



## Instruction Manual and Parts List GLH8L - 462



### WARNING

This Instruction Manual and General Instructions Manual, CA-1, should be read thoroughly prior to pump installation, operation or maintenance.

Manual No. SRM00084

Rev. 00

January 2008

**READ THIS ENTIRE PAGE BEFORE PROCEEDING**

FOR THE SAFETY OF PERSONNEL AND TO PREVENT DAMAGE TO THE EQUIPMENT, THE FOLLOWING NOMENCLATURE HAS BEEN USED IN THIS MANUAL:

	<b>DANGER</b>
Failure to observe the precautions noted in this box can result in severe bodily injury or loss of life.	

	<b>WARNING</b>
Failure to observe the precautions noted in this box can cause injury to personnel by accidental contact with the equipment or liquids. Protection should be provided by the user to prevent accidental contact.	

<b>CAUTION</b>	<b>ATTENTION</b>
Failure to observe the precautions noted in this box can cause damage or failure of the equipment.	

Non compliance of safety instructions identified by the following symbol could affect safety for persons:  	Safety instructions where electrical safety is involved are identified by:  	Safety instructions which shall be considered for reasons of safe operation of the pump and/or protection of the pump itself are marked by the sign:  
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<b>ATTENTION</b>
If operation of this pump is critical to your business, we strongly recommend you keep a spare pump or major repair kit in stock at all times. As a minimum, a minor repair kit (o-rings, gaskets, shaft seal and bearings) should be kept in stock so pump refurbishment after internal inspection can be accomplished.

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# GENERAL INSTRUCTIONS

The instructions found herein cover the disassembly, assembly and parts identification of Series GLH8L-462 pumps.

**NOTE:** Individual contracts may have specific provisions that vary from this manual. Should any questions arise which may not be answered by these instructions, refer to the General Instructions Manual, CA-1, provided with your order. For further detailed information and technical assistance please refer to Imo Pump, Technical Service Department at (704) 289-6511.

This manual cannot possibly cover every situation connected with the installation, operation, inspection and maintenance of the equipment supplied. Every effort was made to prepare the text of the manual so that engineering and design data is transformed into the most easily understood wording. Imo Pump must assume the personnel assigned to operate and maintain the supplied equipment and apply this instruction manual have sufficient technical knowledge and are experienced to apply sound safety and operational practices which may not be otherwise covered by this manual.

## INTRODUCTION

This instruction manual covers Imo Pump GLH8L-462. The "GLH" design is an upgrade to existing 8L series pumps consisting of a modification kit for field conversion. Purchase of the modification kit is a one time occurrence and will require the installation of a "GLH" major repair kit during overhaul. Because of the large number of operating conditions, it is necessary to have a variety of construction arrangements and material combinations to meet application requirements. Each pump is identified with a serial number and model designator number on the pump nameplate. Definitions of model designators are given in Figure 1.

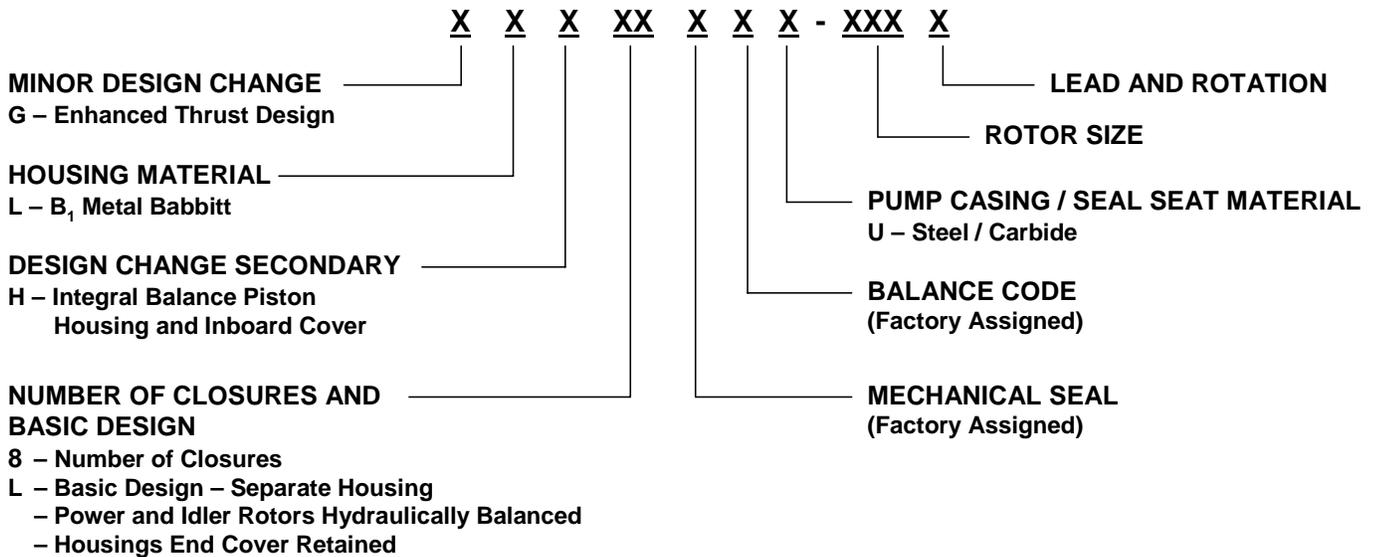


Figure 1. Definitions of Model Designators of GLH8L-462 pumps.

## STRUCTURAL LIMITS

Operating conditions, such as speed, fluid viscosity, inlet pressure, temperature, filtration, duty cycle, mounting, drive type, are interrelated. Due to variable conditions, specific application limitations may vary from structural limitations. This equipment must not be operated without verification that operating requirements are within published capabilities as shown in the appropriate pump brochures (available from local Imo Pump offices and representatives listed in Manual CA-1).

Under no circumstances are the following structural design limits to be exceeded.

Discharge Pressure.....	2000 PSIG Standard Pump
Inlet Pressure .....	55 PSIG Standard Pump
<i>(Modification to some basic design pumps allows continuous inlet pressures up to 400 PSIG, consult Imo Pump for higher or intermittent pressures.)</i>	
Speed Limits .....	2300 RPM Maximum
<i>(Consult Imo Pump for Minimum Speed)</i>	
Viscosity .....	60 SSU Minimum Book Rating
<i>(Consult Imo Pump for minimum viscosity with relation to specific speed and pressure.)</i>	
Temperature.....	250 degrees F (Standard Pump)
Drive.....	Direct only
Mounting .....	Foot mounted

## DESCRIPTION of PUMP FEATURES

	<b>WARNING</b>
<p>The GLH series pump parts are not interchangeable with previous designs. Modification kits containing GLH design parts are specified in addition to major repair kits for all 8L series pumps currently in service.</p>	

### Balance

By design, all rotor sets are hydraulically balanced in the radial direction. Idler rotors (40 and 41) are balanced axially by internally transferring high pressure oil from the pump discharge end to the pump inlet end (thrust end). The high pressure oil is transferred to the pump inlet end through bores that have been gun drilled axially through the rotor housings (3 and 5).

In order to provide axial hydraulic balance on the power rotor (22), a balance piston (24) is provided. The sizes of the balance piston (24) and the balance piston bushing (15) in which it rotates are selected to produce minimum axial thrust loads on the anti-friction ball bearing (31) under the conditions of operation that are "normal" for the application.

	<b>WARNING</b>
<p>When a unit is purchased, if no inlet conditions are specified, the power rotor will be provided with standard balance. If a unit with standard balance is installed on an operation with high inlet pressure, both the ball bearing (31) and the mechanical seal (27) may be overloaded. If the unit has been fitted to operate with high inlet pressure, operation on low inlet pressure can overload the ball bearings. Do not change inlet pressure radically without approval from Imo Pump Division.</p>	

### **Ball Bearing**

The 8L-462 series pumps are equipped with a standard width size 16 Conrad ball bearing.

### **Mechanical Seals**

The GLH8L-462 series pump is equipped with a positive drive mechanical seal. This is a balanced mechanical seal with a carbide rotating face and a carbide stationary face. Refer to mechanical seal drawing, figure 3, for construction.

When ordering new mechanical seals, it is important that the pump designator and/or serial number be given. When pump designator and/or serial number cannot be ascertained, operating conditions should be listed so that proper mechanical seal can be supplied.

### **Instrumentation**

The GLH8L-462 pumps are provided with instrumentation connections for monitoring temperatures of inboard and outboard areas of the pump and vibration at the ball bearing.

**Ball Bearing RTD** – A ½”-14 NPT threaded connection with a 5/16” diameter drill through for a temperature sensor (RTD) probe is provided on the inboard cover (13). This RTD (when installed) monitors the temperature of the ball bearing (31). The temperature will vary, depending on the temperature of the fluid pumped, the speed at which the pump is running and the suction pressure. Typically the ball bearing temperature will run 50 °F to 70°F above the fluid temperature. The maximum temperature allowed is 250°F.

**Thrust Loss RTD's** – Two ½”-14 NPT threaded connection ports with ¼” OD X 1-1/2” deep blind hole for the RTD probe are provided on the outboard cover (50) for connection to two optional RTD's. The RTD's (when installed) are used to read the temperature in the two idler rotor thrust plate areas individual to each idler. These temperatures should be relatively close to each other in normal operation. If a serious idler rotor thrust loss occurs, the temperature difference between the two idler rotor thrust areas will be detected. It is recommended the operating system should immediately be shut down if the delta temperature between these two RTD's exceeds 25°F to 30°F.

**Vibration** - A ¼”-18 NPT, ¾” deep with 2” diameter machined surface spot face, located on the inboard cover (13) is provided for installation of an optional vibration transmitter.

## INSTALLATION

GLH8L-462 series pumps are designed for horizontal foot mounting. The pump case (1) has four feet. The two inboard feet are drilled to receive two tie-down or mounting bolts and the rear or outboard feet are drilled to receive one bolt each. The double bolting on the inboard end is designed to provide rigid location of the front end of the pump. The length of the pump and the normal variations in temperature require that allowance be made for thermal growth. The rigidity of the pump case (1) is usually several times that of the bedplate. If relative movement cannot take place between the outboard feet and the base, thermal movement can distort the bedplate and produce misalignment between pump and driver.

### Inlet Position

The inlet head (37) may be positioned to permit fluid to enter the pump from the top or either side. The inlet head may be rotated in 90 degree increments.

1. To change position of inlet head (37), disconnect bleed tube (53) from elbow fittings (52).
2. Install an eyebolt in  $\frac{3}{4}$  - inch tapped bore in cover (50) to aid in support of cover during removal. (Approximate weight of cover is 135 pounds.) Remove capscrews (51) and cover (50) using caution to avoid damage to O-ring (12).
3. Place a sling or lifting hooks on inlet head (37). (Approximate weight of inlet head is 275 pounds.) Remove capscrews (21) and lockwashers (20). Break inlet head (37) free from case (1).
4. Rotate inlet head (37) so that inlet flange is in desired position, using care to avoid damage to O-ring (12). Install capscrews (21) and lockwashers (20). Tighten capscrews (21) to a torque value of 340 lbs. ft. ( $\pm$  15 lbs. ft.).
5. Remove plug (19) located on the underside of inlet head (37) at the six o'clock position. Remove elbow tube fitting (52) and install in the tapped hole at the six o'clock position on inlet head (37). Install removed pipe plug (19) in the tapped hole from which the tube fitting was removed. Use pipe thread sealant when reinstalling the tube fitting and pipe plug. Connect bleed tube (53) using elbow fittings (52).
6. Install cover (50), ensuring that O-ring (12) is properly seated and not damaged. Install capscrews (51). Tighten capscrews (51) to a torque value of 193 lbs. ft. ( $\pm$  10 lbs. ft.).

## MAINTENANCE

### Servicing Mechanical Seal and/or Ball Bearings

1. Close inlet and outlet valves. Vent pressure from pump. Remove spacer member from coupling.
2. Loosen setscrew (56). Remove nut (55).
3. Remove coupling hub from pump shaft. Remove drive key (54).
4. Loosen setscrews (75). Remove check nut (33). Remove check nut (32).
5. Remove ball bearing retainer (34) by removing bolts (35) and lock washers (36).
6. Pull power rotor (22) assembly together with bearing and seal assembly forward from pump until seat adapter (63) extends from pump.

- Cut two 3/4 -10 continuous thread studs (24 inches minimum) to thread 1-1/8 inches into inboard cover (13) and extend a minimum of 2-1/2 inches past end of power rotor (22) shaft. Install studs in inboard cover located 180 degrees apart. Thread a nut on each stud to lock stud in position. Refer to figure 2 and cut a 1/2 inch thick metal plate approximately 12 inches long and 4 inches wide. Drill two 3/4 inch holes, 9 inches apart in the metal plate. Place drilled flat metal plate over end of power rotor (22) shaft with studs fitting in drilled holes. Install nuts on ends of both studs.

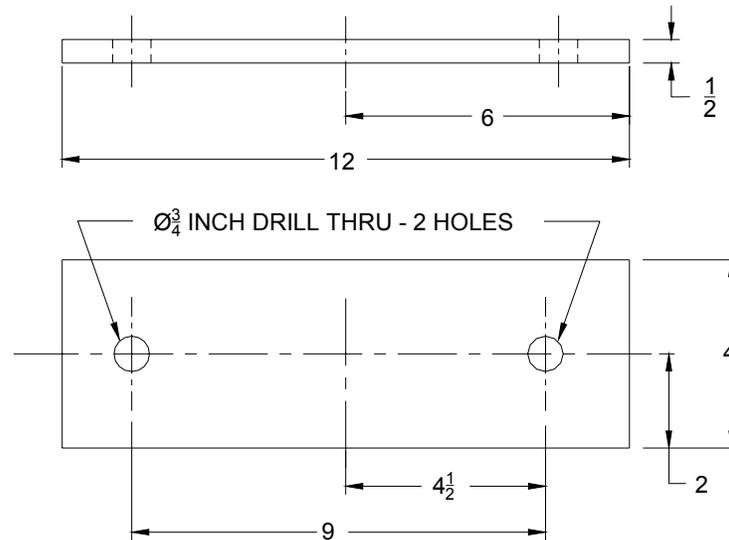


Figure 2. Bearing Puller

- Slide key stock or other strong steel plate in at least three or four locations behind seat adapter subassembly (63) to ensure equal pressure is applied to ball bearing (31) during removal.
- Tighten nuts installed on both studs evenly to press power rotor (22) shaft back into pump and through ball bearing (31) to remove bearing. After power rotor (22) is pressed through ball bearing, remove metal plate. Remove key stock or steel plate from seat adapter subassembly (63). Remove studs from bores of inboard cover (13).

NOTE: If mechanical seal (27) does not require replacement, proceed to step 23. If mechanical seal (27) does require replacement, proceed as follows:

- Pull power rotor (22) assembly forward from pump to expose mechanical seal (27) assembly which is mounted on seal sleeve (26).
- Remove inner spacer (29) and outer spacer (30).
- Remove seal sleeve (26) from power rotor (22) shaft. Removal of seal sleeve (26) will also remove mechanical seal (27), seat adapter (63), gasket (65), and spiral ring (28).
- Remove spiral ring (28) from groove of seal sleeve (26).
- Remove seat adapter (63) with gasket (65). Remove mechanical seal stationary seat (1, figure 3) with O-ring (2, figure 3) from seal sleeve (26).

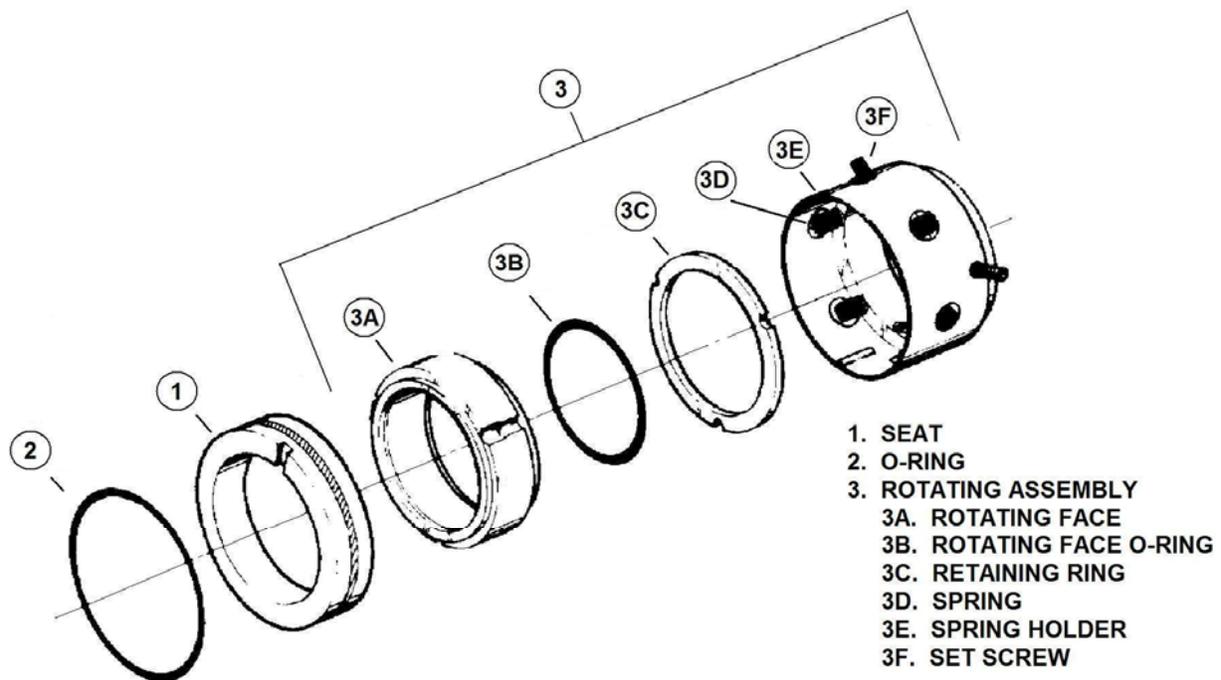


Figure 3. Mechanical Seal Drawing

15. Loosen setscrew (3E, figure 3) from seal spring holder (3D, figure 3) and slide mechanical seal rotating assembly (3, figure 3) from seal sleeve (26).
16. Remove O-ring (69 or 25) from internal groove of seal sleeve (26).
17. Inspect power rotor (22) shaft and seal sleeve (26) and remove any nicks or burrs which are present. Polish power rotor shaft to remove any rust or oxidants that may be present under seal sleeve. The manufacturer recommends replacement of ball bearing (31), mechanical seal (27), gasket (65), and O-ring (69 or 25) when these parts are disturbed from their original installed position. All parts should be coated with light lubricating oil to assist in assembly.
18. Install O-ring (69 or 25) in internal groove of seal sleeve (26).
19. Install rotating assembly (3, figure 3) of mechanical seal (27) on seal sleeve (26), position against shoulder of seal sleeve (26). Install and tighten setscrew (3E, figure 3).
20. Install stationary insert (1, figure 3) and O-ring (2, figure 3) into seal seat adapter (63), ensuring that lock pin engages slot of stationary seat. Install gasket (65) in seat adapter (63). Install assembled seat adapter subassembly (63) on seal sleeve (26) next to installed mechanical seal rotating assembly, using caution to avoid damage to stationary seat and O-ring (1 and 2, figure 3).
21. Compress mechanical seal enough to expose spiral ring groove and install spiral ring (28) in seal sleeve (26) to lock mechanical seal (27) assembly into place.
22. Install assembled seal sleeve (26) on power rotor (22) shaft until it rests against balance piston (24). Use caution when installing seal sleeve (26) to avoid damage to installed O-ring (69 or 25).
23. Install inner spacer (29) and outer spacer (30) on power rotor (22) shaft. Align outer spacer (30) so openings correspond to drain hole and slots in end cover (13).

24. Slide ball bearing (31) on power rotor (22) shaft.

NOTE: If oven is available, ball bearing (31) can be heated to approximately 200 degrees F for ease of installation on power rotor (22) shaft.

25. Thread nut (32) on power rotor (22) shaft and tighten. As nut (32) is tightened onto power rotor, it will push ball bearing (31) and outer spacer (30) into proper position on power rotor shaft.

NOTE: To prevent power rotor shaft from rotating when nut (32) is tightened, hold rotor with a spanner wrench fastened to the rotor's key slot. Remove any burrs from key slot after nut (32) is installed.

26. Thread nut (33) on power rotor (22) shaft. Install set screws (75) in nut (33) to lock nut in place.

27. Install assembled power rotor (22) into pump, ensuring that each part is centered as it enters inboard cover (13) and is properly seated. Ensure that the gasket (65) is seated evenly in the inboard cover (13).

28. Install bearing retainer (34) using bolts (35) and lockwashers (36). Tighten bolts (35) to a torque value of 95 lbs. ft. ( $\pm$  5 lbs. ft.)

29. Install key (54), coupling hub, and coupling nut (55). Tighten setscrew (56).

30. Install coupling spacer.

## **PUMP DISASSEMBLY**

Due to size and weight of individual parts of the pump, it is recommended that a crane and/or block and tackle be available when complete disassembly of pump is required.

1. Close inlet and outlet valves. Vent pressure from pump and drain pump prior to disconnecting inlet and outlet piping. Remove plugs (19) to drain pump fluid from inlet end. Fluid in the outlet end of pump can be pumped to inlet chamber by rotating pump power rotor counterclockwise. Remove bleed tube (53) by loosening elbow connections (52).

NOTE: 8L-462 series pumps incorporate highly finished precision parts which must be handled carefully to avoid damage to critical machined surfaces. Parts should be tagged for identification and exact position so that all parts are properly installed during assembly.

2. Remove coupling spacer. Disconnect inlet and outlet flanges. Remove pump from bedplate.

<b>WARNING</b>
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Approximate weight of pump is 2490 pounds.
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3. Install an eyebolt in  $\frac{3}{4}$  - inch tapped bore in cover (50). (Weight of cover (50) is approximately 135 pounds.) Support weight of cover using installed eyebolt, and remove capscrews (51) and cover (50). Remove O-ring (12) from groove of cover (50).

4. Remove plate (48) by loosening and removing capscrews (61) and spacers (88).

5. Remove oil balance tubes (81) from housing (5). Remove O-rings (82) from oil balance tubes.

6. Slide two idler balance piston housings (44) from end of idler rotors (41).

7. Remove idler rotors (41) from bores of rotor housing (5) by rotating idlers. Rotate power rotor (22) to remove idler rotors (40) from rotor housings (3 and 5). Use extreme caution to avoid dropping idler rotors as they emerge from housing (5).
8. Loosen setscrew (56) and remove coupling hub nut (55). Remove coupling hub and key (54) from power rotor (22) shaft.
9. Remove bolts (35), lockwashers (36) and bearing retainer (34) from inboard cover (13).
10. Grasp power rotor (22) shaft and pull assembled power rotor from pump.

**CAUTION**

Assembled power rotor weighs approximately 175 pounds and should be supported by slings during removal from pump.

NOTE: Removal of power rotor (22) will also remove check nut (32), check nut (33), set screws (75), inner spacer (29), outer spacer (30), ball bearings (31), spiral ring (28), seat adapter (63), gasket (65), mechanical seal (27), seal sleeve (26), O-ring (69 or 25), balance piston (24), and O-ring (23).

11. For disassembly of power rotor (22), support power rotor in soft lined jaws of a bench vice. Use extreme caution in handling power rotor (22) to avoid damage to machined surface. Avoid dropping of any parts as power rotor is disassembled.
12. Loosen setscrews (75) and remove check nut (33) and check nut (32). Using a bearing puller, remove ball bearing (31).
13. Perform procedures outlined in steps 11 through 16 of Maintenance: Servicing Mechanical Seal and/or Ball Bearings.
14. Remove balance piston (24). Remove O-ring (23) from groove of power rotor (22) shaft.
15. Install an eyebolt in  $\frac{3}{4}$  - inch tapped bore in inlet head (37) to aid in support during removal. (Weight of inlet head is approximately 275 pounds.) Remove capscrews (21), lockwashers (20) and inlet head (37) from pump case (1). Remove O-ring (12) from groove of case (1).
16. Install an eyebolt in  $\frac{3}{4}$  - inch tapped bore in inboard cover (13) to aid in support during removal. (Approximate weight of assembled inboard cover is 385 pounds.) Remove capscrews (21) and lockwashers (20). Install two  $\frac{1}{2}$  inch bolts (approx. 3- $\frac{1}{2}$ " long) into jacking holes on inboard cover (13) flange face. Thread bolts into jacking holes until the inboard cover is forced from the case bore. Removal of inboard cover (13) also removes O-ring (4), balance piston bushing (15), idler stop (16), and capscrews (18).
17. Remove O-ring (12) from groove of case (1). Remove O-ring (4), capscrews (18), idler stop (16) and balance piston bushing (15) from inboard cover (13).
18. Remove stop pin plug (11) with O-ring (10) from case (1). Insert a 3/8-16 inch bolt into threaded bore of stop pin (9) and remove stop pin (9).
19. Install  $\frac{3}{4}$  inch eyebolts into tapped holes at end face of rotor housings (3 & 5) and pull housings from case.

**CAUTION**

Support housings (3 & 5) by slings as they are removed from the case. Each housing weighs approximately 350 pounds.

20. Remove O-rings (4), vent pins (8) and oil balance tube (87) from each of the rotor housings (3 & 5). Remove O-rings (82) from oil balance tube.

21. Remove strainer sub-assembly (92) from rotor housing (3).

## **PUMP ASSEMBLY**

Prior to assembly of the pump, all parts should be cleaned and inspected for nicks and burrs. All worn or damaged parts should be replaced. Imo Pump recommends automatic replacement of O-rings (4, 10, 12, 23, 69 or 25, 82), gasket (65), ball bearing (31), mechanical seal (27) and spiral ring (28) when these parts are disturbed from their previous installed position. Wipe all parts with light lubricating oil prior to assembly. Do not permit parts to stand with machined surfaces unprotected for extended periods of time. Check all oil passages to ensure that they are clean and free of any debris. Rotate power rotor frequently by hand during assembly to ensure freedom of rotation.

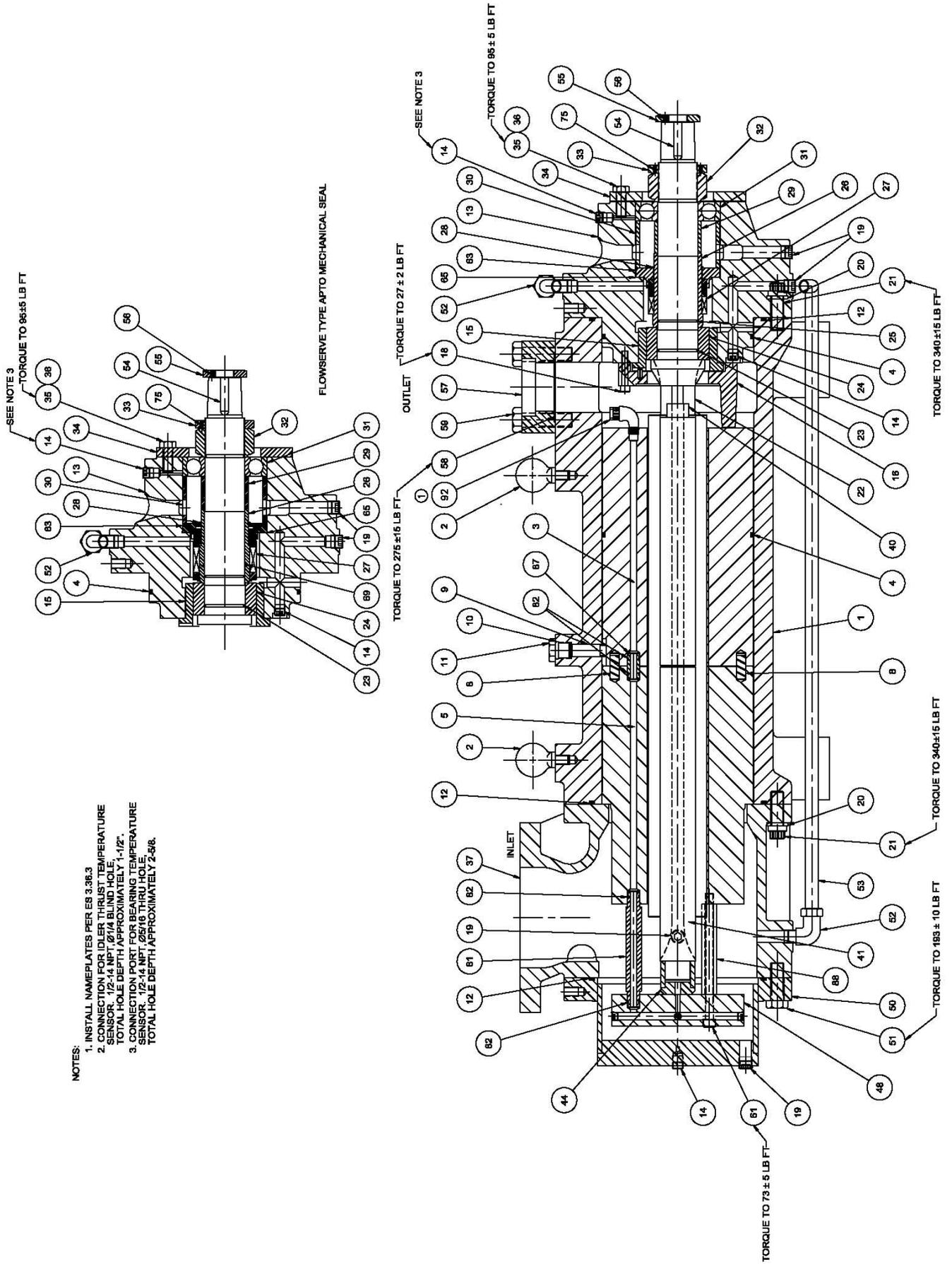
1. Install O-ring (4) in groove of discharge housing (3).
2. Install O-rings (82) in grooves of oil balance tube (87).
3. Install vent pins (8), oil balance tube (87), and strainer sub-assembly (92) in discharge housing (3).
4. Insert discharge housing (3) assembly in case (1) from the coupling end, with vent pins (8) pointed to inlet end of case (1).
5. Assemble inlet housing (5) and discharge housing (3) together ensuring vent pins (8), oil balance tube (87) and housing openings mesh together.
6. Install housing stop-pin (9). Install new O-ring (10) on plug (11) and thread plug into case top opening.

NOTE: Ensure slot in discharge housing (3) flange aligns with stop-pin hole in case (1).

7. Install bushing (15) into bore of inboard cover (13). Install idler stop (16) on inboard cover (13), ensuring that spring pin engages slot in installed bushing (15). Install capscrews (18), and tighten capscrews to a torque value of 27 lbs. ft. ( $\pm 2$  lbs. ft.). Install O-rings (12) in grooves on each end of case (1).
8. Install eyebolt in  $\frac{3}{4}$  - inch tapped bore in inboard cover (13) to support during assembly. Install inboard cover (13) on case (1), using caution to avoid damage to O-ring (12) and ensuring that stop subassembly is properly positioned with idler rotor bores of housing (3). Install capscrews (21) and lockwashers (20). Tighten capscrews (21) to a torque value of 340 lbs. ft. ( $\pm 15$  lbs. ft.).
9. Install O-ring (23) on power rotor (22). Slide balance piston (24) on power rotor (22) shaft using caution to avoid damage to installed O-ring (23). Seat balance piston (24) against shaft shoulder.
10. Support power rotor (22) in lead lined jaws of bench vise, using extreme caution to avoid damage to power rotor. Assemble power rotor (22) as outlined in steps 17 through 28 of Maintenance: Servicing Mechanical Seal and/or Ball Bearing.
11. Install inlet head (37) to case (1) using capscrews (21) and lockwashers (20). Torque capscrews to 340 lbs. ft. ( $\pm 15$  lbs. ft.).
12. Install idler rotors (40), tapered end first, into inlet end of housing (5). Mesh threads of idler rotors (40) with installed power rotor (22) and rotate power rotor (22) by hand to draw idlers into proper position. Install idler rotors (41) into inlet end of rotor housing (5). Mesh threads of idler rotors (41) with threads of power rotor (22), and rotate power rotor (22) by hand to draw idlers into proper position.
13. Slide idler balance piston housings (44) onto end of idler rotors (41).
14. Install O-rings (82) into grooves of oil balance tube (81) and insert oil balance tube (81) into rotor housing (5).
15. Insert capscrews (61) into plate (48). Slide spacers (88) onto capscrews (61). Mount plate (48) onto rotor housing (5), ensuring the oil balance tube (81) is aligned with the slot in the plate (48). Torque capscrews (61) to 73 lbs. ft. ( $\pm 5$  lbs. ft.).

16. Place O-ring (12) in groove of cover (50). Mount cover (50) to inlet head (37) using capscrews (51). Torque capscrews (51) to 193 lbs. ft. ( $\pm$  10 lbs. ft.).
17. Install tubing (53) to elbow fittings (52). Install drain plug (19) in cover (50).
18. Install key (54) in slot of power rotor (22) shaft. Mount pump hub of coupling. Lock coupling hub to power rotor (22) shaft by installing nut (55) and setscrew (56). Tighten setscrew.
19. Mount assembled pump (approximately 2490 pounds) on bedplate. Verify pump and driver alignment as outlined in Manual CA-1.

Figure 4. GLH8L-462 Pump Assembly Drawing



## PARTS LIST

IDP	Part Description	Qty	Kit	IDP	Part Description	Qty	Kit
1	Pump Case	1		33	Check Nut	1	XX
2	Eyebolt	2		34	Bearing Retainer	1	
3	Housing	1	XX	35	Hex Bolt	8	
4	O-ring	2	X	36	Lock Washer	8	
5	Housing	1	XX	37	Inlet Head	1	
8	Vent Pin	2	XX	40	Idler	2	XX
9	Stop Pin	1		41	Idler	2	XX
10	O-ring	1	X	44	Idler Balance Piston Housing	2	XX
11	Plug	1		48	Plate	1	XX
12	O-ring	3	X	50	Cover	1	
13	Inboard Cover	1		51	Flange Screw	12	
14	Pipe Plug	4		52	Elbow Fitting	2	
15	Bushing	1	XX	53	Tube	1	
16	Idler Stop Subassembly	1	XX	54	Key	1	
18	Capscrew	2	XX	55	Nut	1	
19	Pipe Plug	5		56	Setscrew	1	
20	Lockwasher	24		57	Outlet Adapter	1	
21	Flange Screw	24		58	Gasket	1	X
22	Power Rotor	1	XX	59	Hex Bolt	4	
23	O-ring*	1	X	61	Capscrew	4	
24	Balance Piston	1	XX	63	Seal Seat Adapter	1	
25	O-ring	1	X	65	Gasket	1	X
26	Seal Sleeve	1		69	O-Ring*	1	X
27	Mechanical Seal	1	X	75	Set Screw	2	XX
28	Spiral Ring	1	X	81	Oil Balance Tube	1	
29	Inner Spacer	1		82	O-Ring	4	X
30	Outer Spacer	1		87	Oil Balance Tube	1	XX
31	Bearing	1	X	88	Spacer	4	
32	Check Nut	1		92	Strainer Sub-assembly	1	XX

X Denotes Minor Repair Kit Items

XX Denotes Major Repair Kit Items

(Note: Minor Repair Kit Items are included in the Major Repair Kit)

\*Pump will have either O-ring (25) or O-ring (69) depending on seal type.



A Colfax Business Unit

**IMO Pump**  
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Web: [www.imo-pump.com](http://www.imo-pump.com)



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Portland Valve



TUSHACO  
PUMPS



Warren®  
Pumps



Zenith  
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Manual No. SRM00084

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