Imo™ Pump
An Imo Industries Business

INSTRUCTION MANUAL

SERIES 3LBX-187

WARNING

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

Instructions A/C 3LBX(R-3)

This manual now is identified as part no. SRM00034

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FOREWORD

This instruction manual covers Series 3LB-187 Imo Pumps. Due to variable operating conditions, it is necessary to have a variety of construction and material combinations to meet job requirements. The model and serial number of each pump are identified on the pump nameplate. Specific models discussed in this manual are identified in Table 1 below. For maintenance, disassembly and reassembly procedures, refer to assembly drawings, Figures 5 and 6.

TABLE 1
SERIES 3LB-187 PUMP MODELS

Pump Model*	Assembly Drawing No.	Fig. No.	Seal Fig. No.
A3LBX	SD-5475	5	1
A3LBXT	SD-5543	6	2 or 3
B3LBX	SD-5475	5	1
C3LBX	SD-5475	5	1
C3LBXT	SD-5543	6	2 or 3
*Pump model precedes rotor size			

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 limitations to be exceeded.

Maximum Discharge Pressure - 1200 PSIG

Maximum Inlet Pressure - 700 PSIG (at 1800 RPM or less)
- 500 PSIG (above 1800 RPM)
Series 3LB pumps are designed for positive inlet pressures. The unit should not be operated for extended periods of time with inlet pressures less than atmospheric.

Maximum Differential Pressure - 500 PSID

Maximum Fluid Temperature - 160 Degrees F

Maximum Speed - 4400 RPM

Mounting - Foot Mount for Horizontal Mounting

ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for Series 3LB-187 pumps must refer to this instruction book 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.
   NOTE: Because materials used in construction vary from pump type to pump type, it is mandatory that the pump serial number be specified.
3. Give the Figure number on which pump type part(s) is shown.
4. Give the part number(s) for necessary part(s).

MECHANICAL SEALS

Mechanical seals installed in Series 3LB-187 pumps are Crane Type 9B, Figures 1 and 2, and Borg Warner Type QBW, Figure 3. Disassembly and assembly procedures for mechanical seals are as follows:

DISASSEMBLY PROCEDURES

Stationary Assembly

(Figure 1) Slide stationary assembly, seat (1) and O-ring (2) off power rotor (010) shaft. Remove O-ring (2) from groove of seat (1).

(Figures 2 and 3) Stationary assembly, seat (1) and O-ring (2), is removed with seat adapter (032). Remove mechanical seal seat (1) from seat adapter (032) and remove O-ring (2) from seat (1).

Rotating Assembly

Loosen setscrews and slide rotating assembly (3) off power rotor (010) shaft.

ASSEMBLY PROCEDURES

Rotating Assembly

NOTE: The rotating assembly (3) is normally packaged as an assembly for ease of installation. Coat all parts of the seal with oil prior to assembly on power rotor shaft. Refer to mechanical seal drawings, Figures 1, 2 and 3, and assembly drawings, Figures 5 and 6, for applicable assembly procedures.

Slide rotating assembly (3) on power rotor (010) shaft next to piston (inboard end) and next to shim (023) (outboard end) as indicated on assembly drawings.

(Figures 1 and 2) Remove and discard retaining clips (4).

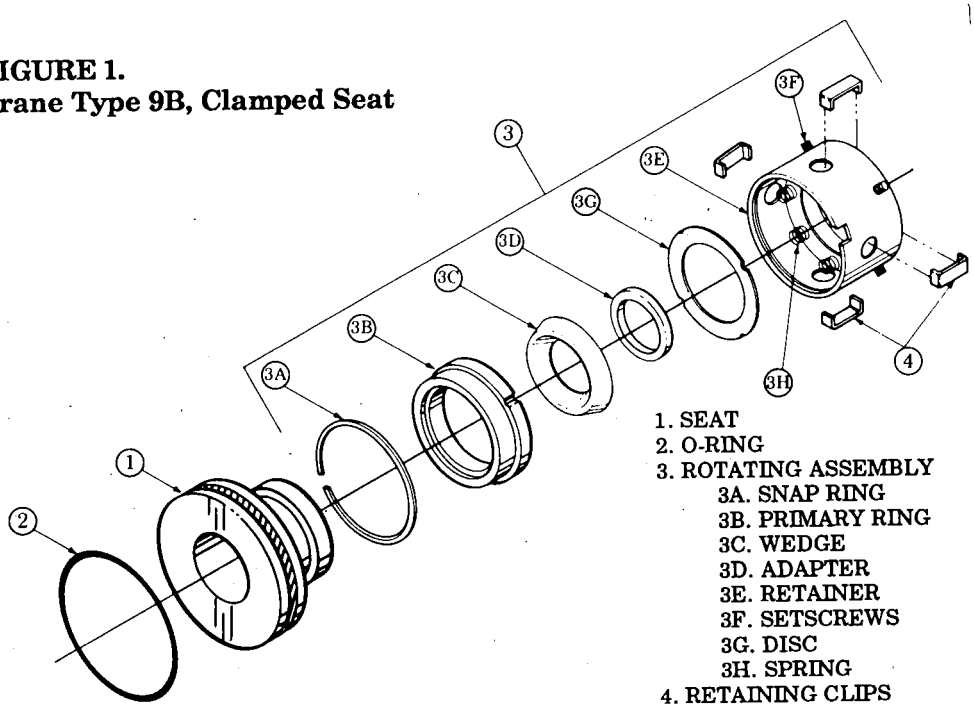
Tighten setscrews.

Stationary Assembly

(Figure 1) Install O-ring (2) in groove of mechanical seal seat (1). Slide mechanical seal stationary assembly, seat (1) and O-ring (2), on power rotor (010) shaft.

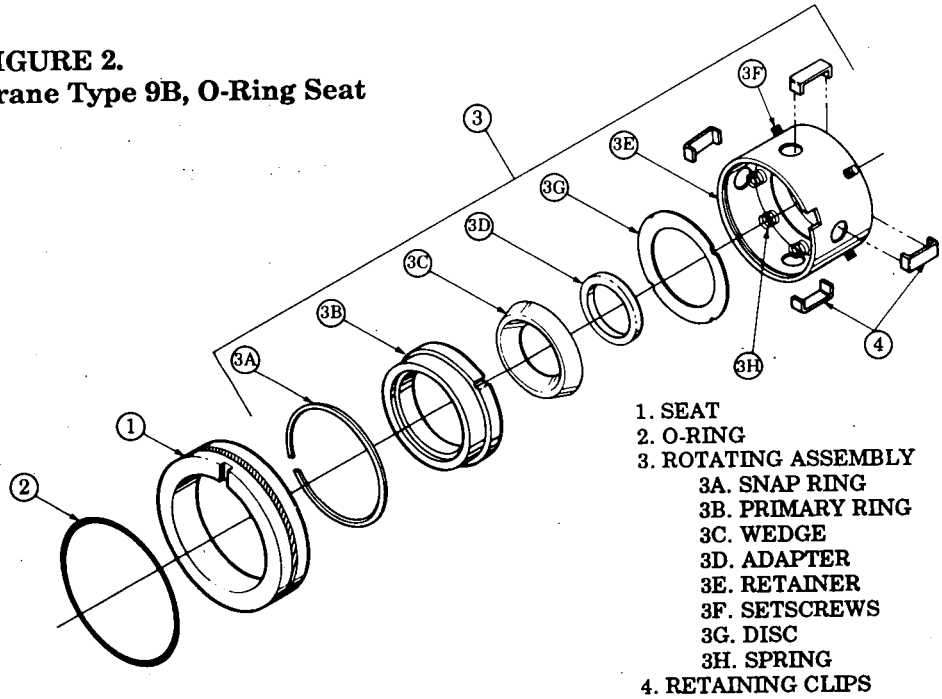
(Figures 2 and 3) Install O-ring (2) on mechanical seal seat (1) and install seal seat (1) in seat adapter (032), ensuring that spring pin (033) is properly positioned to engage slot in mechanical seal seat (1).

FIGURE 1.
Crane Type 9B, Clamped Seat



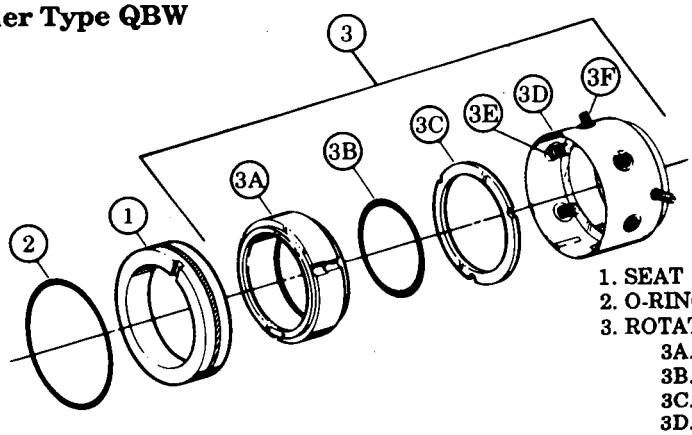
1. SEAT
2. O-RING
3. ROTATING ASSEMBLY
   - 3A. SNAP RING
   - 3B. PRIMARY RING
   - 3C. WEDGE
   - 3D. ADAPTER
   - 3E. RETAINER
   - 3F. SETSCREWS
   - 3G. DISC
   - 3H. SPRING
4. RETAINING CLIPS

FIGURE 2.
Crane Type 9B, O-Ring Seat



1. SEAT
2. O-RING
3. ROTATING ASSEMBLY
   - 3A. SNAP RING
   - 3B. PRIMARY RING
   - 3C. WEDGE
   - 3D. ADAPTER
   - 3E. RETAINER
   - 3F. SETSCREWS
   - 3G. DISC
   - 3H. SPRING
4. RETAINING CLIPS

FIGURE 3.
Borg Warner Type QBW



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

ASSEMBLY AND DISASSEMBLY PROCEDURES

Disassembly of Pump

NOTE: Disassembly procedures for Figures 5 and 6 pumps are identical except when specifically noted for disassembly and removal of mechanical seals, Steps 3 and 8. Refer to Table 1 for proper identification of pump type and applicable Figure Number.

STEP 1. Close off suction and discharge piping to pump and disconnect piping. Remove tubing (030) by loosening elbows (029). Drain pump case. Remove pump from driver, coupling and bracket. Remove coupling hub and key (016).

STEP 2. Remove bolts (008) and outboard retainer (007) from outboard cover (021).

STEP 3. Remove capscrews (006) and assembled outboard cover (021). Disassemble outboard cover (021) as follows:

a. *(Figure 5)* Removal of outboard cover (021) assembly includes removal of O-ring (003), elbow (029) and mechanical seal stationary seat and O-ring (1 and 2, Figure 1).

1. Remove mechanical seal stationary seat and O-ring (1 and 2, Figure 1) as outlined in Mechanical Seals.

2. Remove O-ring (003) from groove of outboard cover (021).

b. *(Figure 6)* Removal of outboard cover (021) assembly includes removal of O-ring (003), elbow (029), seat adapter (032), spring pin (033), O-ring (034) and mechanical seal stationary seat and O-ring (1 and 2, Figure 2 or 3).

1. Remove seat adapter (032) assembly, consisting of seat adapter (032), O-ring (034), spring pin (033) and mechanical seal seat and O-ring (1 and 2, Figure 2 or 3), from outboard cover (021).

2. Remove mechanical seal stationary seat and O-ring (1 and 2, Figure 2 or 3) from seat adapter (032) as outlined in Mechanical Seals.

3. Remove O-ring (034) from groove of seat adapter (032). If necessary, remove spring pin (033).

4. Remove O-ring (003) from groove of outboard cover (021).

STEP 4. Remove mechanical seal rotating assembly (3, Figure 1, 2 or 3) as outlined in Mechanical Seals.

STEP 5. Remove shim (023) and rotating ring (022) from power rotor (010) shaft.

STEP 6. Remove bolts (008) and inboard retainer (007) from inboard cover (004).

STEP 7. Remove power rotor (010) assembly consisting of retaining rings (015), bearing (014), spacer (013), and mechanical seal (012). NOTE: *(Figure 5)* Removal of power rotor (010) also removes seat adapter (032) assembly.

STEP 8. Disassemble power rotor (010) as follows:

a. Remove outer retaining ring (015) from groove of power rotor (010).

b. Press ball bearing (014) off power rotor (010).

c. Remove inner retaining ring (015) from groove of power rotor (010).

d. Remove spacer (013) from power rotor (010).

e. *(Figure 5)* Remove mechanical seal stationary seat and O-ring (1 and 2, Figure 1) from power rotor (010) as outlined in Mechanical Seals.

f. *(Figure 6)* Remove seat adapter (032) assembly, consisting of seat adapter (032), O-ring (034), spring pin (033) and mechanical seal stationary seat and O-ring (1 and 2, Figure 2 or 3), from power rotor (010).

1. Remove mechanical seal seat and O-ring (1 and 2, Figure 2 or 3) from seat adapter (032) as outlined in Mechanical Seals.

2. Remove O-ring (034) from groove of seat adapter (032). If necessary, remove spring pin (033).

g. Remove mechanical seal (012) rotating assembly (3, Figure 1, 2 or 3) as outlined in Mechanical Seals.

STEP 9. Remove assembled inboard cover (004) from case (001) be removing capscrews (006). Disassemble inboard cover (004) as follows:

a. Remove bushing (005) from inboard cover (004).

b. Remove O-ring (003) from groove of inboard cover (004).

STEP 10. Remove idlers (011) from idler bores of housing (002).

STEP 11. Remove housing (002) assembly consisting of housing (002), O-ring (003), spacers (017), plate (051) assembly and capscrews (019) from case (001). Disassemble housing (002) assembly as follows:

a. Remove thrust plate (051) assembly consisting of plate and bushing and spacer (017) from housing (002) by removing capscrews (019).

b. Remove O-ring (003) from groove of housing (002).

Assembly of Pump

NOTE: Prior to assembly of pump, all parts should be cleaned and inspected for nicks and burrs. Replace all worn or damaged parts. The IMO Pump Division recommends automatic replacement of O-rings (003 and 034), mechanical seal (012) and bearing (014) when these parts are disturbed from their previously installed position. Refer to pump assembly drawings (Figures 5 and 6) and Parts List (Table 2) during assembly. Assembly procedures for Figures 5 and 6 pumps are identical except when specifically noted for assembly of mechanical seals, Steps 4 and 12. Coat all parts with a light lubricating oil to assist in assembly.

STEP 1. Assemble and install housing (002) as follows:

a. Install spacers (017) and thrust plate (051) assembly, consisting of plate and bushing, on housing (002) using capscrews (019). Tighten capscrews (019) finger tight only to permit adjustment of

plate assembly (051) to properly install housing (002) with a minimum of force.

b. Install O-ring (003) in groove of housing (002).

c. Install idlers (011) in idler bores of housing (002) with small diameter of idlers at O-ring (003) end of housing.

d. Install assembled housing (002), O-ring (003) end first, into inlet end of case (001).

STEP 2. Assemble and install inboard cover (004) as follows:

a. Install bushing (005) on inboard cover (004).

b. Install O-ring (003) in groove of inboard cover (004).

c. Install assembled inboard cover (004) to pump case (001) using capscrews (006). Torque capscrews (006) to 135 lbs. ft. (± 5 lbs. ft.).

STEP 3. Torque plate (051) assembly capscrews (019) to 50 lbs. ft. (± 3 lbs. ft.).

STEP 4. Assemble and install power rotor (010) as follows:

a. Install mechanical seal (012) rotating assembly (3, Figure 1, 2 or 3) on power rotor (010) as outlined in Mechanical Seals.

b. *(Figure 5)* Install mechanical seal stationary seat and O-ring (1 and 2, Figure 1) on power rotor (010) as outlined in Mechanical Seals.

c. *(Figure 6)* Install mechanical seal seat and O-ring (1 and 2, Figure 2 or 3) in seat adapter (032) as outlined in Mechanical Seals. Install O-ring (034) in groove of seat adapter (032) and install assembled seat adapter (032) on power rotor (010) shaft.

d. Install spacer (013) on power rotor (010) shaft.

e. Install inner retaining ring (015) in groove of power rotor (010) shaft.

f. Press ball bearing (014) on power rotor (010) shaft, pressing only on inner race of bearing.

g. Install outer retaining ring (015) in groove of power rotor (010) shaft to retain bearing.

h. Install assembled power rotor (010) into inboard cover (004) and pump case (001) by rotating power rotor (010) in direction of normal pump rotation to mesh threads of power rotor (010) with threads of idlers (011). NOTE: Ensure that all parts are centered and properly positioned as they enter inboard cover (004).

STEP 5. Install inboard retainer (007) to inboard cover (004) using bolts (008). Torque bolts (008) to 8 lbs. ft. (± 1 lb. ft.).

STEP 6. Install retaining ring (022) in groove of power rotor (010).

STEP 7. Install outboard cover (021) to case (001) using capscrews (006). Torque capscrews (006) to 135 lbs. ft. (±5 lbs. ft.).

STEP 8. Refer to Figure 4 and determine proper shim (023) thickness as follows:

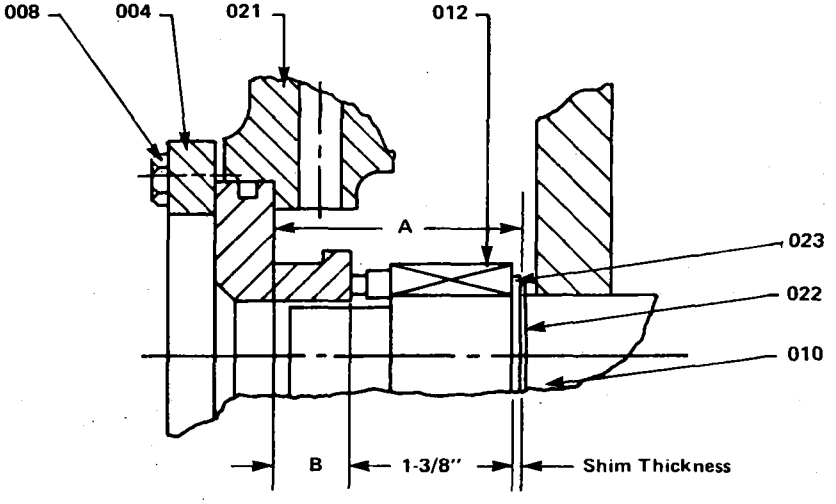
a. Measure distance from counterbore of outboard cover (021) to installed retaining ring (022) to determine dimension "A".

b. *(Figure 5)* Measure distance from face of seal seat (face that mates with counterbore of outboard cover) to outer face of seal seat (face that mates with rotating assembly) to determine dimension "B".

c. *(Figure 6)* Install seal stationary assembly seat (1) and O-ring (2), Figures 2 and 3 in seat adapter (032) as outlined in Mechanical Seals. Measure distance from face of seat adapter (032) to face of mechanical seal seat to determine dimension "B".

d. Subtract dimension "B" from dimension "A" and add .010. From this dimension, subtract the working length (1 3/8-inch, ± .010-inch) of the mechanical seal. The resulting dimension will be the proper thickness of shim (023).

e. Add or remove layers of laminated shim (023) to adjust shim to proper thickness as determined above.



SHIM THICKNESS = [(A – B) + .010] – 1-3/8-inch

FIGURE 4

STEP 9. Remove capscrews (006) and outboard cover (021) from case (001).

STEP 10. Install proper thickness of shim (023) on power rotor (010) shaft next to installed retaining ring (022).

STEP 11. Install rotating assembly (3, Figure 1, 2 or 3) of mechanical seal on power rotor (010) shaft next to laminated shim (023) as outlined in Mechanical Seals.

STEP 12. Assemble and install outboard cover (021) as follows:

a. *(Figure 5)* Install mechanical seal stationary assembly (1 and 2, Figure 1) in outboard cover (021).

b. *(Figure 6)* Install mechanical seal stationary assembly in seat adapter as outlined in Mechanical Seals. Install O-ring (034) in groove of seat adapter (032) and install assembled seat adapter (032) in outboard cover (021).

c. Install O-ring (003) in groove of outboard cover (021), and install assembled outboard cover (021) to case (001) using capscrews (006). Torque capscrews (006) to 135 lbs. ft. (± 5 lbs. ft.).

STEP 13. Install outboard retainer (007) to outboard cover (021) using bolts (008). Torque bolts (008) to 8 lbs. ft. (± 1 lb. ft.).

STEP 14. Install external tubing (030) using elbows (029) in inboard cover (004) and outboard cover (021).

STEP 15. Install coupling hub and key (016).

STEP 16. Mount pump on bracket and align pump with driver as described in CA-1 manual.

TABLE 2
LIST OF MATERIALS (FIGURES 5 AND 6)

Item	Description	Item	Description
001	Case	021	Outboard Cover
002 (2)	Housing	022 (1)	Retaining Ring
003 (1)	O-ring (3)	023 (1)	Shim
004	Inboard Cover	024	Nameplate
005 (2)	Bushing	025	Nameplate
006	Capscrew (8)	026	Nameplate
007	Retainer (2)	027 (3)	Drive Screw (7)
008	Bolt (8)	028	Piston
010 (2)	Power Rotor Assembly	029	Elbow (2)
011 (2)	Idler (2)	030	Tubing
012 (1)	Seal (2)	032	Seat Adapter
013	Spacer	033	Spring Pin
014 (1)	Bearing	034 (1)	O-ring
015 (1)	Retaining Ring (2)	035	Drive Screw (3)
016	Key	051 (2)	Plate Assembly
017	Spacer (2)		(Consists of Plate and Bushing)
019	Capscrew (2)		

Quantities are one (1) except when noted in parentheses after part description.

(1) Minor Repair Kit items.
(2) Major Repair Kit items. Items marked (1) also included in Major Repair Kit.
(3) Quantity is four (4) for Figure 4 pumps.

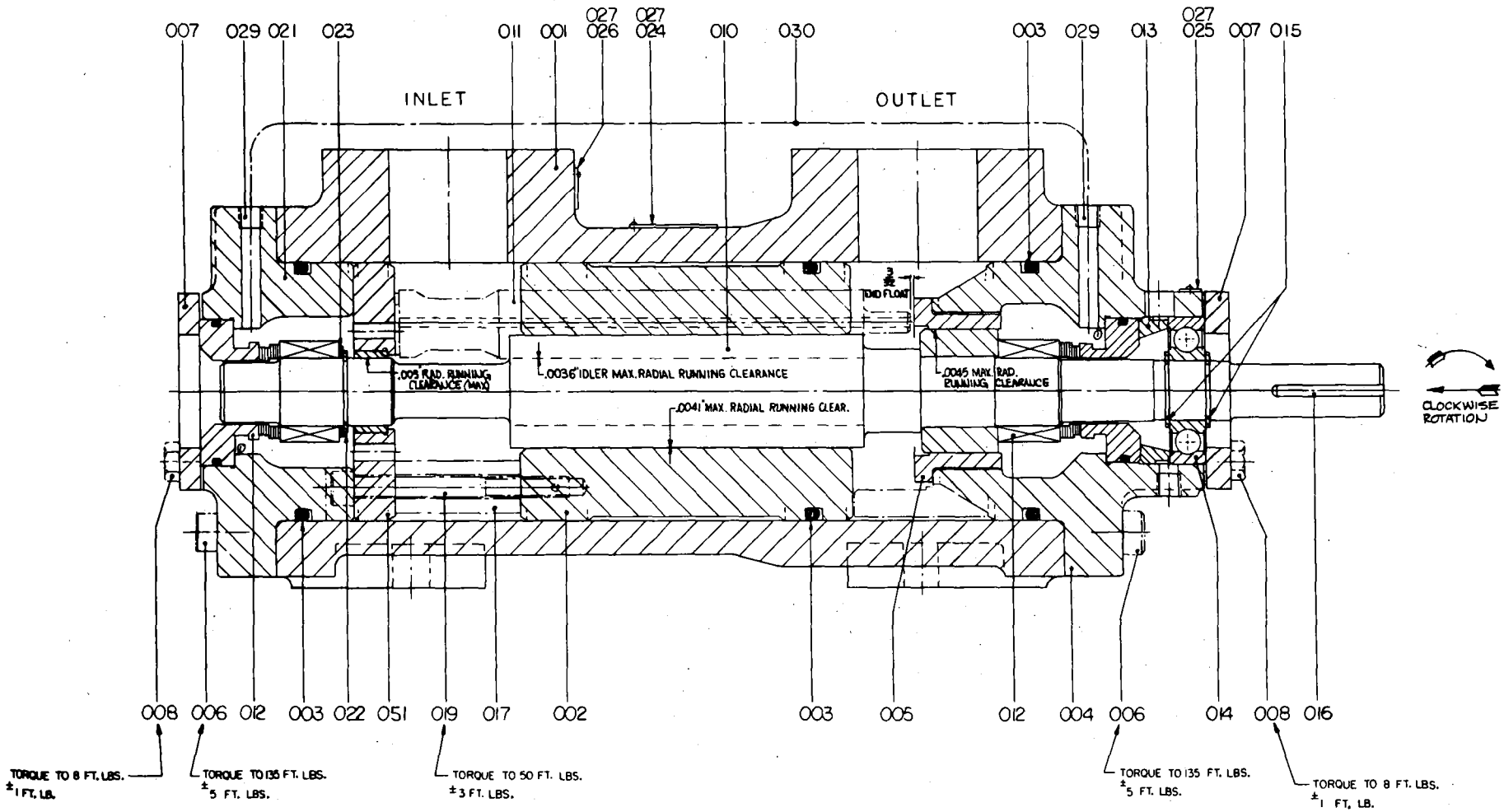


FIGURE 5. Assembly Drawing SD-5475

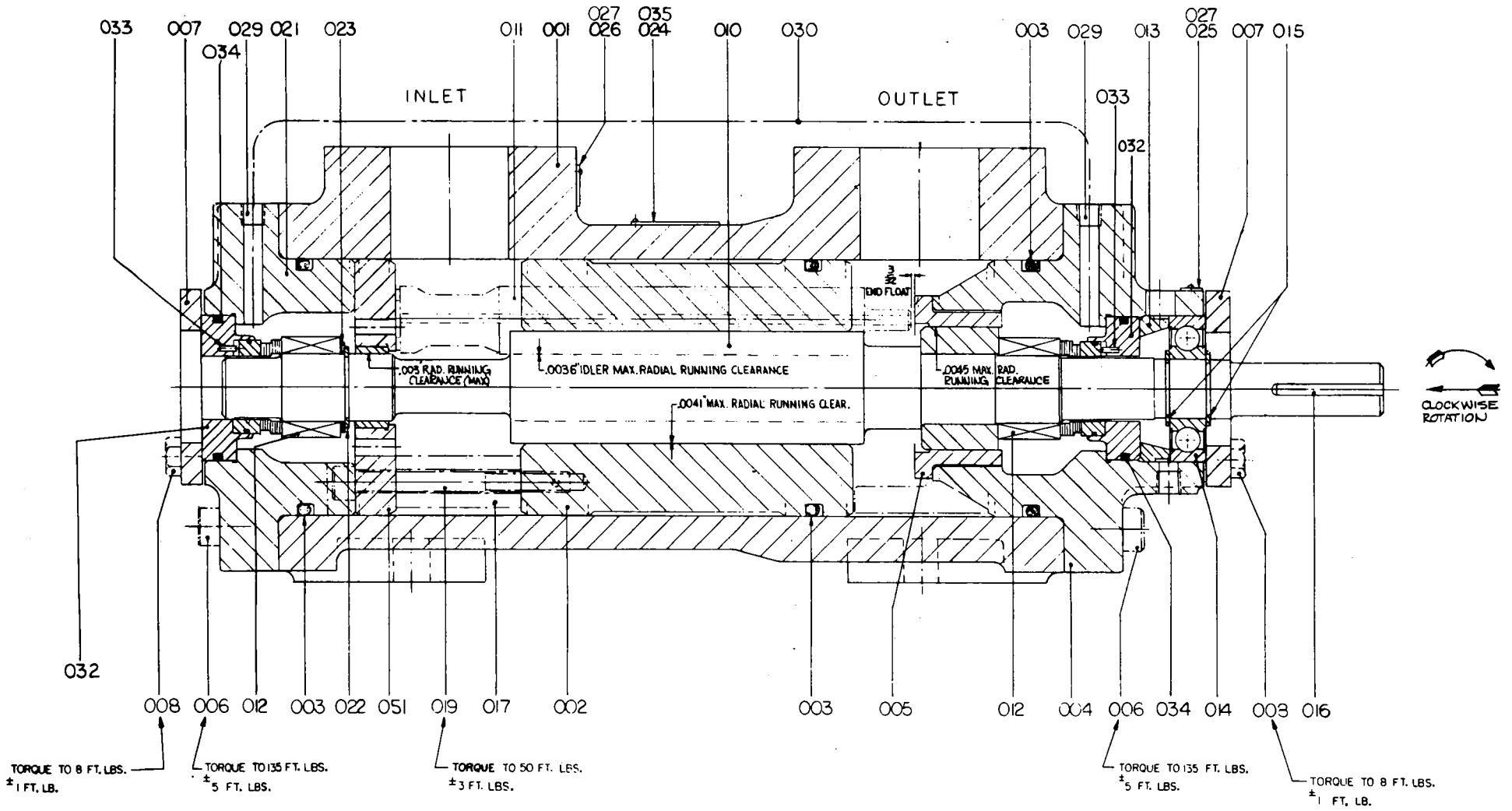


FIGURE 6. Assembly Drawing SD-5543

The instructions given herein cover generally the operation and maintenance of subject equipment. Should any questions arise which may not be answered specifically by these instructions, they should be referred to the Imo Pump for further detailed information and technical assistance.

This manual cannot possibly cover every situation connected with the operation, adjustment, inspection, test, overhaul and maintenance of the equipment furnished. Every effort is made to prepare the text of the manual so that engineering and design data is transformed into the most easily understood wording. The Imo Pump, in furnishing this equipment and this manual, must presume that the operating and maintenance personnel assigned thereto have sufficient technical knowledge and experience to apply sound safety and operational practices which may not be otherwise covered herein.

In applications where the Imo Pump furnished equipment is to be integrated with a process or other machinery, these instructions should be thoroughly reviewed to determine the proper integration of the equipment into the overall plant operational procedures.