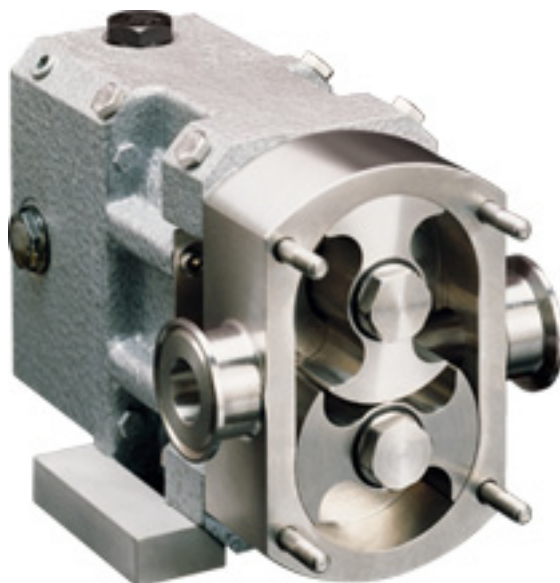


# **Fristam** **PUMPS®**

*Engineered For Lasting Performance®*

## **INSTRUCTION AND MAINTENANCE MANUAL:**

### **FL2 Series Pumps (Models: 15, 58, 75, 100 & 130)**



**Архангельск** (8182)63-90-72  
**Астана** (7172)727-132  
**Астрахань** (8512)99-46-04  
**Барнаул** (3852)73-04-60  
**Белгород** (4722)40-23-64  
**Брянск** (4832)59-03-52  
**Владивосток** (423)249-28-31  
**Волгоград** (844)278-03-48  
**Вологда** (8172)26-41-59  
**Воронеж** (473)204-51-73  
**Екатеринбург** (343)384-55-89  
**Иваново** (4932)77-34-06

**Ижевск** (3412)26-03-58  
**Иркутск** (395)279-98-46  
**Казань** (843)206-01-48  
**Калининград** (4012)72-03-81  
**Калуга** (4842)92-23-67  
**Кемерово** (3842)65-04-62  
**Киров** (8332)68-02-04  
**Краснодар** (861)203-40-90  
**Красноярск** (391)204-63-61  
**Курск** (4712)77-13-04  
**Липецк** (4742)52-20-81  
**Киргизия** (996)312-96-26-47

**Магнитогорск** (3519)55-03-13  
**Москва** (495)268-04-70  
**Мурманск** (8152)59-64-93  
**Набережные Челны** (8552)20-53-41  
**Нижегород** (831)429-08-12  
**Новокузнецк** (3843)20-46-81  
**Новосибирск** (383)227-86-73  
**Омск** (3812)21-46-40  
**Орел** (4862)44-53-42  
**Оренбург** (3532)37-68-04  
**Пенза** (8412)22-31-16  
**Казахстан** (772)734-952-31

**Пермь** (342)205-81-47  
**Ростов-на-Дону** (863)308-18-15  
**Рязань** (4912)46-61-64  
**Самара** (846)206-03-16  
**Санкт-Петербург** (812)309-46-40  
**Саратов** (845)249-38-78  
**Севастополь** (8692)22-31-93  
**Симферополь** (3652)67-13-56  
**Смоленск** (4812)29-41-54  
**Сочи** (862)225-72-31  
**Ставрополь** (8652)20-65-13  
**Таджикистан** (992)427-82-92-69

**Сургут** (3462)77-98-35  
**Тверь** (4822)63-31-35  
**Томск** (3822)98-41-53  
**Тула** (4872)74-02-29  
**Тюмень** (3452)66-21-18  
**Ульяновск** (8422)24-23-59  
**Уфа** (347)229-48-12  
**Хабаровск** (4212)92-98-04  
**Челябинск** (351)202-03-61  
**Череповец** (8202)49-02-64  
**Ярославль** (4852)69-52-93

## DESCRIPTION

This manual contains installation, operation, assembly, disassembly and repair instructions for the Fristam FL2 15, 58, 75, 100 & 130 models rotary pump.

Fristam FL2 Series bi-wing rotor pumps are positive-displacement pumps with non-contact rotors.

Fristam's FL2 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.

The FL2 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.*

## TABLE OF CONTENTS

|   |    |
|---|----|
| DESCRIPTION .....   | 2  |
| TABLE OF CONTENTS .....   | 3  |
| TECHNICAL INFORMATION .....   | 4  |
| INSTALLATION .....  | 7  |
| RECOMMENDED PREVENTIVE MAINTENANCE .....  | 9  |
| SEAL REPLACEMENT .....  | 10 |
| SINGLE SEAL ASSEMBLY DRAWING .....  | 11 |
| DOUBLE SEAL ASSEMBLY DRAWINGS .....   | 12 |
| PUMP END DISASSEMBLY .....  | 13 |
| ADDITIONAL DISASSEMBLY FOR DOUBLE SEAL ONLY.....  | 14 |
| SEAL ASSEMBLY - DOUBLE SEAL .....   | 15 |
| SEAL ASSEMBLY .....   | 15 |
| PUMP END ASSEMBLY .....   | 16 |
| SHAFT AND/OR BEARING REPLACEMENT .....  | 18 |
| GEARBOX DISASSEMBLY .....   | 18 |
| GEARBOX ASSEMBLY .....  | 19 |
| FL2 15 AND 58 (SINGLE SEAL) .....   | 21 |
| FL2 15 PART NUMBER LIST .....   | 21 |
| PUMP ASSEMBLY DRAWING .....   | 22 |
| FL2 58S PART NUMBER LIST .....  | 24 |
| FL2 58L PART NUMBER LIST .....  | 25 |
| FL2 75 AND 100 .....  | 26 |
| PUMP ASSEMBLY DRAWING .....   | 26 |
| FL2 75S PART NUMBER LIST .....  | 28 |
| FL2 75L PART NUMBER LIST .....  | 29 |
| FL2 100S PART NUMBER LIST .....   | 30 |
| FL2 100L PART NUMBER LIST .....   | 31 |
| FL2 130 .....   | 32 |
| PUMP ASSEMBLY DRAWING .....   | 32 |
| FL2 130S PART NUMBER LIST .....   | 34 |
| FL2 130L PART NUMBER LIST .....   | 35 |
| TROUBLESHOOTING.....  | 36 |
| PUMP MAINTENANCE RECORD .....   | 37 |
| NOTICE OF TERMS, WARRANTY PROVISIONS INCLUDING<br>DISCLAIMERS, CLAIMS AND LIMITATION OF LIABILITY ..... | 39 |

## TECHNICAL INFORMATION

### SPECIFICATIONS

---

|                                     |                           |              |
|-------------------------------------|---------------------------|--------------|
| Maximum Differential Pressure ..... | FL2 15 ....               | 145 PSI      |
| .....                               | FL2 58S.....              | 130 PSI      |
| .....                               | FL2 58L.....              | 115 PSI      |
| .....                               | FL2 75S, 100S & 130S..... | 170 PSI      |
| .....                               | FL2 75L, 100L & 130L..... | 120 PSI      |
| Maximum Inlet Pressure .....        |                           | 100 PSI      |
| Temperature Range .....             |                           | up to 350 °F |

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

### MATERIALS OF CONSTRUCTION

---

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

### SHAFT SEALS

---

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

### LUBRICATION

---

|                |           |
|----------------|-----------|
| Oil Grade..... | SAE 15W40 |
|----------------|-----------|

#### Oil Capacity - Horizontal

|               |                               |
|---------------|-------------------------------|
| FL2 15 .....  | 0.15 liters (0.04 US gallons) |
| FL2 58 .....  | 0.25 liters (0.07 US gallons) |
| FL2 75 .....  | 0.60 liters (0.16 US gallons) |
| FL2 100 ..... | 1.80 liters (0.48 US gallons) |
| FL2 130 ..... | 2.00 liters (0.53 US gallons) |

#### Oil Capacity - Vertical

|               |                               |
|---------------|-------------------------------|
| FL2 15 .....  | 0.15 liters (0.04 US gallons) |
| FL2 58 .....  | 0.25 liters (0.07 US gallons) |
| FL2 75 .....  | 0.50 liters (0.13 US gallons) |
| FL2 100 ..... | 1.30 liters (0.34 US gallons) |
| FL2 130 ..... | 1.80 liters (0.48 US gallons) |

**TABLE A1: WOODS SURE-FLEX COUPLING ALIGNMENT**

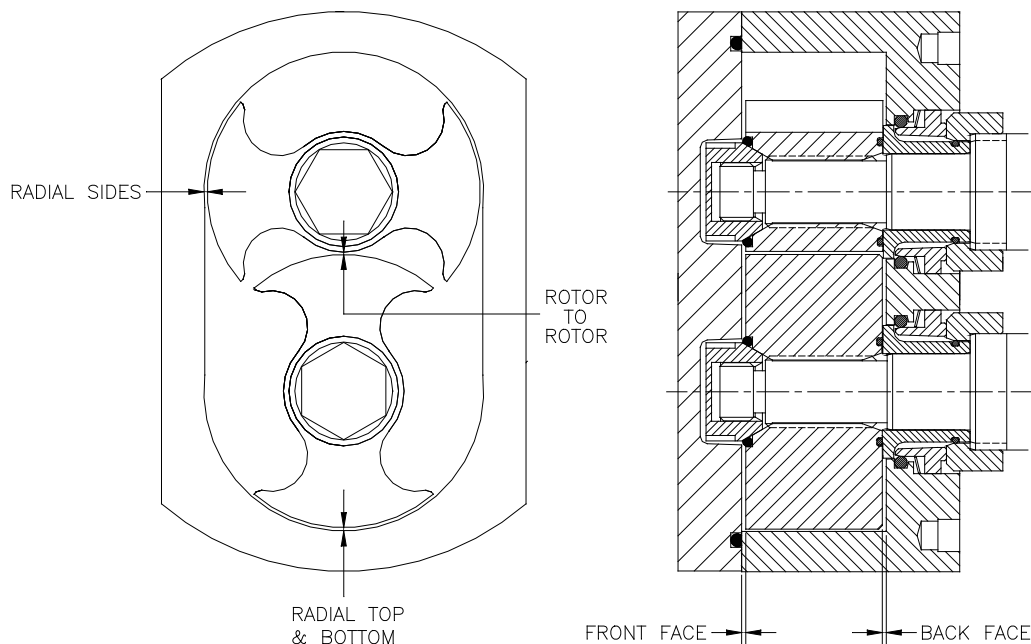
| Sleeve Size | Type E     |                         |       | Type H     |                         |       |
|-------------|------------|-------------------------|-------|------------|-------------------------|-------|
|             | Parallel A | Angular Y max. - Y min. | Y*    | Parallel A | Angular 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 "Y" dimension is shown for reference.

**TABLE A2: RECOMMENDED TORQUE VALUES:**

|           | Cover/housing nuts | Rotor nut (standard) | Rotor Nut (flat cover) | Bearing Lock Nut rolling torque |
|-----------|--------------------|----------------------|------------------------|---------------------------------|
| 15        | 5 ft-lbs.          | n/a                  | 5 ft-lbs. (M8)         |                                 |
| 58L & S   | 15 ft-lbs.         | 50 ft-lbs.           | 5 ft-lbs. (M8)         | 3 in-lbs.                       |
| 75L & S   | 30 ft-lbs.         | 80 ft-lbs.           | 10 ft-lbs. (M10)       | 4 in-lbs.                       |
| 100L & S  | 45 ft-lbs.         | 130 ft-lbs.          | n/a                    | 9 in-lbs.                       |
| 130 L & S | 80 ft-lbs.         | 180 ft-lbs.          | n/a                    | 27 in-lbs.                      |



**TABLE A3: FL2 ROTOR CLEARANCES IN MILLIMETERS (REFERS TO FIGURE 19)**

| STANDARD FL2 ROTOR CLEARANCES |                                |                                |                                  |                                  |                                |
|-------------------------------|--------------------------------|--------------------------------|----------------------------------|----------------------------------|--------------------------------|
| Model                         | Back Face                      | Front Face                     | Radial Sides                     | Radial Top & Bottom              | Rotor to Rotor                 |
| 15                            | 0.06-0.08<br>(0.0024"-0.0031") | 0.07-0.15<br>(0.0028"-0.0057") | 0.09-0.12<br>(0.0036"-0.0046")   | 0.07-0.10<br>(0.0028"-0.0039")   | 0.07-0.12<br>(0.0028"-0.0047") |
| 58S                           | 0.1-0.13<br>(0.0039"-0.0051")  | 0.14-0.23<br>(0.0055"-0.009")  | 0.175-0.205<br>(0.0069"-0.0081") | 0.115-0.145<br>(0.0045"-0.0057") | 0.12-0.16<br>(0.0047"-0.0063") |
| 58L                           |                                |                                |                                  |                                  |                                |
| 75S                           | 0.14-0.17<br>(0.0055"-0.0067") | 0.20-0.29<br>(0.008"-0.011")   | 0.264-0.294<br>(0.010"-0.012")   | 0.14-0.20<br>(0.0055"-0.008")    | 0.125-0.185<br>(0.005"-0.007") |
| 75L                           |                                |                                | 0.325-0.358<br>(0.013"-0.014")   |                                  |                                |
| 100S                          | 0.19-0.23<br>(0.0075"-0.009")  | 0.23-0.33<br>(0.008"-0.011")   | 0.4-0.446<br>(0.016"-0.018")     | 0.18-0.34<br>(0.007"-0.013")     | 0.19-0.265<br>(0.0075"-0.010") |
| 100L                          |                                |                                | 0.485-0.531<br>(0.019"-0.021")   |                                  |                                |
| 130S                          | 0.19-0.23<br>(0.0075"-0.009")  | 0.23-0.33<br>(0.009"-0.013")   | 0.46-0.53<br>(0.018"-0.021")     | 0.26-0.35<br>(0.010"-0.014")     | 0.26-0.34<br>(0.010"-0.013")   |
| 130L                          | 0.21-0.25<br>(0.008"-0.010")   | 0.32-0.42<br>(0.0125"-0.0165") | 0.55-0.62<br>(0.022"-0.024")     | 0.35-0.44<br>(0.014"-0.0175")    | 0.35-0.43<br>(0.014"-0.017")   |

| HIGH TEMPERATURE FL2 ROTOR CLEARANCES |                                |                                  |                                  |                                |                                |
|---------------------------------------|--------------------------------|----------------------------------|----------------------------------|--------------------------------|--------------------------------|
| Model                                 | Back Face                      | Front Face                       | Radial Sides                     | Radial Top & Bottom            | Rotor to Rotor                 |
| 15                                    | 0.07-0.09<br>(0.0028"-0.0035") | 0.085-0.165<br>(0.0033"-0.0065") | 0.13-0.16<br>(0.005"-0.006")     | 0.11-0.14<br>(0.0043"-0.0055") | 0.11-0.16<br>(0.0043"-0.0063") |
| 58S                                   | 0.12-0.20<br>(0.0047"-0.008")  | 0.15-0.28<br>(0.006"-0.011")     | 0.215-0.245<br>(0.0085"-0.0096") | 0.16-0.19<br>(0.006"-0.007")   | 0.16-0.2<br>(0.0063"-0.008")   |
| 58L                                   |                                |                                  |                                  |                                |                                |
| 75S                                   | 0.16-0.25<br>(0.0063"-0.010")  | 0.2-0.35<br>(0.008"-0.014")      | 0.3-0.33<br>(0.012"-0.013")      | 0.18-0.24<br>(0.007"-0.0094")  | 0.16-0.22<br>(0.0064"-0.009")  |
| 75L                                   |                                |                                  | 0.35-0.38<br>(0.014"-0.015")     |                                |                                |
| 100S                                  | 0.27-0.31<br>(0.011"-0.012")   | 0.29-0.39<br>(0.011"-0.015")     | 0.43-0.48<br>(0.017"-0.019")     | 0.21-0.37<br>(0.008"-0.015")   | 0.22-0.3<br>(0.009"-0.012")    |
| 100L                                  |                                |                                  | 0.52-0.56<br>(0.020"-0.022")     |                                |                                |

**TABLE A4: MAXIMUM SPEED**

| Pump Model | Max. Speed |
|------------|------------|
| 15         | 1800 RPM   |
| 58L & S    | 1000 RPM   |
| 75L & S    | 800 RPM    |
| 100L & S   | 600 RPM    |
| 130 L & S  | 600 RPM    |

## 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.

### PIPING

Follow good piping practices when installing your FL2 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 flooded.

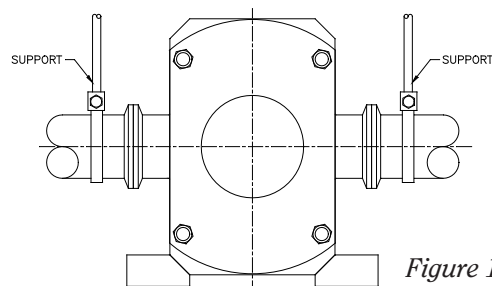


Figure 1

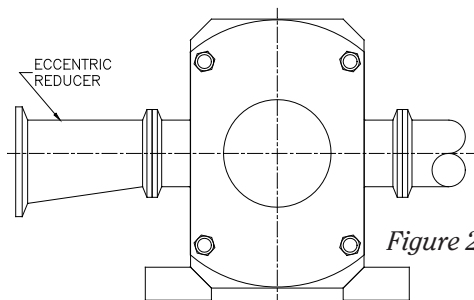


Figure 2

### 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.

### 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 5), 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.

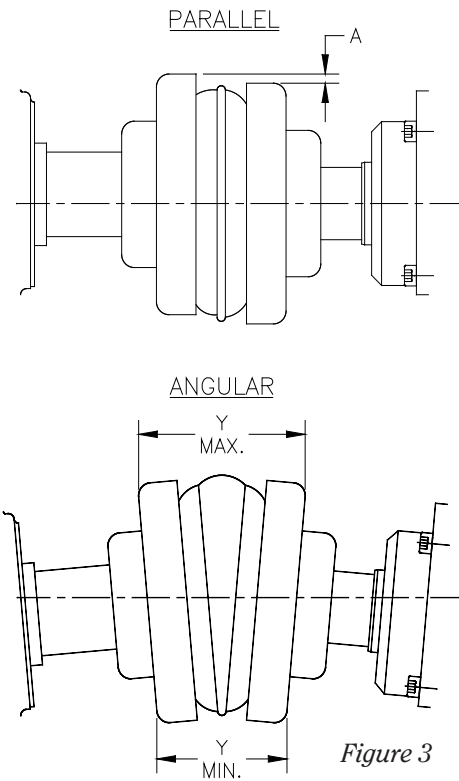


Figure 3

### 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 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 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.

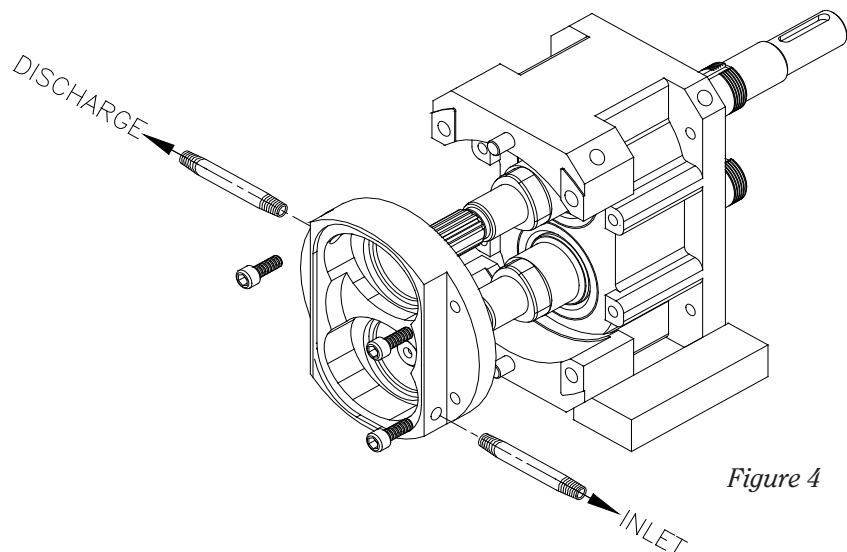


Figure 4



**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 4) 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.*

**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 Fristam representative for assistance.

If the process lines are to be cleaned with the pump, use a by-pass loop around the FL2 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 Fristam if you have any questions.

## RECOMMENDED PREVENTIVE MAINTENANCE

**RECOMMENDED TORQUE VALUES**

---

Table A2, page 5.

**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.).

**ELASTOMER INSPECTION**

---

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

Model 15: If the rotor bolt o-ring, rotor washer o-ring, or rotor o-ring fails, the threaded hole on the end of the shaft and the rotor bolt threads will need to be cleaned. We recommend removing the rotors and rotor bolts/washers while the pump is being CIP'd. This will ensure that the internal threads are cleaned before production resumes. We recommend cleaning the external threads on the rotor bolt with a wire brush.

Models 58-130: 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.

### LUBRICATION

---

*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-rings and gaskets unless otherwise specified. If using EPDM o-rings or gaskets, an oil-based lubricant can't be used.

### 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



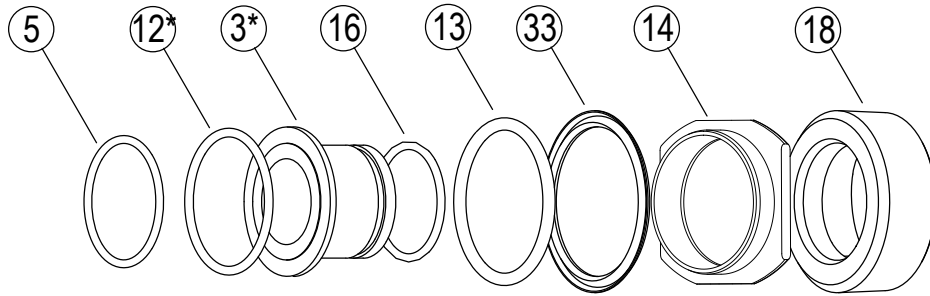
Begin all pump maintenance by disconnecting the energy source to the pump. Observe all lock out/tag out procedures as outlined by ANSI Z244.1-1982 and OSHA 1910.147 to prevent accidental start-up and injury.

### TOOLS REQUIRED FOR SEAL REPLACEMENT:

---

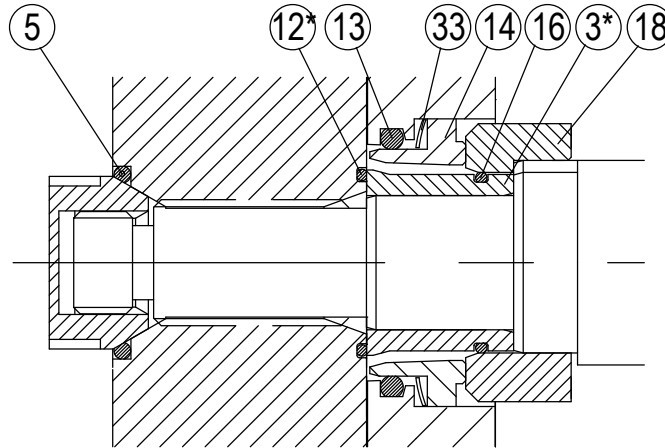
|                     |   |                       |   |
|---------------------|---|-----------------------|---|
| <i>15:</i>          | 10 mm wrench<br>5 mm Allen wrench<br>Flat cover rotor bolt tool<br>(included w/pump)<br>1" socket for flat cover tool                 | <i>100L &amp; S:</i>  | 19 mm wrench<br>41 mm socket<br>6 mm Allen wrench   |
| <i>58L &amp; S:</i> | 13 mm wrench<br>24 mm socket<br>6 mm Allen wrench<br>Flat cover rotor bolt tool<br>(included w/pump)<br>1" socket for flat cover tool | <i>130 L &amp; S:</i> | 24 mm wrench<br>50 mm socket  |
| <i>75L &amp; S:</i> | 17 mm wrench<br>30 mm socket<br>5 mm Allen wrench<br>Flat cover rotor bolt tool<br>(included w/pump)<br>1" socket for flat cover tool | <i>All Models:</i>    | Torque wrench<br>1/2" dowel<br>Soft-faced hammer<br>Small flat blade screwdriver<br>Feeler gauges |

Figure 8-B: FL2 15 - 130 Single seal assembly



**DESCRIPTION**

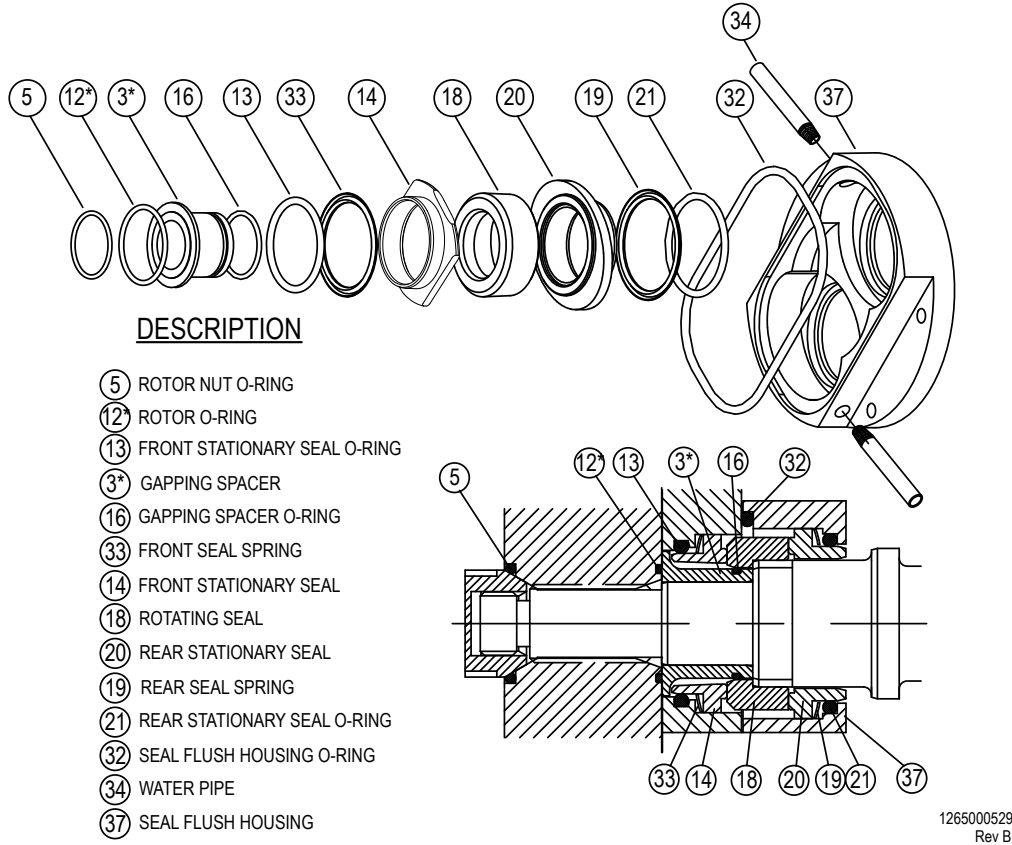
- ⑤ ROTOR NUT O-RING
- ⑫\* ROTOR O-RING
- ⑬ STATIONARY SEAL O-RING
- ⑳ SEAL WAVE SPRING
- ⑭ STATIONARY SEAL
- ⑯ GAPPING SPACER O-RING
- ③\* GAPPING SPACER
- ⑱ ROTATING SEAL



\*PARTS NOT INCLUDED IN FLII 15 PUMPS PRIOR TO MARCH 2009

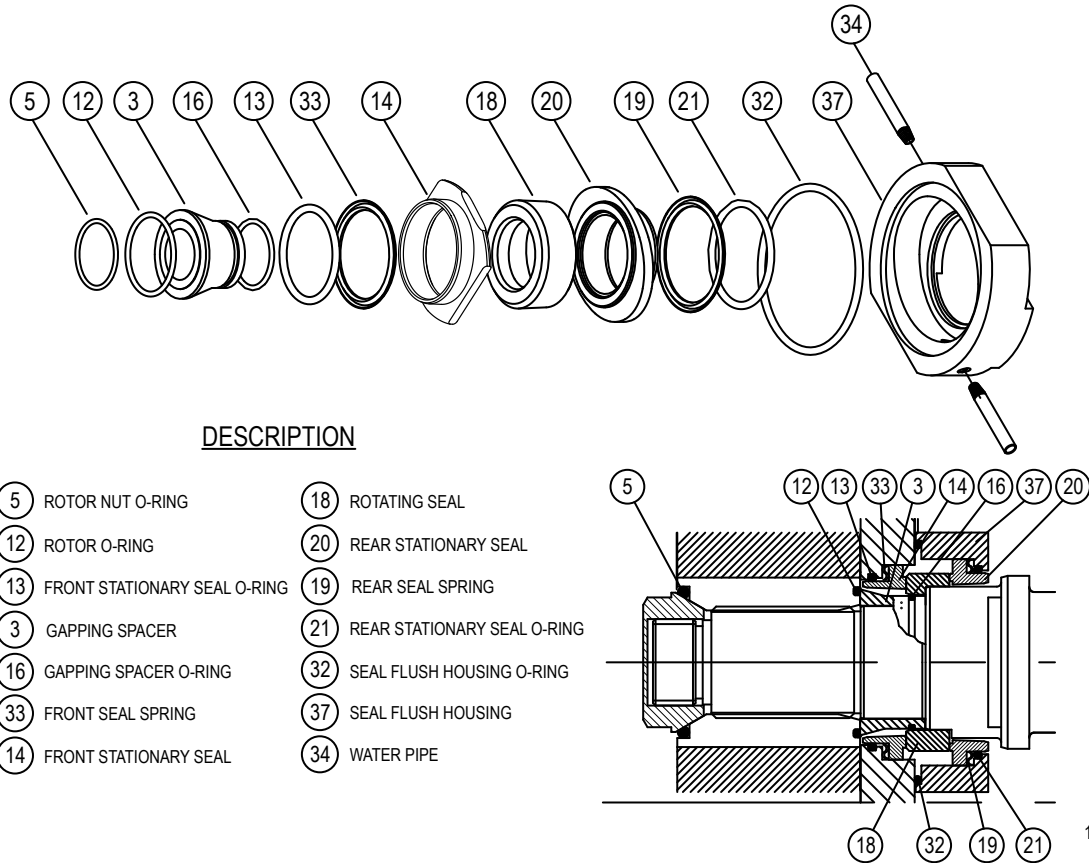
1265000528 Rev A

Figure 12-B: FL2 58 - 100 Double seal assembly



\*PARTS NOT INCLUDED IN FLII 15 PUMPS PRIOR TO MARCH 2009

Figure 12: FL2 130 Double seal assembly



## 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 as shown in *Figure 6*.

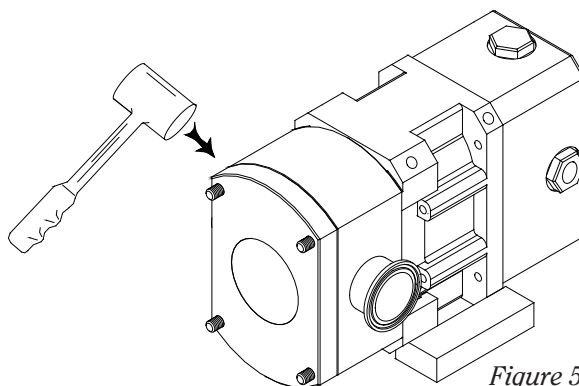


Figure 5

- e) Turn the first rotor nut counter-clockwise (models 15-75 require a Flat Cover Rotor Bolt Tool).
- 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-rings 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.

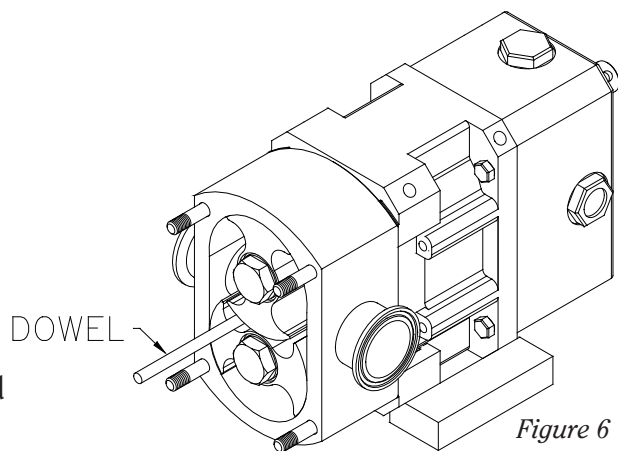


Figure 6

### REMOVE THE MECHANICAL SEAL

- a) Remove the two housing nuts securing the pump housing to the gearbox.
- b) Slide the pump housing away from 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 (except for the FL2 15).
- c) Clean and examine all of the pump components for damage. Replace damaged components as required. Fristam recommends replacing all of the wetted elastomers during reassembly.

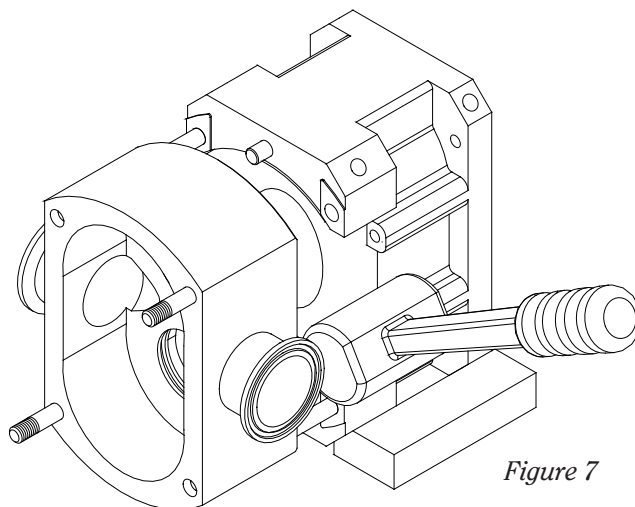


Figure 7

- d) Pull the rotating seals off the gapping spacers and remove both from the pump housing.
- e) Place the pump housing face up on a bench and rest it on the housing studs.
- f) Place your thumbs on the ID of the front stationary seals and push downward to press the stationary seals out of the pump housing (*Figure 9*).
- g) The front seal springs will come out with the stationary seals.
- h) Turn the pump housing over. Use a small flat blade screwdriver to remove the front stationary seal o-rings from the grooves in the pump housing (*Figure 10*).
- i) Discard the o-rings.
- j) Remove the gapping spacer o-rings from the grooves in the gapping spacers and discard.

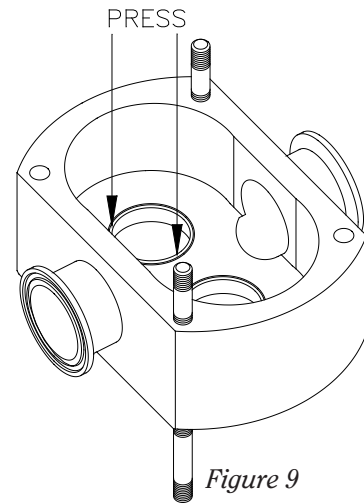


Figure 9

**ADDITIONAL DISASSEMBLY FOR DOUBLE SEAL ONLY**

For pumps with double mechanical seals, you now have to remove the rear stationary seals.

- a) Remove the seal housing o-ring from the front of the seal flush housing.  
*FL2 15 only* - pull off housing.
- b) Loosen the seal housing bolts with the Allen wrench.
- c) Place the seal flush housing face down on the bench. Place your thumbs on the ID of the rear stationary seals and push downward to press the stationary seals out of the seal flush housing (*Figure 11*).
- d) The rear seal springs and rear stationary seal o-rings will come out with the stationary seals. You are now ready to begin seal assembly.

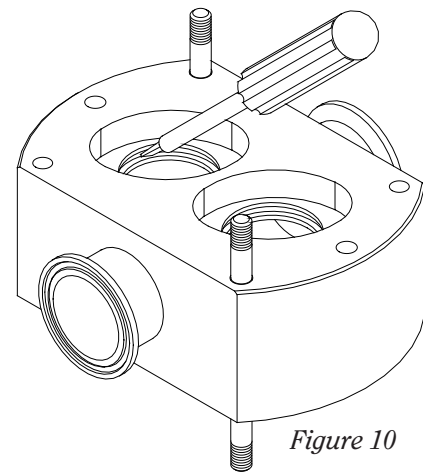
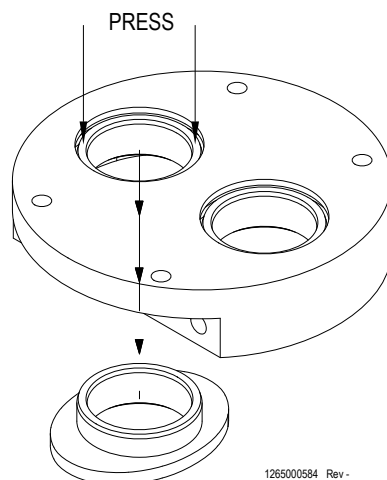
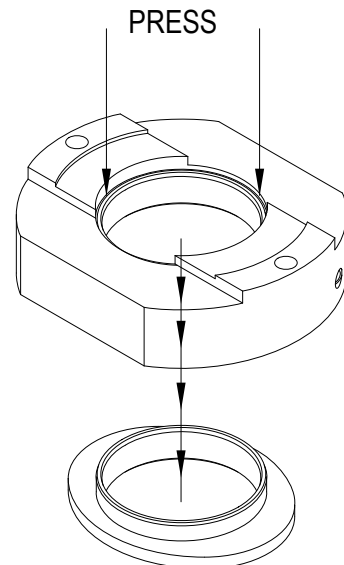


Figure 10



1265000584 Rev -

Figure 11 for models 15 - 100



1265000585 Rev -

Figure 11 for model 130

### SEAL ASSEMBLY – FOR DOUBLE SEAL ONLY

- a) Place the seal flush housing face up on a bench.
- b) Lubricate and install the rear stationary seal o-ring in the bottom of the stationary seal cavity.
- c) Install the rear stationary seal spring into the stationary recess.
- d) Install the rear stationary seals into the stationary seal cavity and press into place. Wipe the face of the stationary seals to remove any dirt or oil.
- e) Fasten the seal flush housing to the front of the gearbox.
- f) Install the seal flush housing o-ring onto the seal flush housing.

Finish assembling the seal as outlined in the “Seal Assembly” section.

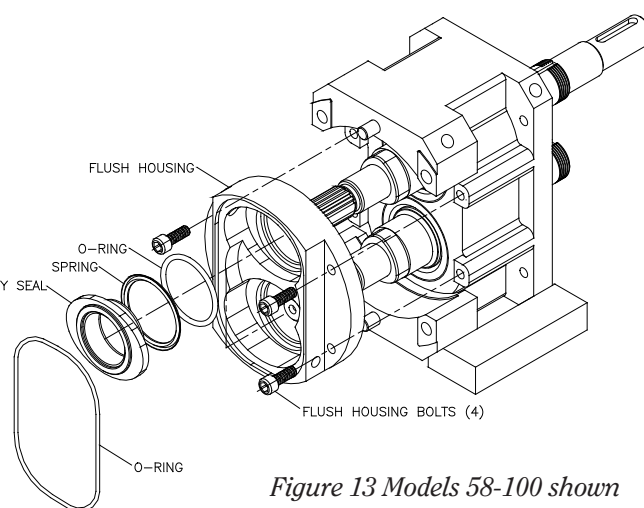
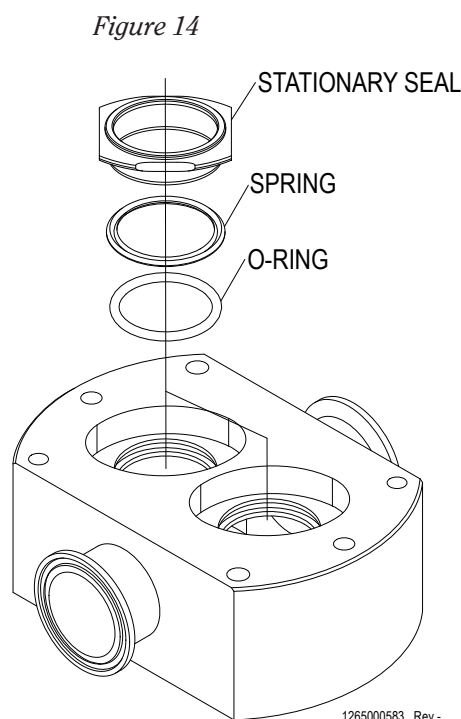


Figure 13 Models 58-100 shown

### SEAL ASSEMBLY

*Note:* when installing the new seal components make sure that you use all of the components supplied with the replacement seal kit. Using some of the old components may reduce seal life.

- a) With the pump housing lying face down on a table, lubricate and install the front stationary seal o-ring in the housing o-ring groove.
- b) Place the stationary seal spring into the stationary seal cavity in the back of the housing (*Figure 14*).
- c) Use your thumbs to install the front stationary seal into the oval shaped stationary seal cavity in the back of the housing. Wipe the face of the stationary seals to remove any dirt or oil.
- d) Install the rotating seal onto the pump shaft (*Figure 15*). *Note:* the back of the rotating seal has a triangular recess that fits on to the triangular area of the shaft.



1265000583 Rev -

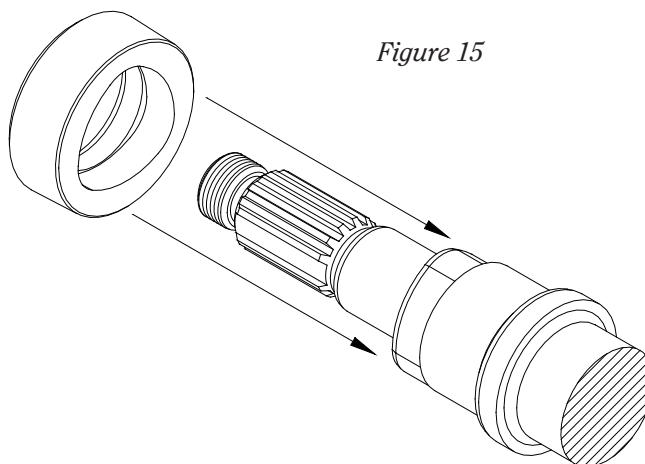


Figure 15

**PUMP END ASSEMBLY**

- a) Install the pump housing onto the gearbox and secure the housing dome nuts.

**NOTE: FOR FL2 15 PRIOR TO MARCH 2009:**

- b) Install the gapping spacer and rotor on to the appropriate shaft. Install the rotor with one dot onto the drive shaft and the rotor with two dots onto the idle shaft (*Figure 16a*).

**FOR ALL OTHER MODELS:**

- b) Install the gapping spacer o-ring into the o-ring groove on the gapping spacer.
  - Install the gapping spacer with one dot onto the drive shaft. Install the gapping spacer with two dots onto the idle shaft (*Figure 16*).
  - Install the rotor o-rings into the grooves on the back of the rotors (*Figure 17*).
  - Install the rotors, o-ring side first, into the pump housing. Install the rotor marked with one dot onto the drive shaft. Install the rotor with two dots onto the idle shaft. Note: the dots are located in the o-ring groove on the front of the rotor.

**FOR ALL MODELS:**

- c) Install the rotor nut o-rings into the rotor nut groove on the front of the rotor.
- d) Apply one drop of removable thread lock to the shaft threads and thread the rotor nuts onto the shaft in the clockwise direction.
- e) Place the wooden dowel between the rotors as shown in *Figure 18*. Tighten the first rotor nut with a socket wrench (and Flat Cover Rotor Bolt Tool on models 15-75). to the recommended torque (*Table A2, page 5*).

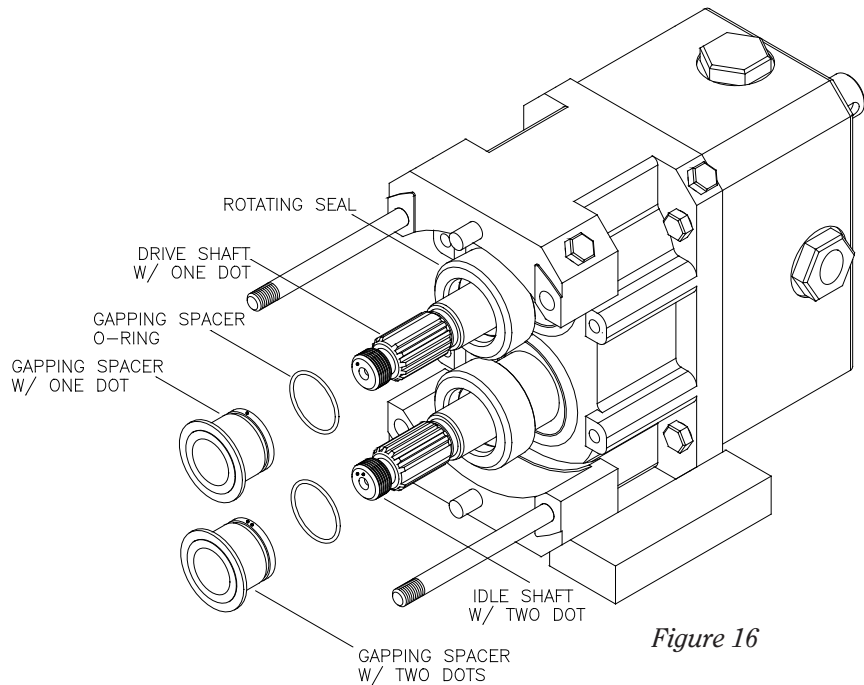


Figure 16

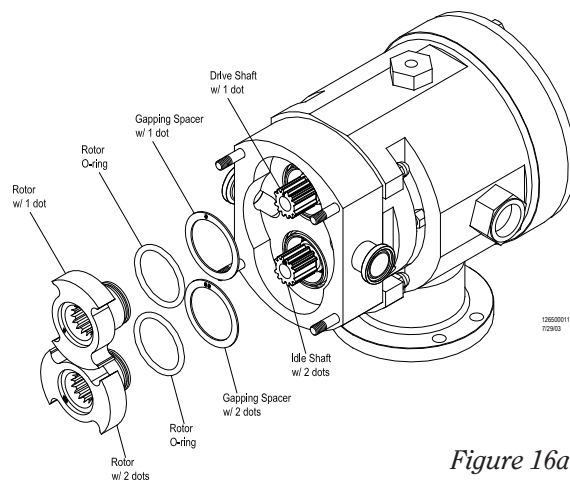


Figure 16a

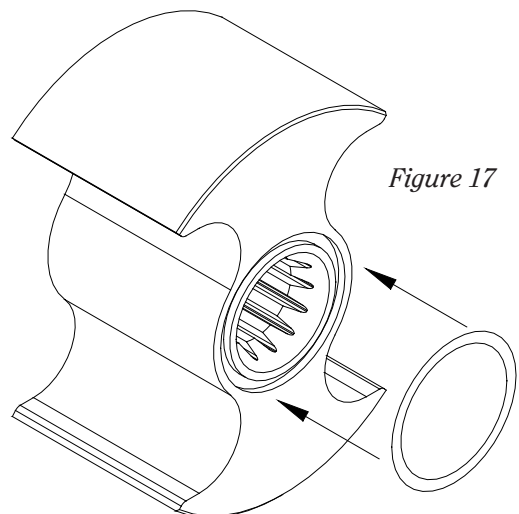


Figure 17



- f) 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*).

#### 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 housings studs, to secure the housing. Assemble the gapping spacer, rotor and rotor nut onto the shaft. (Refer to *Table A2* for the proper rotor nut torque.) 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 back face clearance, *Table A3*.

#### 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 on the FL2 15. 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. (Recommended lap compound – Liquid Diamond 14 microns)

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.

#### NOT ENOUGH CLEARANCE

If the back clearance is less than the clearance specified in *Table A3* a 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.

#### PUMP END ASSEMBLY (CONT.)

- g) Install the cover o-ring into the o-ring groove in the cover. Install the cover and tighten the dome nuts.
- h) 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.*
- i) Check that the oil level is in the center of the oil level sight glass.
- j) 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 re-supply the pump drive with the power. Start the pump.

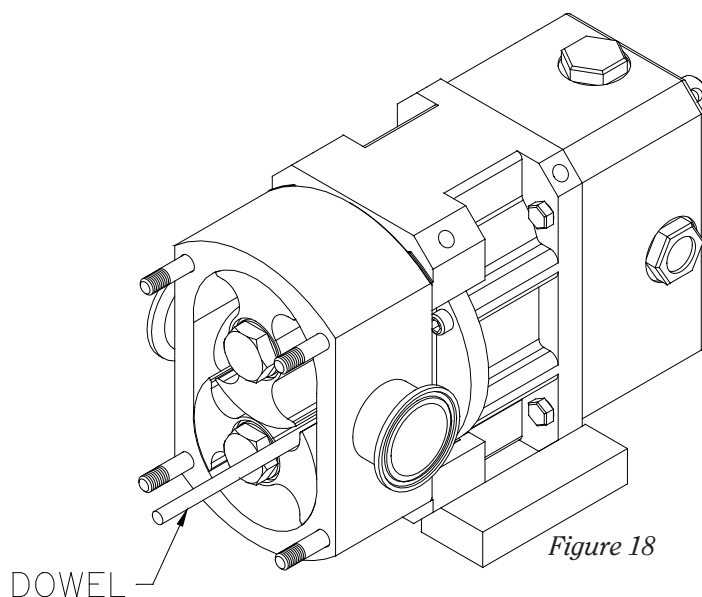


Figure 18

## SHAFT AND/OR BEARING REPLACEMENT (FOR FL2 15 - 130 MODELS)



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 SHAFT AND/OR BEARING REPLACEMENT

#### 15

- 10 mm wrench
- 5 mm Allen wrench

#### 100 L & S

- 17 mm wrench
- 6 mm Allen wrench

Tools for all models:

- Spanner wrench
- Soft-faced hammer
- Indicating torque wrench
- Bearing heater

#### 58 L & S

- 10 mm wrench
- 5 mm Allen wrench
- 10 mm tube for bearings

#### 130 L & S

- 17 mm wrench
- 8 mm Allen wrench
- KM12 spanner wrench

#### 75 L & S

- 10 mm wrench
- 5 mm Allen wrench
- 15 - 17 mm tube for bearings

- Wooden dowel
- Flat blade screwdriver
- Mild steel rod
- Arbor press (beneficial)

- Feeler gauges

### GEARBOX DISASSEMBLY

Remove the oil drain plug and drain the oil.

Remove the coupling key from the drive shaft.

*FL2 15 & 58:* 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.

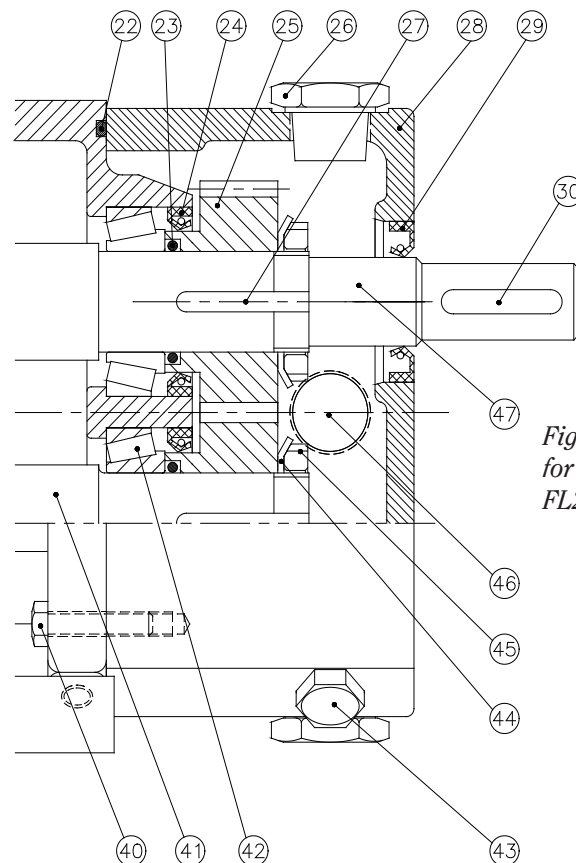


Figure 20  
for models  
FL2 55-100

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

*For FL2 75 - 130 only:* Remove and discard the rear bearing o-rings 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.

### **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.

*For FL2 75 - 130 only:* Pack the front cone and roller assemblies with grease for both shafts.

Place the gearbox over the shafts.

*For FL2 75 - 130 only:* Generously apply grease to the rear bearing cups and insert into the rear bearing bore.

*For FL2 75 - 130 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 FL2 75 - 130 only:* Place the rear bearing o-rings over the shafts and seat against the cone of the rear bearing.

*For FL2 75 - 130 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 gears 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 FL2 15 & 58:* 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 FL2 75 - 130 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.

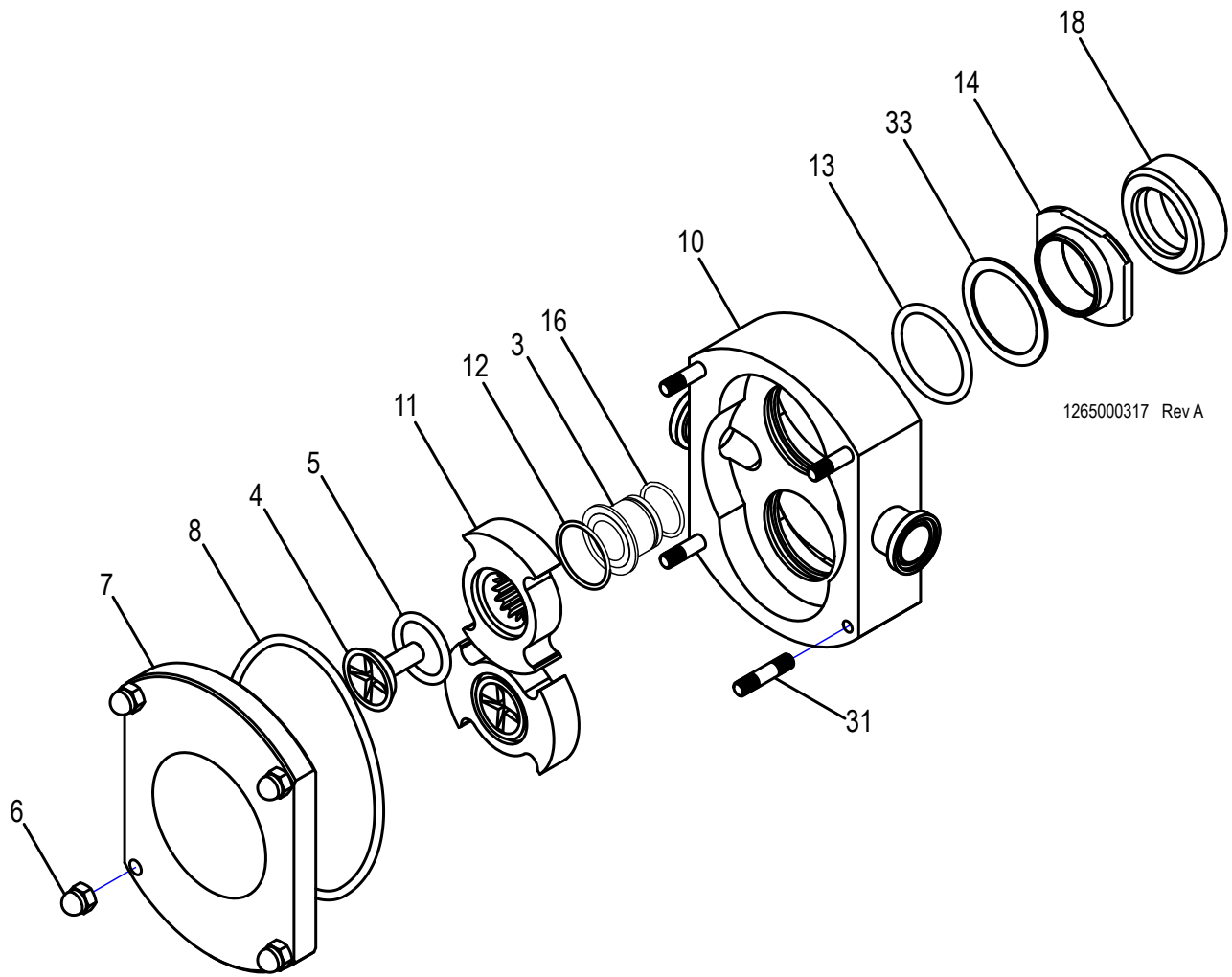
Lubricate and install the rear cover oil seal into the rear cover.

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.

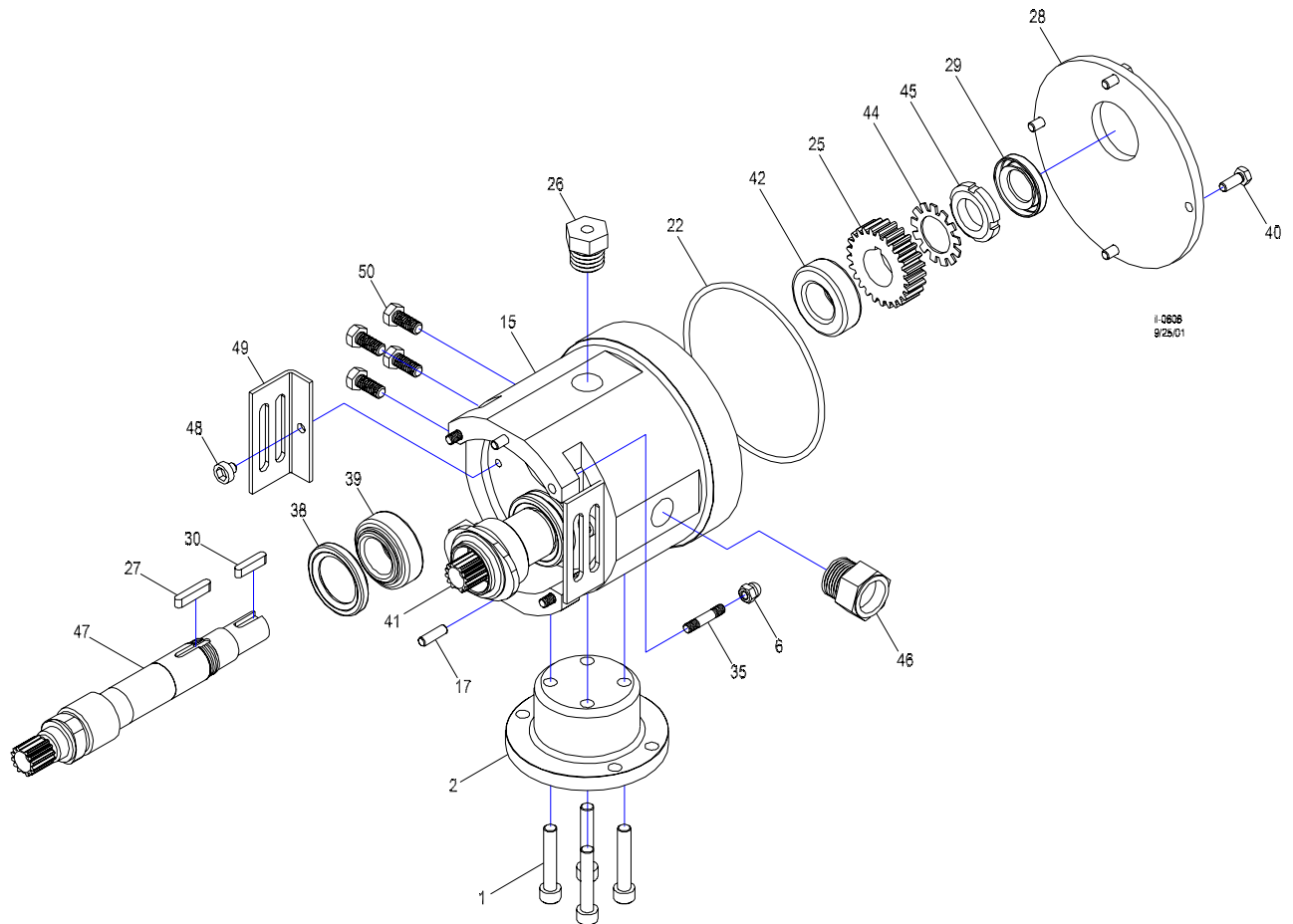
## FL2 15 PART NUMBERS

| Item No. | Description                             | Qty. | Part No.   | Item No. | Description                       | Qty. | Part No.   |
|----------|---|------|------------|----------|-----------------------------------|------|------------|
| 1        | Mounting foot bolt                      | 4    | 1101000129 | 28       | Gearbox cover                     | 1    | 1383001405 |
| 2        | Mounting foot                           | 1    | 1925001403 | 29       | Rear oil seal                     | 1    | 1812002503 |
| 3        | Gapping shim                            | 2    | 1224000110 | 30       | Coupling key                      | 1    | 1315002621 |
| 4        | Rotor nut                               | 2    | 1102004220 | 31       | Cover stud                        | 2    | 1103001406 |
| 5        | Rotor nut o-ring (viton)                | 2    | 1180000379 | 32       | Seal flush housing o-ring (viton) | 1    | 1180000234 |
|          | Rotor nut o-ring (EPDM)                 |      | 1180000393 |          | Seal flush housing o-ring (EPDM)  |      | 1180000235 |
| 6        | Cover/Housing nut                       | 8    | 1103004836 | 33       | Front seal spring                 | 2    | 1820004238 |
| 7        | Cover                                   | 1    | 1650621420 | 34       | Water pipe                        | 4    | 1910000011 |
| 8        | Cover o-ring (viton)                    | 1    | 1181000075 | 35       | Housing stud                      | 2    | 1103001407 |
|          | Cover o-ring (EPDM)                     |      | 1180000557 | 37       | Seal flush housing                | 1    | 1845001480 |
| 10       | Housing                                 | 1    | 1650611412 | 38       | Front oil seal                    | 2    | 1812002516 |
| 11       | Rotor (standard)                        | 2    | 1650631408 | 39       | Front bearing                     | 2    | 1173001002 |
|          | Rotor (high temperature)                |      | 1650631409 | 40       | Gearbox cover bolt                | 4    | 1101000040 |
| 12       | Rotor o-ring (viton)                    | 2    | 1180000121 | 41       | Idle shaft                        | 1    | 1382001461 |
|          | Rotor o-ring (EPDM)                     |      | 1180000249 | 42       | Rear bearing                      | 2    | 1173001002 |
| 13       | Front stationary seal o-ring (viton)    | 2    | 1180000380 | 44       | Bearing lock washer               | 2    | 1104001003 |
|          | Front stationary seal o-ring (EPDM)     |      | 1180000395 | 45       | Bearing lock nut                  | 2    | 1103001004 |
| 14       | Front stationary seal (carbon)          | 2    | 1815604240 | 46       | Sight glass                       | 1    | 1248000029 |
|          | Front stationary seal (silicon carbide) |      | 1815600188 | 47       | Drive shaft                       | 1    | 1382001460 |
| 15       | Gearbox                                 | 1    | 1310601401 | 48       | Guard screw                       | 2    | 1101000130 |
| 16       | Gapping shim o-ring (viton)             | 2    | 1180000326 | 49       | Guard                             | 2    | 1936001437 |
|          | Gapping shim o-ring (EPDM)              |      | 1180000347 | 50       | Bolt                              | 4    | 1101000131 |
| 17       | Pin                                     | 2    | 1891002618 | 51       | Distance screw                    | 2    | 1891001439 |
| 18       | Rotating seal (chrome oxide/SS)         | 2    | 1810604241 |          |                                   |      |            |
|          | Rotating seal (silicon carbide)         |      | 1810600149 | Tool     | Flat Cover Rotor Bolt Tool        | 1    | 1018004111 |
| 19       | Rear seal spring                        | 2    | 1820000060 | Notes:   |                                   |      |            |
| 20       | Rear stationary seal (carbon)           | 2    | 1815604242 |          |                                   |      |            |
| 21       | Rear stationary seal o-ring (buna)      | 2    | 1180000387 |          |                                   |      |            |
| 22       | Rear cover o-ring (viton)               | 1    | 1180000919 |          |                                   |      |            |
| 25       | Gear                                    | 2    | 1365001404 |          |                                   |      |            |
| 26       | Oil plug                                | 1    | 1248000023 |          |                                   |      |            |
| 27       | Gear key                                | 2    | 1315002619 |          |                                   |      |            |



## FL2 15 & 58 EXPLODED VIEW

|    |                    |    |   |
|----|--------------------|----|---|
| 1  | Mounting Foot Bolt | 13 | Front Stationary Seal O-ring                      |
| 2  | Mounting Foot      | 14 | Front Stationary Seal                             |
| 3  | Gapping Spacer     | 15 | Gearbox   |
| 4  | Rotor Nut          | 16 | Gapping Spacer O-Ring                             |
| 5  | Rotor Nut O-ring   | 17 | Pin   |
| 6  | Cover/Housing Nut  | 18 | Rotating Seal                                     |
| 7  | Cover              | 19 | Rear Seal Spring (double seal only)               |
| 8  | Cover O-ring       | 20 | Rear Stationary Seal (double seal only)           |
| 10 | Housing            | 21 | Rear Stationary Seal O-ring<br>(double seal only) |
| 11 | Rotor              | 22 | Rear Cover O-ring                                 |
| 12 | Rotor O-ring       |    |   |



|    |   |    |                                   |
|----|---|----|-----------------------------------|
| 25 | Gear  | 38 | Front Oil Seal                    |
| 26 | Oil Plug  | 39 | Front Bearing                     |
| 27 | Gear Key  | 40 | Gearbox Cover Bolt                |
| 28 | Gearbox Cover                                   | 41 | Idle Shaft                        |
| 29 | Rear Oil Seal                                   | 42 | Rear Bearing                      |
| 30 | Coupling Key                                    | 44 | Bearing Lock Washer               |
| 31 | Cover Stud                                      | 45 | Bearing Lock Nut                  |
| 32 | Seal Flush Housing O-ring<br>(double seal only) | 46 | Sight Glass                       |
| 33 | Front Seal Spring                               | 47 | Drive Shaft                       |
| 34 | Water Pipe (double seal only)                   | 48 | Guard screw (single seal only)    |
| 35 | Housing Stud                                    | 49 | Guard (single seal only)          |
| 37 | Seal Flush Housing<br>(double seal only)        | 50 | Bolt                              |
|    |   | 51 | Distance screw (double seal only) |

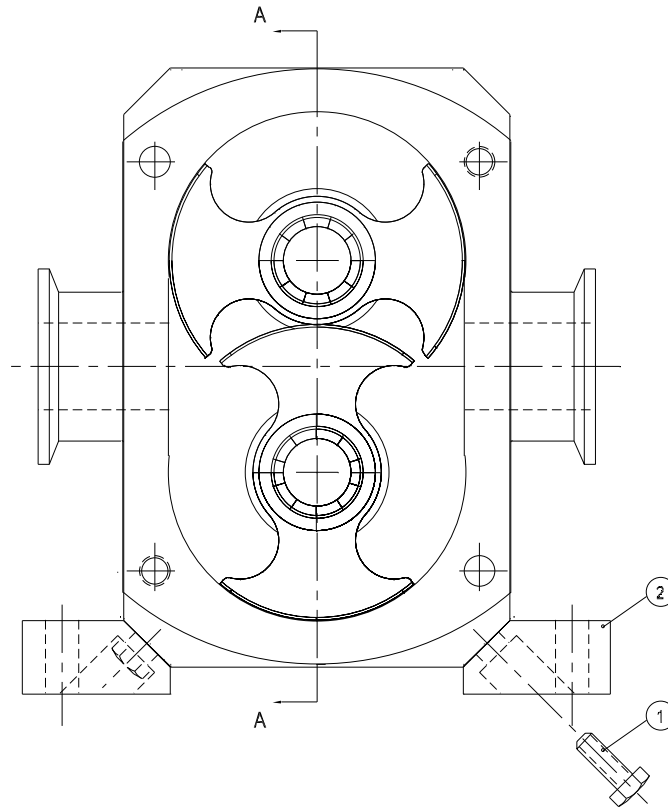
## FL2 58S PART NUMBERS

| Item No. | Description                             | Qty. | Part No.   | Item No.                                    | Description                       | Qty. | Part No.   |
|----------|---|------|------------|---|-----------------------------------|------|------------|
| 1        | Mounting foot bolt                      | 4    | 1101000129 | 28  | Gearbox cover                     | 1    | 1383001305 |
| 2        | Mounting foot                           | 1    | 1925001303 | 29  | Rear oil seal                     | 1    | 1812002503 |
| 3        | Gapping shim                            | 2    | 1224001330 | 30  | Coupling key                      | 1    | 1315002605 |
| 4        | Rotor nut                               | 2    | 1103003509 | 31  | Cover stud                        | 4    | 1103001506 |
| 5        | Rotor nut o-ring (viton)                | 2    | 1180000379 | 32  | Seal flush housing o-ring (viton) | 1    | 1180000011 |
|          | Rotor nut o-ring (EPDM)                 |      | 1180000393 |   | Seal flush housing o-ring (EPDM)  |      | 1180000005 |
| 6        | Cover/Housing nut                       | 8    | 1103004836 | 33  | Front seal spring                 | 2    | 1820004238 |
| 7        | Cover                                   | 1    | 1679621320 | 34  | Water pipe                        | 4    | 1910000011 |
| 8        | Cover o-ring (viton)                    | 1    | 1181000141 | 35  | Housing stud                      | 4    | 1103001506 |
|          | Cover o-ring (EPDM)                     |      | 1181000081 | 37  | Seal flush housing                | 1    | 1845001380 |
| 10       | Housing                                 | 1    | 1678611312 | 38  | Front oil seal                    | 2    | 1812002517 |
| 11       | Rotor (standard)                        | 2    | 1678631308 | 39  | Front bearing                     | 2    | 1173001021 |
|          | Rotor (high temperature)                |      | 1678631312 | 40  | Gearbox cover bolt                | 4    | 1101000040 |
| 12       | Rotor o-ring (viton)                    | 2    | 1180000326 | 41  | Idle shaft                        | 1    | 1382001397 |
|          | Rotor o-ring (EPDM)                     |      | 1180000347 | 42  | Rear bearing                      | 2    | 1173001021 |
| 13       | Front stationary seal o-ring (viton)    | 2    | 1180000380 | 44  | Bearing lock washer               | 2    | 1104000023 |
|          | Front stationary seal o-ring (EPDM)     |      | 1180000395 | 45  | Bearing lock nut                  | 2    | 1103001012 |
| 14       | Front stationary seal (carbon)          | 2    | 1815601340 | 46  | Sight glass                       | 1    | 1248000029 |
|          | Front stationary seal (silicon carbide) |      | 1815600189 | 47  | Drive shaft                       | 1    | 1382001396 |
| 15       | Gearbox                                 | 1    | 1310601301 | 48  | Guard screw                       | 2    | 1101000130 |
| 16       | Gapping shim o-ring (viton)             | 2    | 1180000413 | 49  | Guard                             | 2    | 1936001437 |
|          | Gapping shim o-ring (EPDM)              |      | 1180000450 | 50  | Bolt                              | 4    | 1101000131 |
| 17       | Pin                                     | 2    | 1891002606 | 51  | Distance screw                    | 2    | 1891001339 |
| 18       | Rotating seal (chrome oxide/SS)         | 2    | 1810601341 | Notes: special rotor bolt tool, see page 21 |                                   |      |            |
|          | Rotating seal (silicon carbide)         |      | 1810600150 |   |                                   |      |            |
| 19       | Rear seal spring                        | 2    | 1820000060 |   |                                   |      |            |
| 20       | Rear stationary seal (carbon)           | 2    | 1815604242 |   |                                   |      |            |
| 21       | Rear stationary seal o-ring (buna)      | 2    | 1180000569 |   |                                   |      |            |
| 22       | Rear cover o-ring (buna)                | 1    | 1180000568 |   |                                   |      |            |
| 25       | Gear                                    | 2    | 1365001304 |   |                                   |      |            |
| 26       | Oil plug                                | 1    | 1248000023 |   |                                   |      |            |
| 27       | Gear key                                | 2    | 1315002620 |   |                                   |      |            |



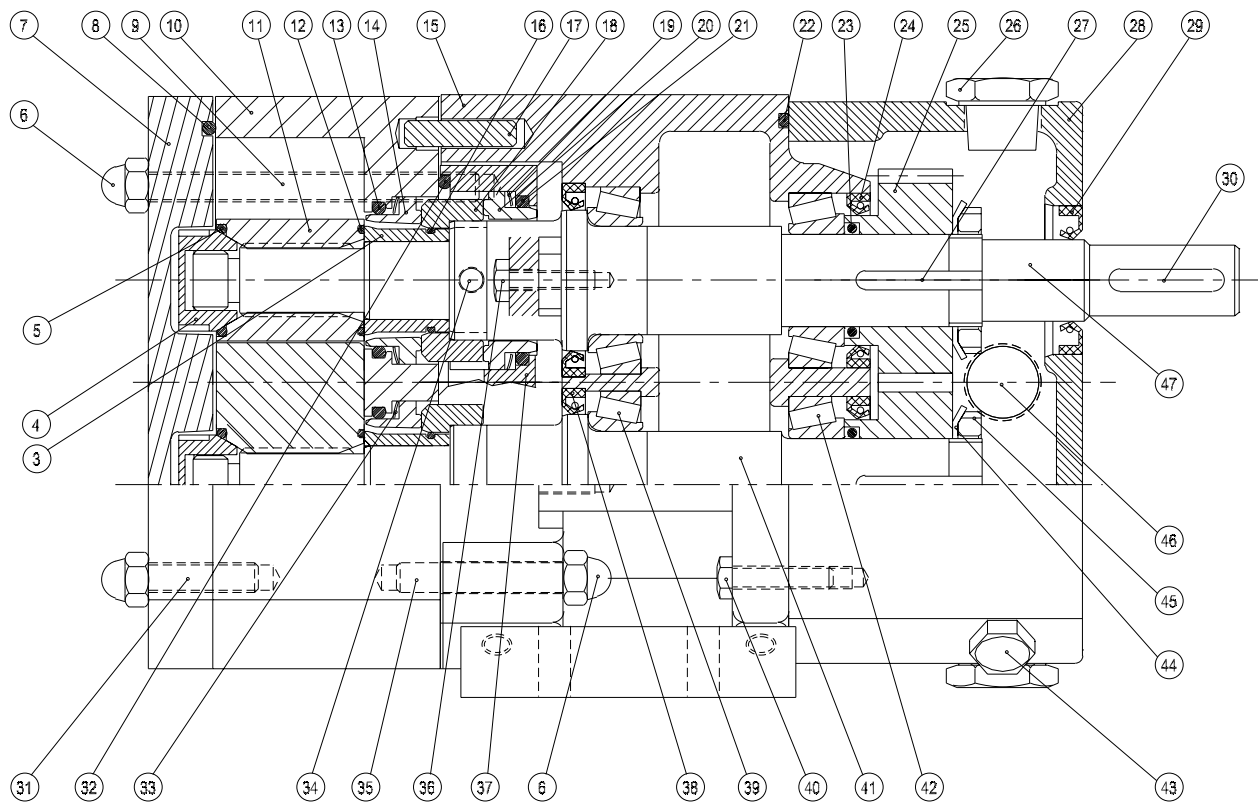
## FL2 58L PART NUMBERS

| Item No. | Description                             | Qty. | Part No.   | Item No.                                    | Description                       | Qty. | Part No.   |
|----------|---|------|------------|---|-----------------------------------|------|------------|
| 1        | Mounting foot bolt                      | 4    | 1101000129 | 28  | Gearbox cover                     | 1    | 1383001305 |
| 2        | Mounting foot                           | 1    | 1925001303 | 29  | Rear oil seal                     | 1    | 1812002503 |
| 3        | Gapping shim                            | 2    | 1224001330 | 30  | Coupling key                      | 1    | 1315002605 |
| 4        | Rotor nut                               | 2    | 1103003509 | 31  | Cover stud                        | 4    | 1103001506 |
| 5        | Rotor nut o-ring (viton)                | 2    | 1180000379 | 32  | Seal flush housing o-ring (viton) | 1    | 1180000011 |
|          | Rotor nut o-ring (EPDM)                 |      | 1180000393 |   | Seal flush housing o-ring (EPDM)  |      | 1180000005 |
| 6        | Cover/Housing nut                       | 8    | 1103000032 | 33  | Front seal spring                 | 2    | 1820004238 |
| 7        | Cover                                   | 1    | 1679621320 | 34  | Water pipe                        | 4    | 1910000011 |
| 8        | Cover o-ring (viton)                    | 1    | 1181000141 | 35  | Housing stud                      | 4    | 1103001506 |
|          | Cover o-ring (EPDM)                     |      | 1181000081 | 37  | Seal flush housing                | 1    | 1845001380 |
| 10       | Housing                                 | 1    | 1679611352 | 38  | Front oil seal                    | 2    | 1812002517 |
| 11       | Rotor (standard)                        | 2    | 1679631362 | 39  | Front bearing                     | 2    | 1173001021 |
|          | Rotor (high temperature)                |      | 1679631349 | 40  | Gearbox cover bolt                | 4    | 1101000040 |
| 12       | Rotor o-ring (viton)                    | 2    | 1180000326 | 41  | Idle shaft                        | 1    | 1382001399 |
|          | Rotor o-ring (EPDM)                     |      | 1180000347 | 42  | Rear bearing                      | 2    | 1173001021 |
| 13       | Front stationary seal o-ring (viton)    | 2    | 1180000380 | 44  | Bearing lock washer               | 2    | 1104000023 |
|          | Front stationary seal o-ring (EPDM)     |      | 1180000395 | 45  | Bearing lock nut                  | 2    | 1103001012 |
| 14       | Front stationary seal (carbon)          | 2    | 1815601340 | 46  | Sight glass                       | 1    | 1248000029 |
|          | Front stationary seal (silicon carbide) |      | 1815600189 | 47  | Drive shaft                       | 1    | 1382001398 |
| 15       | Gearbox                                 | 1    | 1310601301 | 48  | Guard screw                       | 2    | 1101000130 |
| 16       | Gapping shim o-ring (viton)             | 2    | 1180000413 | 49  | Guard                             | 2    | 1936001437 |
|          | Gapping shim o-ring (EPDM)              |      | 1180000450 | 50  | Bolt                              | 4    | 1101000131 |
| 17       | Pin                                     | 2    | 1891002606 | 51  | Distance screw                    | 2    | 1891001339 |
| 18       | Rotating seal (chrome oxide/SS)         | 2    | 1810601341 | Notes: special rotor bolt tool, see page 21 |                                   |      |            |
|          | Rotating seal (silicon carbide)         |      | 1810600150 |   |                                   |      |            |
| 19       | Rear seal spring                        | 2    | 1820000060 |   |                                   |      |            |
| 20       | Rear stationary seal (carbon)           | 2    | 1815604242 |   |                                   |      |            |
| 21       | Rear stationary seal o-ring (buna)      | 2    | 1180000569 |   |                                   |      |            |
| 22       | Rear cover o-ring (buna)                | 1    | 1180000568 |   |                                   |      |            |
| 25       | Gear                                    | 2    | 1365001304 |   |                                   |      |            |
| 26       | Oil plug                                | 1    | 1248000023 |   |                                   |      |            |
| 27       | Gear key                                | 2    | 1315002620 |   |                                   |      |            |



## EXPLODED VIEW OF FL2 75 & 100

|    |                         |    |                              |
|----|-------------------------|----|------------------------------|
| 1  | Mounting Foot Bolt      | 13 | Front Stationary Seal O-ring |
| 2  | Mounting Foot           | 14 | Front Stationary Seal        |
| 3  | Gapping Spacer          | 15 | Gearbox                      |
| 4  | Rotor Nut               | 16 | Gapping Spacer O-ring        |
| 5  | Rotor Nut O-ring        | 17 | Housing Pins                 |
| 6  | Cover/Housing Dome Nuts | 18 | Rotating Seal                |
| 7  | Cover                   | 19 | Rear Seal Spring             |
| 8  | Cover O-ring            | 20 | Rear Stationary Seal         |
| 9  | Housing thru studs      | 21 | Rear Stationary Seal O-ring  |
| 10 | Pump Housing            | 22 | Rear Cover O-ring            |
| 11 | Rotor/Bi-wing Rotors    | 23 | Rear Bearing O-ring          |
| 12 | Rotor O-ring            | 24 | Rear Bearing Lip Seal        |



SECTION A-A

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|    |                           |    |                        |
|----|---------------------------|----|------------------------|
| 25 | Gear                      | 37 | Seal Flush Housing     |
| 26 | Oil Fill Plug             | 38 | Front Bearing Lip Seal |
| 27 | Gear Key                  | 39 | Front Bearing          |
| 28 | Rear Cover                | 40 | Rear Cover Bolt        |
| 29 | Rear Cover Oil Seal       | 41 | Idle Shaft             |
| 30 | Coupling Key              | 42 | Rear Bearing           |
| 31 | Cover Studs               | 43 | Drain Plug             |
| 32 | Seal Flush Housing O-ring | 44 | Bearing Lock Washer    |
| 33 | Front Seal Spring         | 45 | Bearing Lock Nut       |
| 34 | Water Pipe                | 46 | Sight Glass            |
| 35 | Housing Studs             | 47 | Drive Shaft            |
| 36 | Flush Housing Bolts       |    |                        |

## FL2 75S PART NUMBERS

| Item # | Part #     | Description                             | QTY |
|--------|------------|---|-----|
| 1      | 1101000080 | Mounting Foot Screw                     | 4   |
| 2      | 1925004303 | Foot (zinc plated)                      | 2   |
| 2      | 1925004304 | Foot (stainless steel)                  | 2   |
| 2      | 1925004403 | Vertical Mount Foot (zinc plated)       | 2   |
| 2      | 1925004404 | Vertical Mount Foot (stainless steel)   | 2   |
| 3      | 1224004315 | Gapping Spacer                          | 2   |
| 4      | 1103003609 | Rotor Nut                               | 2   |
| 4      | 1102004420 | Rotor Nut (flat cover)                  | 2   |
| 5      | 1181000073 | Rotor Nut O-ring (viton)                | 2   |
| 5      | 1181000079 | Rotor Nut O-ring (epdm)                 | 2   |
| 6      | 1101000137 | Dome Nut                                | 6   |
| 7      | 1687621620 | Pump Cover                              | 1   |
| 7      | 1687624320 | Pump Cover (flat cover)                 | 1   |
| 8      | 1181000072 | Cover O-ring (viton)                    | 1   |
| 8      | 1181000080 | Cover O-ring (epdm)                     | 1   |
| 9      | 1103004433 | Thru Stud                               | 2   |
| 10     | 1687614360 | Pump Housing                            | 1   |
| 11     | 1687634411 | Rotor                                   | 2   |
| 12     | 1180000341 | Rotor O-ring (viton)                    | 2   |
| 12     | 1180000077 | Rotor O-ring (epdm)                     | 2   |
| 13     | 1180000044 | Stationary Seal O-ring (viton)          | 2   |
| 13     | 1180000168 | Stationary Seal O-ring (epdm)           | 2   |
| 14     | 1815604443 | Front Stationary Seal (silicon carbide) | 2   |
| 14     | 1815604440 | Front Stationary Seal (carbon)          | 2   |
| 15     | 1310604301 | Gearbox (cast iron)                     | 1   |
| 15     | 1310604302 | Gearbox (S.S.)                          | 1   |
| 16     | 1180000350 | Gapping Spacer O-ring (viton)           | 2   |
| 16     | 1180000076 | Gapping Spacer O-ring (epdm)            | 2   |
| 17     | 1891002613 | Pin                                     | 2   |
| 18     | 1810604444 | Silicon Carbide Rotating                | 2   |
| 18     | 1810604441 | Chrome Oxide Rotating                   | 2   |
| 19     | 1820000015 | Rear Spring                             | 2   |
| 20     | 1815604442 | Rear Stationary Seal (carbon)           | 2   |
| 21     | 1180000030 | Rear Stationary Seal O-ring (buna)      | 2   |
| 22     | 1181000077 | Rear Cover O-ring                       | 1   |

| Item # | Part #     | Description                      | QTY |
|--------|------------|----------------------------------|-----|
| 23     | 1180000354 | Gear O-ring (viton)              | 2   |
| 24     | 1812002508 | Gear Lip Seal                    | 2   |
| 25     | 1381001604 | Gear                             | 2   |
| 26     | 1248000023 | Vent Plug                        | 1   |
| 27     | 1315002611 | Gear Key                         | 2   |
| 28     | 1383004305 | Rear Cover (cast iron)           | 1   |
| 28     | 1383004306 | Rear Cover (S.S.)                | 1   |
| 29     | 1812002509 | Rear Lip Seal                    | 1   |
| 30     | 1315002638 | Coupler Key                      | 1   |
| 31     | 1103001606 | Front Housing Stud               | 2   |
| 32     | 1180000389 | Seal Flush Housing O-ring (buna) | 1   |
| 33     | 1820000062 | Front Spring                     | 2   |
| 34     | 1910000012 | Water Pipe                       | 4   |
| 35     | 1103001607 | Rear Housing Stud                | 2   |
| 36     | 1101000080 | Flush Housing Bolt               | 4   |
| 37     | 1845004380 | Seal Flush Housing               | 1   |
| 38     | 1812002510 | Front Lip Seal                   | 2   |
| 39     | 1173001009 | Front Bearing                    | 2   |
| 40     | 1101000127 | Rear Cover Bolt                  | 4   |
| 41     | 1382004322 | Idle Shaft                       | 1   |
| 41     | 1382004324 | Idle Shaft (flat cover)          | 1   |
| 42     | 1173001010 | Rear Bearing                     | 2   |
| 43     | 1248000012 | Drain Plug                       | 1   |
| 44     | 1104001011 | Lock Washer                      | 2   |
| 45     | 1103001012 | Gear Nut                         | 2   |
| 46     | 1248000029 | Sight Glass                      | 2   |
| 47     | 1382004321 | Drive Shaft D                    | 1   |
| 47     | 1382004323 | rive Shaft (flat cover)          | 1   |

Note: special rotor bolt tool, see page 21

## FL2 75L PART NUMBERS

| Item # | Part #     | Description                             | QTY |
|--------|------------|---|-----|
| 1      | 1101000080 | Mounting Foot Screw                     | 4   |
| 2      | 1925004303 | Foot (zinc plated)                      | 2   |
| 2      | 1925004304 | Foot (stainless steel)                  | 2   |
| 2      | 1925004403 | Vertical Mount Foot (zinc plated)       | 2   |
| 2      | 1925004404 | Vertical Mount Foot (stainless steel)   | 2   |
| 3      | 1224004315 | Gapping Spacer                          | 2   |
| 4      | 1103003609 | Rotor Nut                               | 2   |
| 4      | 1102004420 | Rotor Nut (flat cover)                  | 2   |
| 5      | 1181000073 | Rotor Nut O-ring (viton)                | 2   |
| 5      | 1181000079 | Rotor Nut O-ring (epdm)                 | 2   |
| 6      | 1101000137 | Dome Nut                                | 6   |
| 7      | 1687621620 | Pump Cover                              | 1   |
| 7      | 1687624320 | Pump Cover (flat cover)                 | 1   |
| 8      | 1181000072 | Cover O-ring (viton)                    | 1   |
| 8      | 1181000080 | Cover O-ring (epdm)                     | 1   |
| 9      | 1103004433 | Thru Stud                               | 2   |
| 10     | 1687614360 | Pump Housing                            | 1   |
| 11     | 1687634411 | Rotor                                   | 2   |
| 12     | 1180000341 | Rotor O-ring (viton)                    | 2   |
| 12     | 1180000077 | Rotor O-ring (epdm)                     | 2   |
| 13     | 1180000044 | Stationary Seal O-ring (viton)          | 2   |
| 13     | 1180000168 | Stationary Seal O-ring (epdm)           | 2   |
| 14     | 1815604443 | Front Stationary Seal (silicon carbide) | 2   |
| 14     | 1815604440 | Front Stationary Seal (carbon)          | 2   |
| 15     | 1310604301 | Gearbox (cast iron)                     | 1   |
| 15     | 1310604302 | Gearbox (S.S.)                          | 1   |
| 16     | 1180000350 | Gapping Spacer O-ring (viton)           | 2   |
| 16     | 1180000076 | Gapping Spacer O-ring (epdm)            | 2   |
| 17     | 1891002613 | Pin                                     | 2   |
| 18     | 1810604444 | Silicon Carbide Rotating                | 2   |
| 18     | 1810604441 | Chrome Oxide Rotating                   | 2   |
| 19     | 1820000015 | Rear Spring                             | 2   |
| 20     | 1815604442 | Rear Stationary Seal (carbon)           | 2   |
| 21     | 1180000030 | Rear Stationary Seal O-ring (buna)      | 2   |
| 22     | 1181000077 | Rear Cover O-ring                       | 1   |

| Item # | Part #     | Description                      | QTY |
|--------|------------|----------------------------------|-----|
| 23     | 1180000354 | Gear O-ring                      | 2   |
| 24     | 1812002508 | Gear Lip Seal                    | 2   |
| 25     | 1381001604 | Gear                             | 2   |
| 26     | 1248000023 | Vent Plug                        | 1   |
| 27     | 1315002611 | Gear Key                         | 2   |
| 28     | 1383004305 | Rear Cover (cast iron)           | 1   |
| 28     | 1383004306 | Rear Cover (S.S.)                | 1   |
| 29     | 1812002509 | Rear Lip Seal                    | 1   |
| 30     | 1315002638 | Coupler Key                      | 1   |
| 31     | 1103001606 | Front Housing Stud               | 2   |
| 32     | 1180000389 | Seal Flush Housing O-ring (buna) | 1   |
| 33     | 1820000062 | Front Spring                     | 2   |
| 34     | 1910000012 | Water Pipe                       | 4   |
| 35     | 1103001607 | Rear Housing Stud                | 2   |
| 36     | 1101000080 | Flush Housing Bolt               | 4   |
| 37     | 1845004380 | Seal Flush Housing               | 1   |
| 38     | 1812002510 | Front Lip Seal                   | 2   |
| 39     | 1173001009 | Front Bearing                    | 2   |
| 40     | 1101000127 | Rear Cover Bolt                  | 4   |
| 41     | 1382004332 | Idle Shaft                       | 1   |
| 41     | 1382004334 | Idle Shaft (flat cover)          | 1   |
| 42     | 1173001010 | Rear Bearing                     | 2   |
| 43     | 1248000012 | Drain Plug                       | 1   |
| 44     | 1104001011 | Lock Washer                      | 2   |
| 45     | 1103001012 | Gear Nut                         | 2   |
| 46     | 1248000029 | Sight Glass                      | 2   |
| 47     | 1382004331 | Drive Shaft                      | 1   |
| 47     | 1382004333 | Drive Shaft (flat cover)         | 1   |

Note: special rotor bolt tool, see page 21

## FL2 100S PART NUMBERS

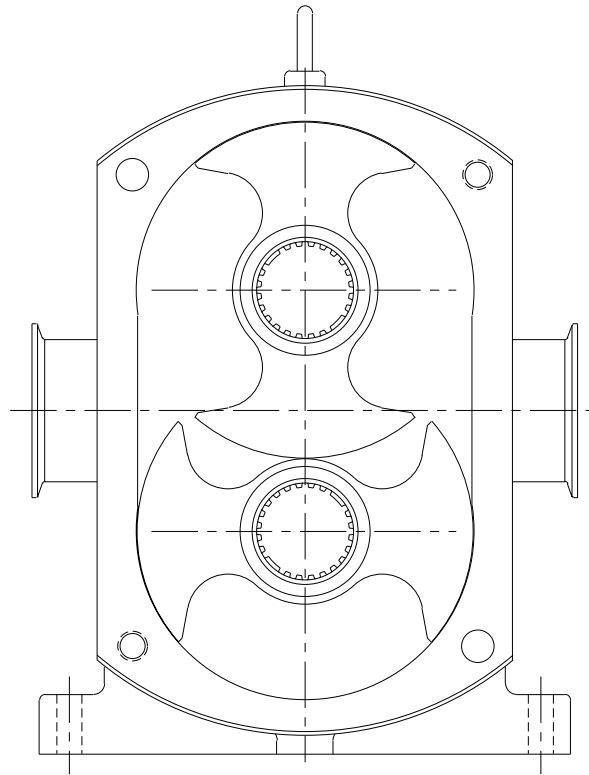
| Item # | Part #     | Description                         | QTY |
|--------|------------|-------------------------------------|-----|
| 1      | 1101000007 | Mounting Foot Screw                 | 4   |
| 2      | 1925004503 | Foot (zinc plated)                  | 2   |
| 3      | 1224004515 | Gapping Spacer                      | 2   |
| 4      | 1103003709 | Rotor Nut                           | 2   |
| 5      | 1180000260 | Rotor Nut O-ring (viton)            | 2   |
| 5      | 1180000394 | Rotor Nut O-ring (epdm)             | 2   |
| 6      | 1103004835 | Dome Nut                            | 6   |
| 7      | 1692621720 | Pump Cover                          | 1   |
| 8      | 1180000998 | Cover O-ring (viton)                | 1   |
| 8      | 1180000007 | Cover O-ring (epdm)                 | 1   |
| 9      | 1103004632 | Thru Stud                           | 2   |
| 10     | 1690614540 | Pump Housing                        | 1   |
| 11     | 1690634601 | Rotor                               | 2   |
| 12     | 1180000383 | Rotor O-ring (viton)                | 2   |
| 12     | 1180000397 | Rotor O-ring (epdm)                 | 2   |
| 13     | 1180000253 | Stationary Seal O-ring (viton)      | 2   |
| 13     | 1180000278 | Stationary Seal O-ring (epdm)       | 2   |
| 14     | 1815004643 | Silicon Carbide Stationary          | 2   |
| 14     | 1815004640 | Carbon Stationary                   | 2   |
| 15     | 1310604501 | Gearbox (cast iron)                 | 1   |
| 16     | 1180000343 | Gapping Spacer O-ring (viton)       | 2   |
| 16     | 1180000396 | Gapping Spacer O-ring (epdm)        | 2   |
| 17     | 1891002609 | Pin                                 | 2   |
| 18     | 1810604644 | Silicon Carbide Rotating            | 2   |
| 18     | 1810604641 | Chrome Oxide Rotating               | 2   |
| 19     | 1820000029 | Rear Spring                         | 2   |
| 20     | 1815604640 | Rear Seal (carbon)                  | 2   |
| 21     | 1180000253 | Rear Stationary Seal O-ring (viton) | 2   |
| 22     | 1180000385 | Rear Cover O-ring                   | 1   |
| 23     | 1180000378 | Gear O-ring                         | 2   |
| 24     | 1812002505 | Rear Lip Seal                       | 2   |
| 25     | 1381001704 | Gear                                | 2   |

| Item # | Part #     | Description                      | QTY |
|--------|------------|----------------------------------|-----|
| 26     | 1248000023 | Vent Plug                        | 1   |
| 27     | 1315002607 | Gear Key                         | 2   |
| 28     | 1383004505 | Rear Cover (cast iron)           | 1   |
| 29     | 1812002507 | Rear Cover Lip Seal              | 1   |
| 30     | 1315002637 | Coupler Key                      | 1   |
| 31     | 1103001706 | Front Housing Stud               | 2   |
| 32     | 1180000390 | Seal Flush Housing O-ring (buna) | 1   |
| 33     | 1820000029 | Front Spring                     | 2   |
| 34     | 1910000013 | Water Pipe                       | 4   |
| 35     | 1103001707 | Rear Housing Stud                | 2   |
| 36     | 1101000080 | Flush Housing Bolt               | 4   |
| 37     | 1845004580 | Seal Flush Housing               | 1   |
| 38     | 1812002504 | Front Lip Seal                   | 2   |
| 39     | 1173001005 | Front Bearing                    | 2   |
| 40     | 1101000136 | Rear Cover Bolt                  | 4   |
| 41     | 1382004522 | Idle Shaft                       | 1   |
| 42     | 1173000008 | Rear Bearing                     | 2   |
| 43     | 1248002614 | Drain Plug                       | 1   |
| 44     | 1104001021 | Lock Washer                      | 2   |
| 45     | 1103001008 | Gear Nut                         | 2   |
| 46     | 1248000029 | Sight Glass                      | 2   |
| 47     | 1382004521 | Drive Shaft                      | 1   |

## FL2 100L PART NUMBERS

| Item # | Part #     | Description                         | QTY |
|--------|------------|-------------------------------------|-----|
| 1      | 1101000007 | Mounting Foot Screw                 | 4   |
| 2      | 1925004503 | Foot (zinc plated)                  | 2   |
| 3      | 1224004515 | Gapping Spacer                      | 2   |
| 4      | 1103003709 | Rotor Nut                           | 2   |
| 5      | 1180000260 | Rotor Nut O-ring (viton)            | 2   |
| 5      | 1180000394 | Rotor Nut O-ring (epdm)             | 2   |
| 6      | 1103004835 | Dome Nut                            | 6   |
| 7      | 1692621720 | Pump Cover                          | 1   |
| 8      | 1180000998 | Cover O-ring (viton)                | 1   |
| 8      | 1180000007 | Cover O-ring (epdm)                 | 1   |
| 9      | 1103004633 | Thru Stud                           | 2   |
| 10     | 1692614560 | Pump Housing                        | 1   |
| 11     | 1692634611 | Rotor                               | 2   |
| 12     | 1180000383 | Rotor O-ring (viton)                | 2   |
| 12     | 1180000397 | Rotor O-ring (epdm)                 | 2   |
| 13     | 1180000253 | Stationary Seal O-ring (viton)      | 2   |
| 13     | 1180000278 | Stationary Seal O-ring (epdm)       | 2   |
| 14     | 1815604643 | Silicon Carbide Stationary          | 2   |
| 14     | 1815604640 | Carbon Stationary                   | 2   |
| 15     | 1310604501 | Gearbox (cast iron)                 | 1   |
| 16     | 1180000343 | Gapping Spacer O-ring (viton)       | 2   |
| 16     | 1180000396 | Gapping Spacer O-ring (epdm)        | 2   |
| 17     | 1891002609 | Pin                                 | 2   |
| 18     | 1810604644 | Silicon Carbide Rotating            | 2   |
| 18     | 1810604641 | Chrome Oxide Rotating               | 2   |
| 19     | 1820000029 | Rear Spring                         | 2   |
| 20     | 1815004640 | Rear Seal (carbon)                  | 2   |
| 21     | 1180000253 | Rear Stationary Seal O-ring (viton) | 2   |
| 22     | 1180000385 | Rear Cover O-ring                   | 1   |
| 23     | 1180000378 | Gear O-ring                         | 2   |
| 24     | 1812002505 | Rear Lip Seal                       | 2   |
| 25     | 1381001704 | Gear                                | 2   |

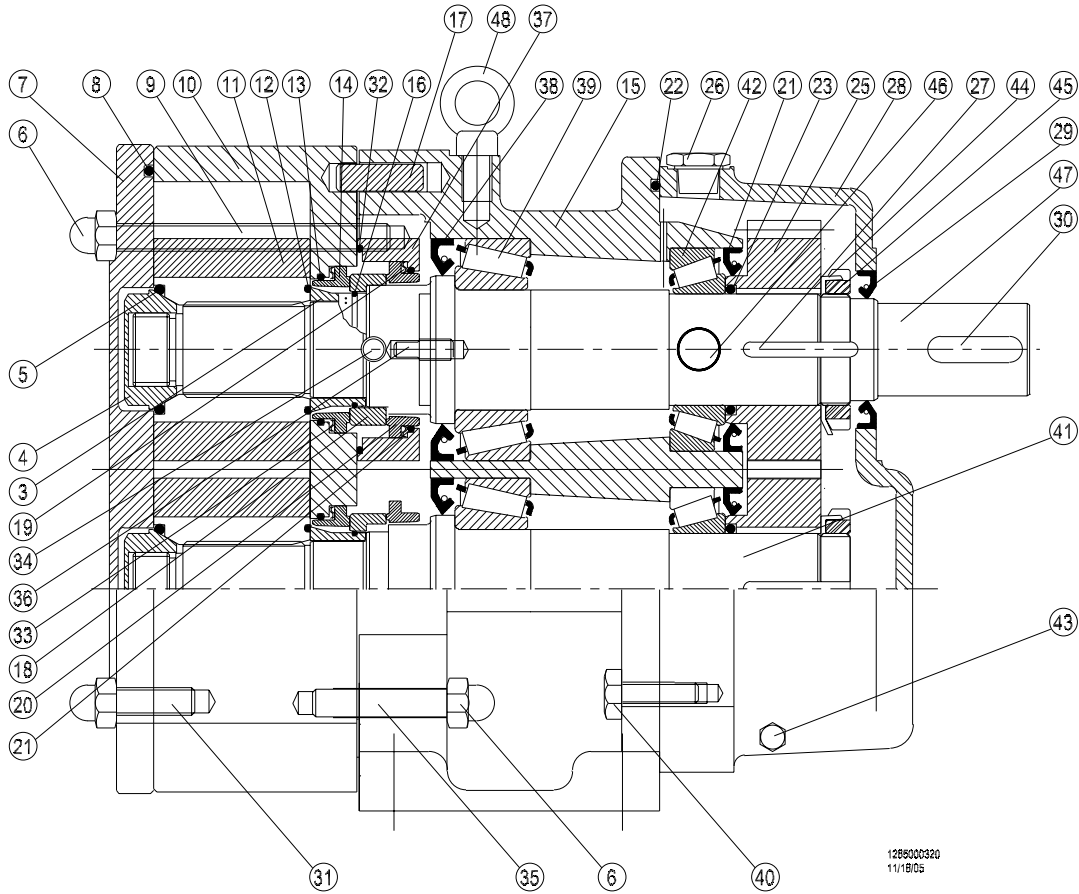
| Item # | Part #     | Description                      | QTY |
|--------|------------|----------------------------------|-----|
| 26     | 1248000023 | Vent Plug                        | 1   |
| 27     | 1315002607 | Gear Key                         | 2   |
| 28     | 1383004505 | Rear Cover (cast iron)           | 1   |
| 29     | 1812002507 | Rear Cover Lip Seal              | 1   |
| 30     | 1315002637 | Coupler Key                      | 1   |
| 31     | 1103001706 | Front Housing Stud               | 2   |
| 32     | 1180000390 | Seal Flush Housing O-ring (buna) | 1   |
| 33     | 1820000029 | Front Spring                     | 2   |
| 34     | 1910000013 | Water Pipe                       | 4   |
| 35     | 1103001707 | Rear Housing Stud                | 2   |
| 36     | 1101000080 | Flush Housing Bolt               | 4   |
| 37     | 1845004580 | Seal Flush Housing               | 1   |
| 38     | 1812002504 | Front Lip Seal                   | 2   |
| 39     | 1173001005 | Front Bearing                    | 2   |
| 40     | 1101000134 | Rear Cover Bolt                  | 4   |
| 41     | 1382004532 | Idle Shaft                       | 1   |
| 42     | 1173000008 | Rear Bearing                     | 2   |
| 43     | 1248002614 | Drain Plug                       | 1   |
| 44     | 1104000021 | Lock Washer                      | 2   |
| 45     | 1103001008 | Gear Nut                         | 2   |
| 46     | 1248000029 | Sight Glass                      | 2   |
| 47     | 1382004531 | Drive Shaft                      | 1   |



## FL2 130 EXPLODED VIEW

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





- 35 Housing Studs
- 36 Seal Flush Housing Pins
- 37 Seal Flush Housing
- 38 Front Bearing Lip Seal
- 39 Front Bearing
- 40 Rear Cover Bolt
- 41 Idle Shaft
- 42 Rear Bearing
- 43 Drain Plug
- 44 Bearing Lock Washer
- 45 Bearing Lock Nut
- 46 Sight Glass
- 47 Drive Shaft
- 48. Lifting Lug

128600320  
11/18/05

## FL2 130S PART NUMBERS

| Item # | Part #     | Description                             | QTY |
|--------|------------|---|-----|
| 3      | 1224004715 | Gapping spacer                          | 2   |
| 4      | 1103001809 | Rotor bolt                              | 2   |
| 5      | 1180000384 | Rotot bolt o-ring (viton)               | 2   |
| 5      | 1180000392 | Rotor bolt o-ring (EPDM)                | 2   |
| 6      | 1103000010 | Cover nut                               | 6   |
| 7      | 1692621820 | Pump cover                              | 1   |
| 8      | 1181000074 | Cover o-ring (viton)                    | 1   |
| 8      | 1181000082 | Cover o-ring (EPDM)                     | 1   |
| 9      | 1103004832 | Housing stud FL2 130S                   | 2   |
| 10     | 1695614740 | Pump housing with 3" clamp fittings     | 1   |
| 10     | 1695614742 | Pump housing with 4" clamp fittings     | 1   |
| 11     | 1695634801 | Rotor                                   | 2   |
| 12     | 1180000233 | Rotor o-ring (viton)                    | 2   |
| 13     | 1180000381 | Front stationary seal o-ring (viton)    | 2   |
| 13     | 1180000365 | Front stationary seal o-ring (EPDM)     | 2   |
| 14     | 1815004840 | Front stationary seal (carbon)          | 2   |
| 14     | 1815004843 | Front stationary seal (silicon carbide) | 2   |
| 15     | 1310604702 | Gearbox (cast iron) horizontal          | 1   |
| 15     | 1310604701 | Gearbox (cast iron) vertical            | 1   |
| 16     | 1180000115 | Gapping spacer o-ring (viton)           | 2   |
| 16     | 1180000205 | Gapping spacer o-ring (EPDM)            | 2   |
| 17     | 1891002617 | Housing pins                            | 2   |
| 18     | 1810604841 | Rotating seal (chrome oxide)            | 2   |
| 18     | 1810604844 | Rotating seal (silicon carbide)         | 2   |
| 19     | 1820004839 | Rear seal wave spring                   | 2   |
| 20     | 1815604842 | Rear stationary seal (carbon)           | 2   |
| 21     | 1180000388 | Rear stationary seal o-ring (buna)      | 2   |
| 22     | 1180000339 | Rear cover o-ring (buna)                | 1   |
| 23     | 1181000078 | Rear Bearing o-ring                     | 2   |
| 24     | 1812002514 | Rear oil seal                           | 2   |
| 25     | 1381001804 | Gear                                    | 2   |

| Item # | Part #     | Description                       | QTY |
|--------|------------|-----------------------------------|-----|
| 26     | 1248000023 | Vent plug                         | 1   |
| 27     | 1315002635 | Gear key                          | 2   |
| 28     | 1383001805 | Rear cover (cast iron)            | 1   |
| 29     | 1812002515 | Rear cover oil seal               | 1   |
| 30     | 1315002636 | Coupling key                      | 1   |
| 31     | 1103001806 | Cover studs                       | 2   |
| 32     | 1180000382 | Seal flush housing o-ring (viton) | 1   |
| 33     | 1820004838 | Front seal wave spring            | 2   |
| 34     | 1910000013 | Water pipe                        | 4   |
| 35     | 1103001807 | Housing stud                      | 2   |
| 36     | 1103004834 | Seal flush housing stud           | 4   |
| 37     | 1845004780 | Seal flush housing                | 2   |
| 38     | 1812002513 | Front oil seal                    | 2   |
| 39     | 1173001017 | Front bearing                     | 2   |
| 40     | 1101000138 | Rear cover bolt                   | 4   |
| 41     | 1382004722 | Idle shaft                        | 1   |
| 42     | 1173001018 | Rear bearing                      | 2   |
| 43     | 1248002614 | Oil drain plug                    | 1   |
| 44     | 1104001019 | Bearing lock nut washer           | 2   |
| 45     | 1103001020 | Bearing lock nut                  | 2   |
| 46     | 1248000029 | Sight glass                       | 2   |
| 47     | 1382004721 | Drive shaft                       | 1   |
| 48     | 1101001826 | Eyebolt                           | 1   |
|        | 1936004717 | Shaft guard                       | 2   |

## FL2 130L PART NUMBERS

| Item # | Part #     | Description                             | QTY |
|--------|------------|---|-----|
| 3      | 1224004715 | Gapping spacer                          | 2   |
| 4      | 1103001809 | Rotor bolt                              | 2   |
| 5      | 1180000384 | Rotot bolt o-ring (viton)               | 2   |
| 5      | 1180000392 | Rotor bolt o-ring (EPDM)                | 2   |
| 6      | 1103000010 | Cover nut                               | 6   |
| 7      | 1692621820 | Pump cover                              | 1   |
| 8      | 1181000074 | Cover o-ring (viton)                    | 1   |
| 8      | 1181000082 | Cover o-ring (EPDM)                     | 1   |
| 9      | 1103004833 | Housing stud FL2 130L                   | 2   |
| 10     | 1697614760 | Pump housing -4" clamp fittings         | 1   |
| 11     | 1695634801 | Rotor                                   | 2   |
| 12     | 1180000233 | Rotor o-ring (viton)                    | 2   |
| 13     | 1180000381 | Front stationary seal o-ring (viton)    | 2   |
| 13     | 1180000365 | Front stationary seal o-ring (EPDM)     | 2   |
| 14     | 1815004840 | Front stationary seal (carbon)          | 2   |
| 14     | 1815004843 | Front stationary seal (silicon carbide) | 2   |
| 15     | 1310604702 | Gearbox (cast iron) horizontal          | 1   |
| 15     | 1310604701 | Gearbox (cast iron) vertical            | 1   |
| 16     | 1180000115 | Gapping spacer o-ring (viton)           | 2   |
| 16     | 1180000205 | Gapping spacer o-ring (EPDM)            | 2   |
| 17     | 1891002617 | Housing pins                            | 2   |
| 18     | 1810604841 | Rotating seal (chrome oxide)            | 2   |
| 18     | 1810604844 | Rotating seal (silicon carbide)         | 2   |
| 19     | 1820004839 | Rear seal wave spring                   | 2   |
| 20     | 1815604842 | Rear stationary seal (carbon)           | 2   |
| 21     | 1180000388 | Rear stationary seal o-ring (buna)      | 2   |
| 22     | 1180000339 | Rear cover o-ring (buna)                | 1   |
| 23     | 1181000078 | Rear bearing o-ring (viton)             | 2   |
| 24     | 1812002514 | Rear oil seal                           | 2   |
| 25     | 1381001804 | Gear                                    | 2   |

| Item # | Part #     | Description                       | QTY |
|--------|------------|-----------------------------------|-----|
| 26     | 1248000023 | Vent plug                         | 1   |
| 27     | 1315002635 | Gear key                          | 2   |
| 28     | 1383001805 | Rear cover (cast iron)            | 1   |
| 29     | 1812002515 | Rear cover oil seal               | 1   |
| 30     | 1315002636 | Coupling key                      | 1   |
| 31     | 1103001806 | Cover stud                        | 2   |
| 32     | 1180000382 | Seal flush housing o-ring (viton) | 2   |
| 33     | 1820004838 | Front seal wave spring            | 2   |
| 34     | 1910000013 | Water pipe                        | 4   |
| 35     | 1103001807 | Housing stud                      | 2   |
| 36     | 1103004834 | Seal flush housing stud           | 4   |
| 37     | 1845004780 | Seal flush housing                | 2   |
| 38     | 1812002513 | Front oil seal                    | 2   |
| 39     | 1173001017 | Front bearing                     | 2   |
| 40     | 1101000138 | Rear cover bolt                   | 4   |
| 41     | 1382004722 | Idle shaft                        | 1   |
| 42     | 1173001018 | Rear bearing                      | 2   |
| 43     | 1248002614 | Oil drain plug                    | 1   |
| 44     | 1104001019 | Gear locknut washer               | 2   |
| 45     | 1103001020 | Gear locknut                      | 2   |
| 46     | 1248000029 | Sight glass                       | 2   |
| 47     | 1382004721 | Drive shaft                       | 1   |
| 48     | 1101001826 | E yebolt                          | 1   |
|        | 1936004717 | Shaft guard                       | 2   |

## TROUBLESHOOTING

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

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