade screwdriver
Feeler gauges

4.7. Pump End Disassembly



warning

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 seal.

- a) Loosen and remove the four cover dome nuts from the cover.
- b) Next remove the cover. If it is stuck, tap on the cover with a soft-faced hammer (Figure 5).
- c) Remove the cover o-ring.
- d) To remove the rotors, first loosen the first rotor, place the dowel between the rotors to prevent rotation as shown in Figure 6.

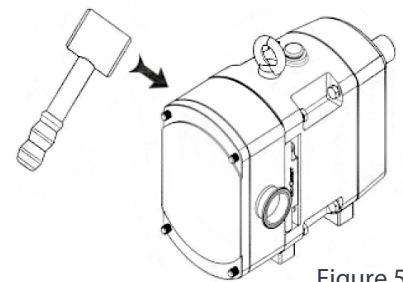


Figure 5



- e) Turn the first rotor nut counter-clockwise.
- f) Remove the rotor nut and o-ring.
- g) To loosen the other rotor, place the dowel between the rotors on the opposite side of the pump. Again turn the rotor nut counter-clockwise.
- h) Remove the rotor nut and o-ring.
- i) The rotors and rotor o-ring can now be removed from the pump housing by pulling straight. Handle the rotors with care to avoid damage. While removing the rotors watch for the stamped markings. There should be one dot on the rotor for the drive shaft and two dots on the rotor for the idle shaft.

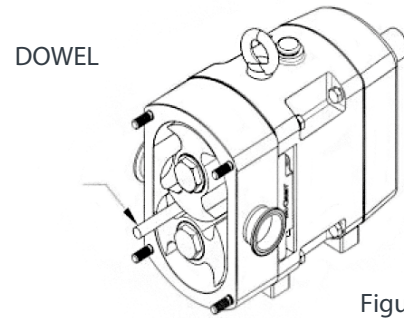


Figure 6

4.8. Remove the mechanical seal

- a) Remove the two housing nuts securing the pump housing to the gearbox.
- b) Slide the pump housing away the gearbox. If the housing is stuck, alternately tap on the inlet and outlet ports with a soft-faced hammer (Figure 7).

Note: the gapping spacers and the rotating seals will come off with the pump housing.

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

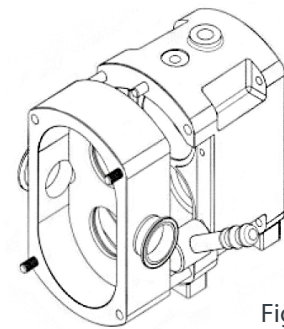


Figure 7

- c) Pull the rotating seals off the gapping spacers and remove both from the pump housing.
- d) Place the pump housing face up on a bench and rest it on the housing studs.
- e) Place your thumbs on the ID of the front stationary seals and push downward to press the stationary seals out of the pump housing.
- f) The front seal springs will come out with the stationary seals.
- g) Turn the pump housing over. Use a small flat blade screwdriver to remove the front stationary seal o-ring from the grooves in the pump housing.
- h) Discard the o-rings.
- i) Remove the gapping spacer o-ring from the grooves in the gapping spacers.

PRESS

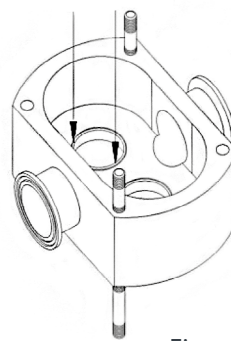


Figure 9

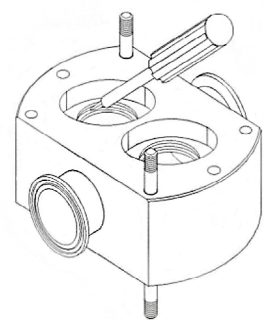


Figure 10

4.9. For all Models

- a) Install the rotor nut o-ring into the rotor nut groove on the front of the rotor.
- b) Apply one drop of removable thread lock to the shaft threads and thread the rotor nuts onto the shaft in the clockwise direction.
- c) Place the wooden dowel between the rotors as shown in Figure 18.

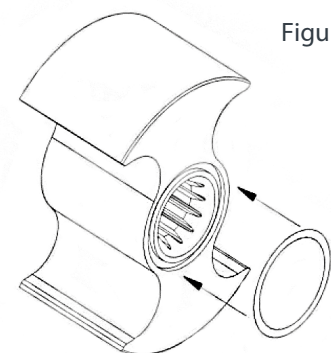


Figure 17

Tighten the first rotor nut with a socket wrench, to the recommended torque (Table A2, page 5).

d) To tighten the second rotor place the dowel on the opposite side of the pump and tighten the second rotor nut to the proper torque.

Use feeler gauges to verify the back and radial clearances between the rotors and the housing. A depth gauge should be used to verify the front clearance. (see Table A3)

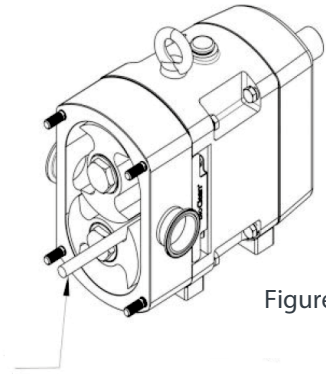


Figure 18

4.10. Back Face Clearance

The rotor to housing back face clearance is maintained by the gapping spacer.

To check the back clearance, mount the pump housing onto the gearbox. Make sure to use washers and dome nuts on the long housing studs, to secure the housing. Assemble the gapping spacer, rotor and rotor nut onto the shaft. Measure the clearance between the back face of the pump housing and the back of the rotor with a feeler gauge. Check the reading with the recommended clearance, Table A3.

4.11. Too Much Clearance

If the clearance is greater than the clearance specified in Table A3, remove the gapping spacer or the rotor and gapping spacer. Machine and lap the o-ring end of the gapping spacer to the required length. Lap the gapping spacer until the shim faces are perfectly flat and the spacer thickness is the same around the entire circumference of the shim.

Re-assemble the gapping spacer, rotor, and rotor nut. Recheck the back face clearance.

Assemble the pump wet end up as outlined in the "Pump End Assembly" section.

4.12. Not Enough Clearance

If the back clearance is less than the clearance specified in Table A3. Thicker shim must be added. Remove the gapping spacer. Install a new standard length gapping spacer. Follow the procedures outlined in the Too Much Clearance section above.

5 Pump End Assembly (cont.)

a) Install the cover o-ring into the o-ring groove in the cover. Install the cover and tighten the dome nuts.

b) Rotate the drive shaft to verify that the pump turns freely. Do not rotate the shafts with the cover removed. Rotors and housing could be damaged.

c) Check that the oil level is in the center of the oil level sight glass.

Install all required shaft guards. Install inlet and outlet piping. Verify that all valves on the suction and discharge side of the pump are open. Follow proper lockout procedures to resupply the pump drive with the power. Start the pump.



6 Shaft and/or Bearing Replacement



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.

6.1. Tools required for shaft and/or bearing replacement

RX01	RX02/RX2D	RX04/RX4D	RX03/RX3D	RX05/RX5D
· 10mm wrench	· 10mm wrench	· 17 mm wrench	· 10mm wrench	· 17 mm wrench
· 5 mm Allen wrench	· 5 mm Allen wrench	· 6 mm Allen wrench	· 5 mm Allen wrench	· 8 mm Allen wrench
	· 10 mm tube for bearings		· 15-17 mm tube for bearings	· KM12 spanner wrench

Tools for all models:

- | | | |
|----------------------------|--------------------------|----------------------------|
| · Spanner wrench | · Bearing heater | · Mild steel rod |
| · Soft-faced hammer | · Wooden dowel | · Arbor press (beneficial) |
| · Indicating torque wrench | · Flat blade screwdriver | · Feeler gauges |

7 Gearbox Disassembly

Remove the oil drain plug and drain the oil.

Remove the coupling key from the drive shaft.

RX01/RX02/RX03: remove guards.

Remove the rear cover bolts from the rear cover.

Pull the rear cover off the drive shaft extension. If the cover sticks use a soft-faced hammer to loosen it.

Remove the rear cover oil seal from the rear cover and discard.

Remove the rear cover o-ring from the rear cover and discard.

Straighten the locking tab of the bearing lock washer. Reinstall the rotors on the drive and idle shafts. Lock the rotor with a wood dowel. Remove the lock nut and lock nut washer from the drive shaft and idle shaft.

Pull the two gears off the pump shafts. Remove the gear keys.

For models RX3/RX3D/RX4/RX4D/RX5/RX5D only: Remove and discard the rear bearing o-ring from the pump shafts and rear bearing lip seals from the rear bearing bore.

Remove and discard the front bearing lip seals from the front bearing bore.

Place the gearbox, 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 from the rear bearing bores and discard.

Remove and discard the rear bearing cups from the rear bearing bores.

Remove and discard the front bearing cups from the front bearing bores.

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

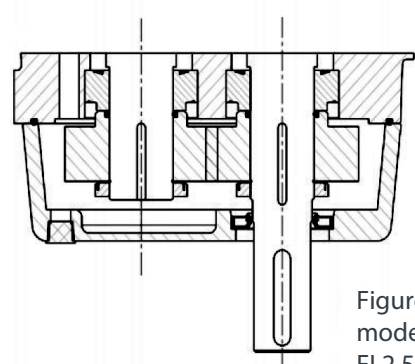


Figure 20 for models FL2 55-100

8 Gearbox Assembly

Position the gearbox with wet end up.

Unwrap the front bearing assemblies.

Insert the front bearing cups with the smaller inner diameter toward the inside of the gearbox, into the bearing bores until seated against the shoulder. There should be a tight sliding fit between the housing bore and the bearing cups.

Position the gearbox with the drive end up.

Unwrap rear bearing assemblies.

Insert the rear bearing cups, with the smaller inner diameter toward the inside of the gearbox, into the rear bearing bores until seated against the shoulder. There should be a tight sliding fit between the housing bore and the bearing cups.

Place the bi-wing rotors on a flat surface and insert the shafts into the rotor splines to stand them vertical on a flat surface.

Lubricate the front and rear bearing areas of the drive and idle shafts with grease.

Heat the front bearing cone to 250°F (110°C).

Place the cone and roller assembly over the shaft, with the larger outer diameter toward the rotor.

After the front bearing cone is cooled, use a .02 mm shim stock to check if the cone has moved. The shim stock should not be able to fit between the front bearing cone and shaft shoulder. If the shim can fit between the cone and shaft shoulder the cone will need to be pressed back into place. A piece of mild or stainless steel pipe cut to fit over the shaft and hammer could be used to seat the cone against the shaft shoulder. NOTE: Only tap on the inner cone of the race.

Pack the front cone and roller assemblies with grease for both shafts.

Place the gearbox over the shafts.

For models RX03-RX5D only: Generously apply grease to the rear bearing cups and insert into the rear bearing bore.

For models RX03-RX5D only: Pack the rear cone and roller assemblies with grease then heat the cones to 250°F (110°C).

Place the cone and roller assemblies over the shafts with the smaller diameter end sliding over the shaft first. Tap them into place if necessary. Make sure that there is some endplay.

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

For models RX03-RX5D only: Lubricate the rear bearing lip seals with oil. Press the rear bearing lip seals into the rear bearing bores. The flat side of the seal goes inside the gearbox and the recessed side should face you.

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

Place the gear, lock washer and lock nut onto the shafts and hand tighten.

After the gear are installed, turn the shafts to make sure they turn freely and that the rotors are timed correctly.

Use a spanner wrench to tighten the bearing lock nut on the drive shaft.

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.

For models RX01/RX02/RX2D: Measure rolling torque with no load on bearing, there should be zero endplay on the shafts.

The bearing locknut should be tightened until the rolling torque on the shaft measures the values in Table A3, Page 6.

Tighten the locknut on the idle shaft, following the previous steps.

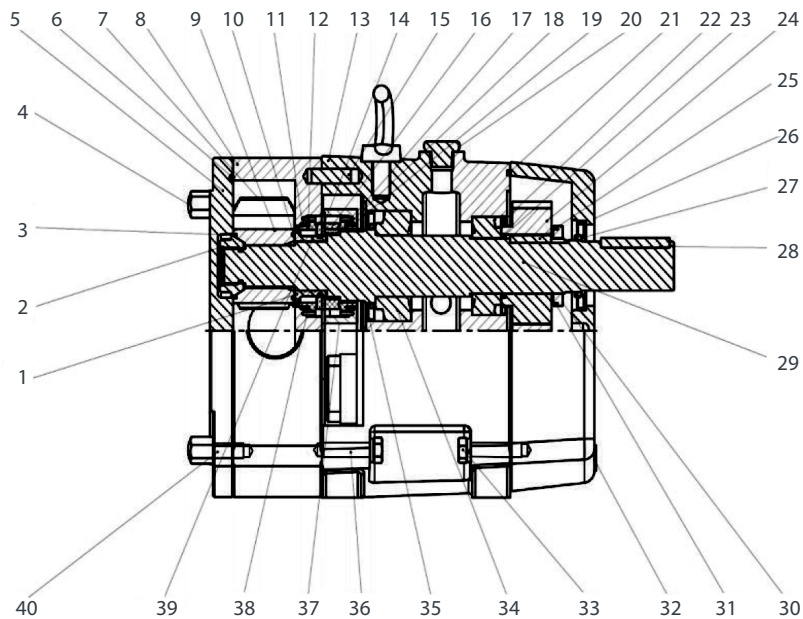
For models RX03-RX5D only: Measure the shaft endplay to be sure it is zero. If the endplay is not zero, repeat the tightening steps. To repeat these steps, the locknut will have to be backed off and the bearing will have to be tapped to remove the loading.

Lubricate and install the front bearing lip seals.

Lubricate and install the rear cover oil seal into the rear cover.

Install the rear cover o-ring 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 sight glass.





- | | |
|---------------------------------|------------------------------|
| 1 Gapping Spacer | 21 Oil Fill Plug |
| 2 Rotor Nut | 22 Rear Bearing Seal |
| 3 Rotor Nut O-ring | 23 Rear Bearing Lip Seal |
| 4 Cover/Housing Dome Nuts | 24 Gear |
| 5 Cover | 25 Rear Cover |
| 6 Cover O-ring | 26 Rear Cover Oil Seal |
| 7 Housing thru studs | 27 Coupling Key |
| 8 Pump Housing | 28 Cover Studs |
| 9 Rotor/Bi-wing Rotors | 29 Seal Flush Housing O-ring |
| 10 Rotor O-ring | 30 Drive Shaft |
| 11 Front Stationary Seal O-ring | 31 Front Seal Spring |
| 12 Front Stationary Seal | 32 Seal Flush Housing |
| 13 Gearbox | 33 Front Bearing Lip Seal |
| 14 Gapping Spacer O-ring | 34 Cover/Housing Dome Nuts |
| 15 Housing Pins | 35 Front Bearing |
| 16 Rotating Seal | 36 Rear Cover Bolt |
| 17 Rear Stationary Seal | 37 Rear Bearing |
| 18 Rear Stationary Seal O-ring | 38 Drain Plug |
| 19 Rear Cover O-ring | 39 Bearing Lock Washer |
| 20 Rear Bearing O-ring | 40 Bearing Lock Nut |

9 Troubleshooting

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



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