



IMO[®]

INSTRUCTIONS AND PARTS LIST

Series 8L-400, 400P and 462

WARNING

**READ CA-1 AND THIS INSTRUCTION BOOK BEFORE
INSTALLATION, OPERATION OR MAINTENANCE**

Instructions 8L-(R-3)

This manual now is
identified as part no.
SRM00031

FOREWORD

This instruction manual covers the 8L series Imo pumps. The 8L series has been designed to meet the requirements of crude oil and high pressure fuel oil applications. Because of the largest number of operating conditions, it is necessary to have a variety of constructions and material combinations so the proper pump is available to match each job requirement. The model of each particular pump is identified on the pump nameplate.

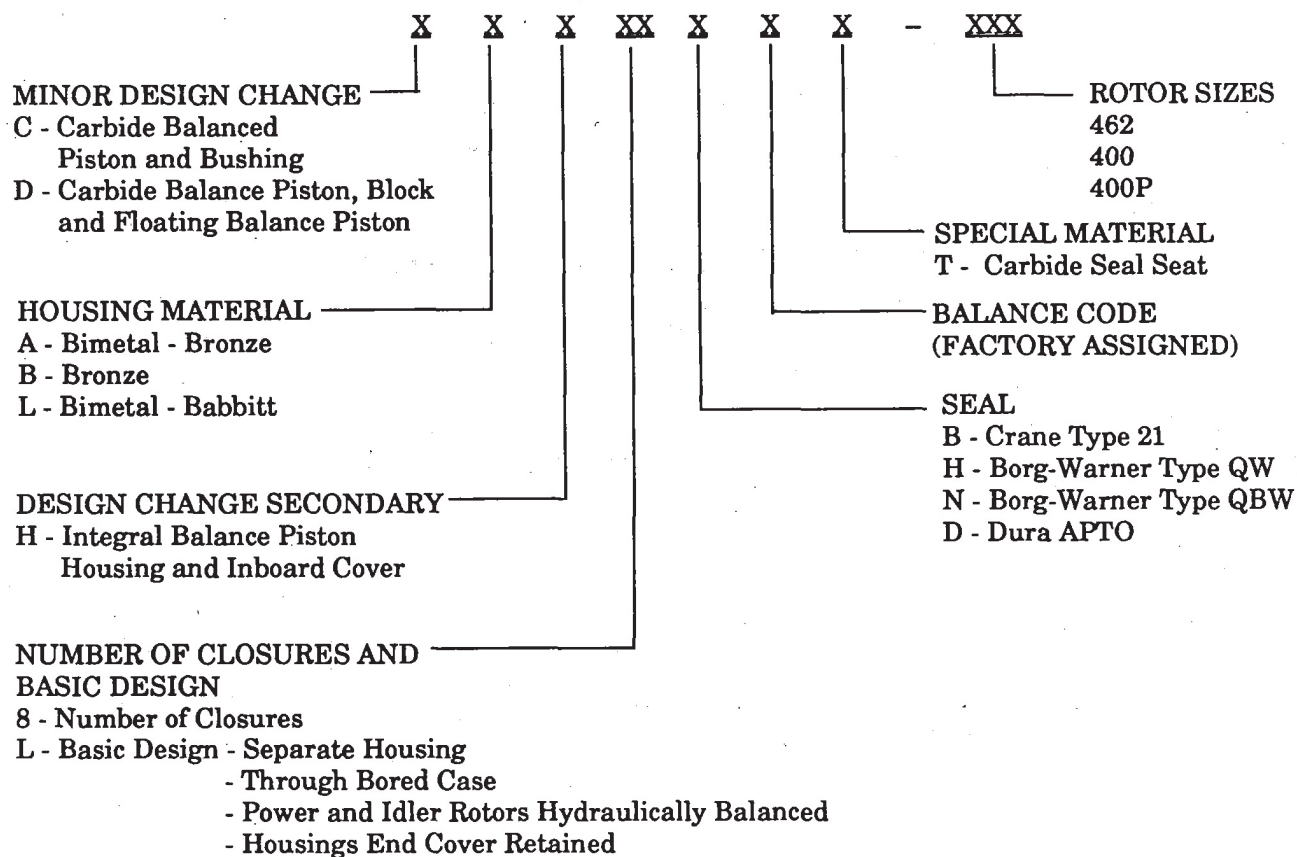


FIGURE 1. Definition of Model Designator of 8L Series Pumps

STRUCTURAL LIMITS

Operating conditions such as speed, fluid, viscosity, inlet pressure, temperature, filtration, duty cycle, mounting, driving type, etc. 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 data manuals (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 – 1000 PSIG Standard Pump (Bronze Construction)
– 1500 PSIG Bimetal Construction (Some pumps are designed to operate above 1500 PSIG and should only be operated at the specified operating conditions.)

INLET PRESSURE – 75 PSIG Maximum (Modification to some basic design pumps allow inlet pressures up to 400 PSIG.)

SPEED LIMITS – 2300 RPM Maximum (All speeds above 1800 RPM must be factory approved.)

VISCOSITY – 33SSU (2.0 cst) Minimum. Pump data manual should be consulted for each pump type minimum viscosity with relation to specific speed and pressure.

TEMPERATURE – Standard pump (Bronze Construction): 0 - 250 degrees F
– Bimetal Construction: 0 - 250 degrees F

ROTATION – Clockwise rotation only, facing pump shaft.

DRIVE – Direct only

MOUNTING – May be foot mounted in any attitude.

ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for series 8L pumps must refer to this instruction book manual number and should be addressed to the nearest Imo Pump representative listed in Manual CA-1.

The following directions should be followed for renewal part orders:

- (1) Give the number of this instruction book.
- (2) Give the pump type and serial number of the pump for which part(s) is ordered.
- (3) Give the figure number(s) on which pump type and sealing design part(s) are shown.
- (4) Give part(s) name, item number(s) and table number in this manual when identifying part(s) ordered.

DESCRIPTION

BALANCE

By design, all rotor sets are hydraulically balanced in the radial direction. Idlers (040 and 041) 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 idler balance assembly (044) through holes that have been gun drilled axially through the idlers (040 and 041).

WARNING

Solid idlers cannot be used in pumps that do not have external piping and drilled ported outboard end cover.

In order to provide axial hydraulic balance on the power rotor (022), a balance piston (024) is provided. The size of the balance pistons (024) and the bushing (015) in which it rotates are selected to produce minimum axial thrust loads on the antifriction bearing (031) under the conditions of operation that are "normal" for the application.

WARNING

When a unit is purchased, if no inlet conditions are specified, the rotor will be provided with standard balance. If a unit with standard balance is installed on an operation with high inlet pressure, both the bearing (031) and the seal (027) may be overloaded. If the unit has been fitted to operate with high inlet pressure, operation on low inlet pressure can overload the bearing. Do not change the inlet pressure radically without approval from the IMO Pump Division.

BALL BEARING

The 8L series pumps are equipped with a cartridge width, deep groove prelubricated and sealed, Conrad type ball bearing. The 250°F pumps have a prelubricated temperature bearing installed with SRI No. 2 grease and Viton seals. The other model bearings are standard bearings prelubricated with BRB No. 2 grease and Buna seals.

With hydraulic balancing of the power rotor, the loading on the bearing is light. The fatigue or B-10 life of the bearing will be very high and for practical purposes can be considered infinite. The life expectancy of the bearing will be governed by the life expectancy of the grease that lubricates it.

The prediction of grease life is less than an exact science. Life expectancy is based on laboratory tests extrapolated and tempered by field experience.

The grease selected for prelubricating the high temperature bearings has a life expectancy in excess of 20,000 hours at 275 degrees F (bearing metal temperature). The grease selected for prelubricating the standard bearing has a life expectancy in excess of 20,000 hours at 200 degrees F (bearing metal temperature). If the bearing seals function properly and keep dirt and contamination out of the bearing, the grease and the bearing should function properly over this time span.

MECHANICAL SEALS

The mechanical seal (027) is a variable hardware item. Four seal types and material constructions are used to meet the requirements of the specific installation. Refer to Figure 1 for pump model and applicable seal type and Figures 2 and 3 for mechanical seal illustrations.

Because of the number of seal variations available, it is important that the pump designator and/or serial number be forwarded with purchase order when ordering new seals. Where the full designator or serial number cannot be ascertained, a listing of the operating conditions should be made in order that the proper seal for replacement can be supplied.

INSTALLATION

MOUNTING

While the pump is designed for horizontal foot mounting, the unit can be mounted in a vertical position without modification or impairing its operational characteristics. The pump case (001) has four feet; the two inboard feet are each drilled to receive two tie-down or mounting bolts. The rear or outboard feet are each drilled to receive one bolt each. The double bolting on the inboard or front end is designed to provide rigid location of the pump front end. 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 (001) is usually several times that of the subbase or bedplate. If relative movement cannot take place between the outboard feet and the base, thermal movement can distort the subbase and produce pump to driver misalignment.

INLET POSITION

The inlet flange on the inlet head (037) may be positioned to have the fluid enter the pump from the top or either side. The inlet flange may be rotated for bottom inlet, but a special vent seal tube (053) and a positive fluid inlet pressure is required.

CAUTION

The Thrust Cover (050) must always be assembled with caution nameplate at top with arrow pointing toward eyebolt for proper idler balance.

To change the position of the inlet flange, disconnect the seal vent line (053) and flare fitting (052) from inlet head (037).

Install an eyebolt in the 3/4-inch tapped hole in thrust cover (050) for handling. (The approximate weight of the cover is 175 pounds). Remove the Ferry capscrews (051) and lockwashers (020). Remove cover (050). Take care not to damage O-ring (012) or thrust plate (048).

Place a sling or lifting hooks on inlet head (037) (the head weighs roughly 300 pounds). Remove capscrews (021) and lockwashers (020). Break inlet head (037) free from case.

Rotate inlet head (037) so that the inlet flange is in the desired position, use care in moving the head (037) in order not to damage the O-ring (012). Install capscrews (021) with their lockwashers (020). Torque capscrews to 340 lbs. ft. (± 10 lbs. ft.).

Remove plug (019) that is now on the underside of the inlet head (037) in line with the seal vent line (053). Install fitting (052), use either pipe compound or Teflon tape on the threads to ensure an airtight seal. Connect seal vent line (053) to fitting (052). Install plug (019) in the tapped opening from which fitting (052) has been taken. Use thread compound or Teflon tape to ensure an airtight seal.

Mount cover (050). Check to make sure O-ring (012) is properly seated in the face groove and not damaged. Align thrust plate (048) in plane of idlers (040 and 041) so that idler cups (044) will bear properly on the thrust plates. Install capscrews (051) with their lockwashers (020). Torque capscrews (051) to 155 lbs. ft. (± 10 lbs. ft.).

MAINTENANCE

SERVICING MECHANICAL SEAL AND BEARING (Refer to Proper Assembly Drawing)

Close inlet and outlet valves. Vent pressure from pump. Remove spacer member from coupling. Loosen setscrew (056) and remove check nut (055). Remove coupling hub from pump shaft. Remove drive key (054).

NOTE

The 8L series units are normally installed with a spacer type coupling between the pump and its driver. Removal of the coupling spacer piece provides sufficient space for removal of the coupling hub mounted on the pump and servicing of ball bearing and mechanical seal.

Using a spanner type wrench, remove bearing lock nut (033) and nut (032).

Remove retainer (034) by removing bolts (035) with the lockwasher (036). After the retainer (034) has been removed, pull the power rotor assembly, together with the bearing and seal assembly, forward until seat adapter (063) (065 for 400 size) extends out from pump.

Removal of ball bearing (031) can be accomplished by bolting a flat bar across end of power rotor and to the inboard cover to push the power rotor back into the pump case with the bearing locked outside the pump. To remove ball bearing, proceed as follows:

Drill two 13/16-inch holes, 9 inches apart in a 1/2-inch thick flat metal plate approximately 12 inches long and 4 inches wide.

Cut two 3/4-10-inch continuous thread studs long enough to thread 1-3/8-inch into inboard cover (013) and extend one inch past end of power rotor. Install both studs in inboard cover (013) located 180 degrees apart. Thread a nut on each stud next to inboard cover to lock stud tight in position.

Slide key stock or other strong steel plate either in openings of spacer (030) or behind seat adapter (063 or 065). Install key stock in at least three or four locations behind seat adapter (063 or 065) or in spacer (030) to ensure equal pressure applied to ball bearing (031) during removal.

Place drilled flat metal plate over end of power rotor (022) and with studs fitting in drilled holes. Install nuts on ends of both studs and tighten evenly to remove ball bearing (031). After ball bearing (031) is removed, also remove metal plate and studs from inboard cover (031).

Move power rotor assembly forward to expose mechanical seal assembly (027) which is mounted on seal sleeve (026). Remove spacers (029 and 030). Slide mechanical seal and seal sleeve off the power rotor (022) as a complete unit. This will include the following parts: mechanical seal (027), seal sleeve (026), retaining ring (028), stationary seat adapter (063 or 065) and seat gasket (065 or 067). Remove "o" ring (025) from power rotor (022).

Slide mechanical seal from seal sleeve after removing retaining ring (028). If the seal is a Borg-Warner type QW or QBW, loosen set screws before removing seal.

Inspect shaft and remove any nicks or burrs which are present. Polish shaft to remove any rust or oxidants that may be present under seal sleeve. Install new "o" ring (025) on power rotor.

Assembly of Mechanical Seal.

Borg-Warner Type QW and QBW (Refer to Figure 2 and appropriate assembly drawings.)

Note: Although the Borg-Warner type QW and QBW are not identical in design, the installation procedures are the same.

Wipe sleeve (026) and inside diameter of mechanical seal rotating assembly (3, Figure 2) with clean, light lubricating oil. Wipe lubricating oil on rotating face (3A, Figure 2).

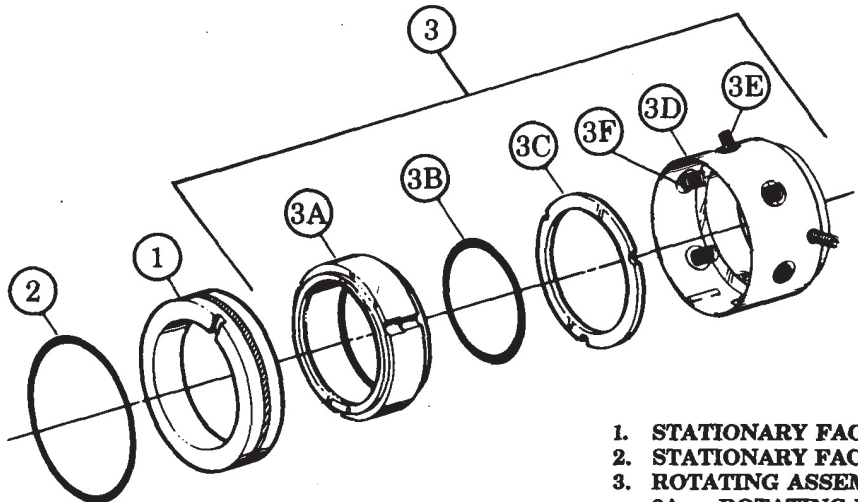
Slide rotating assembly (3, Figure 2) on sleeve 026, until spring holder (3D Figure 2) fits next to shoulder on sleeve.

Install stationary face (1, Figure 2) with "o" ring into seat adapter (063 or 065). Slide seat adapter assembly with gasket (065 or 067) on seal sleeve and compress seal to expose snap ring groove. Install spiral ring (028) into groove.

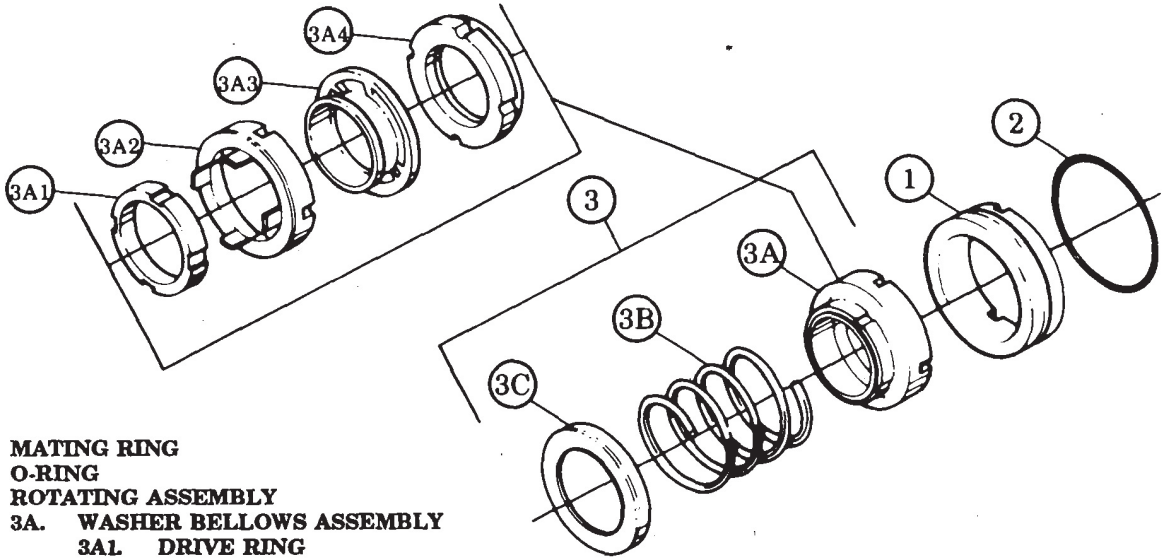
Crane Type 21 (Refer to Figure 3 and appropriate pump assembly drawing during installation).

Wipe sleeve (026) and inside diameters of mechanical rotating assembly (3, Figure 3) with clean, light lubricating oil. Wipe lubricating oil on face of washer (3A4, Figure 3).

Figure 2



- 1. STATIONARY FACE
- 2. STATIONARY FACE "O" RING
- 3. ROTATING ASSEMBLY
 - 3A. ROTATING FACE
 - 3B. ROTATING FACE "O" RING
 - 3C. RETAINING RING
 - 3D. SPRING HOLDER
 - 3E. SETSCREW
 - 3F. SPRING



- 1. MATING RING
- 2. O-RING
- 3. ROTATING ASSEMBLY
 - 3A. WASHER BELLOWS ASSEMBLY
 - 3A1. DRIVE RING
 - 3A2. RETAINER
 - 3A3. FLEX RUBBER DIAPHRAGM
 - 3A4. WASHER
 - 3B. SPRING
 - 3C. SPRING HOLDER

Figure 3

Slide rotating assembly (3, Figure 3) on sleeve (026), until spring holder (3C, Figure 3) butts against shoulder on sleeve.

Install stationary face (1, Figure 3) with "o" ring into seat adapter (063 or 065). Slide seat adapter assembly with gasket (065 or 067) on seal sleeve and compress seal to expose snap ring groove. Install spiral ring (028) into groove.

To Install Mechanical Seal Assembly, Proceed As Follows:

Replace "O" Ring (025) in groove of power rotor (022).

Slide assembled mechanical seal and sleeve on power rotor (022) until it butts against balance piston (024).

Install spacers (029 and 030) on power rotor (022). Align spacers (030) so openings correspond to drain hole and slots in end cover (013).

Slide ball bearings (031) on power rotor (022). Thread nut (032) and tighten nut (032) to press ball bearing (031) on shaft. Ball bearing is correctly positioned when spacers (029 and 030) are clamped in position.

NOTE

To prevent power rotor (022) from rotating when nut (032) is tightened, hold power rotor (022) using a spanner wrench located in power rotor key (054) slot. Remove any burrs from key slot after nut (032) is installed.

Install nut (033) on power rotor (022) using a spanner wrench.

Push power rotor assembly into end cover (013), while centering all parts as they enter end cover (013). Ensure that gasket (065 or 067) is seated evenly.

Mount bearing retainer (034) on end cover (013) using bolts (035) and lockwashers (036). Tighten bolts (035) to a torque value of 95 lbs. ft. (± 5 lbs. ft.).

Install drive key (054), coupling hub, check nut (055) and tighten setscrew (056). Install spacer coupling.

PUMP DISASSEMBLY (Refer To Proper Assembly Drawing).

Because of the size and weight of the individual parts, it is usually preferable to remove the pump from its baseplate to a location equipped with crane or tackle when a full disassembly and rebuild is required.

Close inlet and outlet valves. Vent pressure from pump and drain before disconnecting inlet and outlet lines. The inlet may be drained by loosening tube fitting (052) or removing plug (019) from outboard end cover (050). Fluid in the outlet can be pumped to the inlet chamber by rotating the unit counterclockwise. Remove tubing (053) from pump.

NOTE

The 8L series pumps incorporates highly finished precision parts that must be handled carefully to avoid damage to critical machined surfaces. The parts removed should be tagged for identification and their exact positions in the pump carefully noted so that the new parts, or the same parts, are properly replaced without damage.

Remove spacer section of coupling. Disconnect inlet and outlet flanges. Remove pump from baseplate.

Install a 3/4-inch eyebolt in the tapped hole in cover (050) (the plate weighs approximately 175 pounds). Support weight of cover and remove Ferry capscrews (051) with their lockwashers (020). Remove cover (050) with thrust block (048) and capscrews (049).

Remove O-ring (012) and discard. Remove capscrews (049) and block (048) from cover (050).

Slide idler balance piston housing (044) from idlers (041). NOTE: Idler balance piston housings are not installed on pump type DAH8LHET idlers.

Rotate idlers (041) and remove from housing (005). Rotate power rotor (022) counterclockwise and remove both idlers (040). DO NOT drop idlers as they emerge from housing (005).

Loosen setscrew (056) and remove coupling nut (055). Remove coupling hub and key (054) from power rotor (022).

Remove retainer (034) by removing bolts (035) and lockwashers (036). Grasp power rotor (022) and pull assembly from pump. Removal of power rotor includes removal of nuts (032 and 033), ball bearing (031), spacers (029 and 030), mechanical seal seat adapter (063 or 065), spring pin, mechanical seal (027), sleeve (026), O-ring (025), piston (024) and O-ring (023).

CAUTION

The power rotor assembly is quite heavy, and should be supported by a rope sling as it is removed from pump. (The assembly weighs approximately 225 pounds.)

To remove parts from power rotor (022), the power rotor can be held in lead lined jaws of a bench vice. Use care in handling rotor assembly and DO NOT drop parts during removal. Disassemble power rotor as follows:

Remove nuts (033) and (032). Using a bearing puller, remove ball bearing (031).
Slide spacers (029 and 030) off power rotor (022).

Slide mechanical seal assembly and seal sleeve off power rotor (022). This assembly consists of the seal sleeve (026), mechanical seal (027), retaining ring (028), seat adapter (065 or 063) and gasket (065 or 067).

Refer to section "Servicing Mechanical Seal and Bearing for Seal Inspection and Installation."

Remove "o" ring (025). Remove balance piston (024) and "o" ring (023).

Connect a support sling on inlet head (037) and remove capscrews (021) and lock washers (020). Carefully remove inlet head (weight is approximately 275 pounds). Remove "o" ring (012) from case (001). For 400 and 400P rotor sizes, remove spirolox retaining ring (007) and spacer (006).

Install a 3/4 " eyebolt in the tapped hole of inboard cover (013). Connect a lifting hook to the eyebolt for support of the cover. Approximate weight is 385 pounds.

Remove inboard cover capscrews (021) and lockwashers (020).

Using a soft face mallet, tap the inboard cover (013) to loosen it from the case and remove. Set inboard cover (013) on a work bench and remove bushing (015). This is done by removing capscrew (018) and idler stop (016). Remove "o" ring (004) from the cover and "o" ring (012) from pump case.

NOTE

Socket head capscrews (018) have a plastic nyloc locking pallet. If capscrew appears to give inadequate holding discard and replace.

Remove stop pin plug (011) with "o" ring (010). Insert 3/8 – 16 inch bolt in threaded hole of stop pin (009) and remove.

Install 3/4 inch eyebolt into tapped holes at the end face of rotor housing (003 and 005) and pull housings from pump case. Do not rotate housing when removing until ends separate from each other to clear length of vent pin (008). Support each housing as it is removed (Approximate weight is 240 pounds each). Remove "o" ring (004) from housing and vent pins (005).

For solid bronze housing pumps with sleeves, proceed as follows.

Remove spacer or retaining ring (068 or 007 respectively) from case bore. Install 3/4" eyebolt in each end of housing (003). Pull housings from pump case. Removal of housing (003) will include "O" rings (004, 066, or 068), spiral rings (067 or 006), sleeves (006 or 080) and vent pins (008).

Pump Assembly – Refer to proper assembly drawing

General Comments

Inspect and clean all parts before starting assembly of pump. Do not open seal or ball bearing until they are ready for assembly.

A new mechanical seal should be installed if the old seal has been disturbed. A new bearing should also be installed when replacing the seal.

New "o" rings should be installed whenever an "o" ring joint has been disturbed.

Check all oil passages to make sure they are clean and free of any debris.

Use light lubricating oil on parts immediately before assembly. Do not allow parts to stand with machined surfaces exposed for extended periods of times.

Rotate power rotor frequently after installed in the pump during assembly to insure freedom of rotation.

Assemble Housing as follows:

Install O-ring (004) in O-ring groove of housing (003).

Install vent pins (008) in the outlet housing (003). Wipe the O-ring (004) and flange O.D.'s with a light coating of lubricating oil. Insert the housing (003) assembly in case (001) with dowels (008) pointed to the inlet end of the case (001). Slide the housing into the case (001) bore until the dowels (008) are almost flush with the flange of the inlet end of the case (001).

NOTE

Make sure slot in housing flange aligns with stop pin (009) hole in case.

Wipe a light coating of lubricating oil on the inlet housing (005). Mount the inlet housing (005) on the dowels (008) in order to align the housings. Push the housings (003 and 005) into the case (001) bore until the housing (005) flange aligns with the case (001). For 400 and 400P, slide housings (008 and 006) past slot in pump case (001). Install spacer (006), and Spirolox Retaining ring (007).

Install housing stop pin (009). Install a new O-ring (010) on plug (011) and then install plug assembly in case (001).

NOTE

Pumps having two housings (003), they must be assembled with sleeves (006 or 080), spiral rings (067 or 006) and O-rings (004 and 066 or 068) before they are assembled in the pump case (001).

Install O-ring (066 or 068) in O-ring groove of housing (003). Wipe O-ring (066 or 068) with a light coating of lubricating oil. Slide sleeve (006 or 080) over O-ring (066 or 068) and seat against flange, being careful not to pinch or cut O-ring (066 or 068). Install spiral ring (067 or 006) in ring groove of housing (003). Spiral ring (067 or 006) positions the sleeve (006 or 080) and keeps it in its proper position during assembly. Install O-rings (004) in O-ring groove in sleeve (006 or 080).

Assemble the second housing (003) in the same manner.

NOTE

The housing assemblies are identical and either section may be used for the discharge section.

Install vent pins (008) in the housing (003). Wipe the O-ring (004) and flange O.D.'s with a light coating of lubricating oil. Insert the housing (003) assembly in inlet end of case (001) with dowels (008) pointed to the inlet end of the case (001). Slide the housing into the case (001) bore until the dowels (008) are almost flush with the flange of the inlet end of the case (001).

NOTE

Make sure slot in housing flange aligns with stop pin (009) hole in case.

Wipe a light coating of lubricating oil on the O-ring (004) and flanges of second housing (003). Mount the second housing (003) on the dowels (008) in order to align the housings. Push the housing (003) into the case (001) bore until the housing has cleared the inlet end of case (001). Install spacer (068) in case (001). For 400 and 400P rotor sizes, slide housing assemblies past slot in case. Install spirolox retaining ring 007.

Install housing stop pin (009). Install a new O-ring (010) on plug (011) and then install plug assembly in case (001).

Assemble Inboard End Cover and Power Rotor in Pump Case as follows:

Slide bushing (015) in bore of inboard cover (013).

Install spring pin (017) in idler stop (016). Install idler stop (016) with spring pin (017) engaged in slot of flange face of bushing (015). Rotate entire engagement to align holes in idler stop (016) with tapped holes in cover (013) and idler stop tabs aligned with idler bore of housing (003). Install socket head capscrews (018) and tighten.

NOTE

If socket head capscrews (018) have been replaced, make sure they are replaced with Nylok fitted capscrews.

Install O-ring (004) in O-ring groove in cover (013). Install face seal O-ring (012) in O-ring groove of discharge end of pump case (001).

Wipe the rabbet diameter of inboard cover (013) with a light coating of lubricating oil.

Slide inboard cover (013) into case (001) and align bolt holes. DO NOT damage O-rings (004 and 012) when installing inboard cover. Install Ferry capscrews (020) and lockwashers (021) in inboard cover. Tighten capscrews (020) to a torque value of 340 lbs. ft. (± 10 lbs. ft.).

Wipe seal and bearing bore of inboard cover with oil. Wipe both sides of gasket (065 or 067) with oil and place gasket (065 or 067) in seal bore or inboard cover (013).

Assembly power rotor (022) as follows:

Clean power rotor then wipe shaft with clean lubricating oil. Slide "o" ring (023) in groove where balance piston sits. Slide balance piston (024) on power rotor until it butts shoulder.

NOTE

For assembly of particular mechanical seal, refer to pages 4 through 8.

Take the previously assembled power rotor and wipe the threaded section to remove all dirt and grid. Wipe all sections with a light coating of lubricating oil and install in pump case (001) by feeding threaded section through the inboard cover (013).

Before mechanical seal enters inboard cover, check gasket (065 or 067) to ensure gasket is not folded, pinched or out of position. Install retainer (034) using bolts (035) with lockwashers (036). Tighten bolts (035) to a torque value of 95 lbs. ft. (± 5 lbs. ft.).

Assemble Idlers

Wipe clean the discharge idler (040) and liberally coat with lubricating oil. Insert one idler (040) in each bore. The reduced diameter of the idler (040) is inserted first. Wipe and oil the inlet idler (041) and insert one in each bore. The inlet idler sections (041) can only be installed in one direction.

Install face seal O-ring (012) in the inlet end of case (001). Mount inlet head (037) using Ferry capscrews (021) and lockwashers (020). Tighten capscrews on a torque value of 340 lbs. ft. (± 10 lbs. ft.).

Wipe idler balance piston housing (044) and exposed ends of idlers (041) with lubricating oil. Slide an idler balance piston housing (044) on each idler (041).

NOTE

Pump types DAH8LHET are not equipped with idler balance piston housings (044). Shoe installed on each idler (041) rides directly on block (048).

If idler thrust block (048) was removed from cover (050), it must be in place before cover (050) is mounted to inlet head (037). Use capscrews (049) to attach block (048) to cover (050).

Install face O-ring (012) in cover (050) and mount cover (050) to inlet head (037) using Ferry capscrews (051) and lockwashers (039). Note – make certain that the thrust block (048) aligns properly with idler balance piston housings (044) on ends of idlers (041). Tighten capscrews (051) to a torque value of 155 lbs. ft. (± 10 lbs. ft.).

Install tubing (053) to connectors (052). Install drain plug (019) in cover (050).

Install drive key (054) and mount pump hub of coupling. Lock coupling hub to power rotor (022) using nut (055) and setscrew (056).

Mount pump on bedplate and check alignment as described in CA-1 manual.

**Table 1 List of Material
Bimetal Housings**

ITEM	PART DESCRIPTION	ITEM	PART DESCRIPTION	ITEM	PART DESCRIPTION
001	Case	022**	Power Rotor	048**	Block
002	Eyebolt (2)	023	O-Ring	049	Capscrew (2)
003**	Outlet Housing	024	Piston	050	Cover
004*	O-Ring (2)	025*	O-ring	051	Flange Screw (12)
005**	Inlet Housing	026	Seal Sleeve	052	90 Degree Elbow (2)
008	Vent Pin (2)	027*	Seal	053	Tube
009	Stop Pin	028	Spiral Ring	054	Key
010*	O-Ring	029	Spacer	055	Nut
011	Plug	030	Spacer	056	Setscrew
012*	O-Ring (3)	031*	Bearing	057	Adapter
013	Inboard Cover	032	Nut	058*	Gasket
014	Plug	033	Bearing Nut	059	Bolt (4)
015**	Bushing	034	Retainer	060	Name Plate
016	Stop Subassembly	035	Bolt (8)	061	Drive Screw (2)
018	Capscrew (2)	036	External Tooth Washer (8)	063	Adapter Seat Subassembly
019	Plug (4)	037	Inlet Head	065**	Gasket
020	Internal Tooth Washer (36)	040**	Idler (2)		
021	Flange Screw (24)	041**	Idler Subassembly (2)		
		044**	Idler Balance Piston Housing		

* Items required for Minor Repair Kit.

* & ** Items required for Major Repair Kit.

All quantities are one except when noted in parentheses.

NOTE: Imo DeLaval Inc. recommends that repair parts be ordered by minor or major repair kit.
When ordering kit, identify minor or major repair, pump model and serial number.

**Tabl 2 List of Material
Bronze Housings**

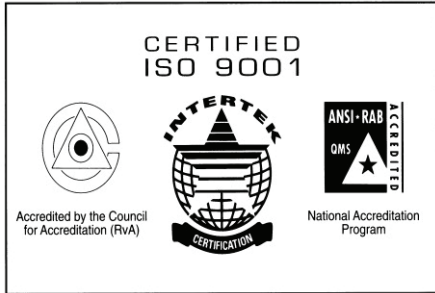
ITEM	PART DESCRIPTION	ITEM	PART DESCRIPTION	ITEM	PART DESCRIPTION
001	Case	024**	Piston	049	Capscrew (2)
002	Eyebolt (2)	025 *	O-Ring	050	Cover
003**	Housing (2)	026	Seal Sleeve	051	Flange Screw (12)
004*	O-Ring (5)	027*	Seal	052	90 Degree Elbow (2)
006	Sleeve (2)	028	Spiral Ring	053	Tube
008	Vent Pin (2)	029	Spacer	054	Key
009	Stop Pin	030	Spacer	055	Nut
010*	O-Ring	031*	Bearing	056	Setscrew
011	Plug	032	Nut	057	Adapter
012*	O-ring (3)	033	Bearing Nut	058*	Gasket
013	Inboard Cover	034	Retainer	059	Bolt (4)
014	Plug	035	Bolt (8)	060	Name Plate
015**	Bushing	036	External Tooth Washer (8)	061	Drive Screw (2)
016	Stop Subassembly	037	Inlet Head	063	Adapter Seat Subassembly
018	Capscrew (2)	040**	Idler (2)	065**	Gasket
019	Plug (4)	041**	Idler Subassembly (2)	066*	O-Ring (2)
020	Internal Tooth Washer (36)	044**	Idler Balance Housing Subassembly	067	Spiral Ring (2)
021	Flange Screw (24)	048**	Block	068	Spacer
022**	Power Rotor				
023*	O-Ring				

* Items required for Minor Repair Kit.

* & ** Items required for Major Repair Kit.

All quantities are one except when noted in parentheses.

NOTE: Imo DeLaval Inc. recommends that repair parts be ordered by minor or major repair kit.
When ordering kit, identify minor or major repair, pump model and serial number.



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