



## INSTRUCTION MANUAL

# SERIES 12DZ - 350/400

WARNING

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

This manual now is  
identified as part no.  
SRM00012

### Instructions 12 DZ (R-2)

Imo Industries Inc.  
**IMO Pump Division**  
P.O. Box 5020  
Airport Road  
Monroe, NC 28111-5020  
USA

June 1987

## FOREWORD

This instruction book with the CA-1 manual covers the IMO Pump Division Series 12DZ-350/400 IMO pumps. Because of the large number of operating conditions, it is necessary to have a variety of construction and material combinations to meet job requirements. The model of each pump is identified on the pump nameplate. Letter designators preceding series designator (12D) identify basic design modifications. All Series 12DZ-350/400 pumps are equipped with Borg Warner Type Q mechanical seals (designator Z). This manual identifies pump types by Assembly Figure Numbers. For maintenance, disassembly and assembly procedures, ensure that specific pump type is identified with correct Figure number. Refer to Table 1 and Figures 2 through 4 for identification of specific models.

**TABLE 1. LIST OF PUMP TYPES**

Pump Type	Pump Assy. Dwg. No.	Pump Assy. Fig. No.
D12DZ-350	SF-5565	2
D12DZ-400	SF-5565	2
G12DZ-350	SF-5581	3
H12DZ-350	SF-5581	3
AG12DZ-350	SF-5594	4

## STRUCTURAL LIMITS

Operating conditions such as speed, fluid viscosity, inlet pressure, temperature, filtration, duty cycle, mounting, drive 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 Division offices and representatives listed in Manual CA-1).

Series 12DZ-350/400 pumps should never be utilized for any application other than the application for which the original pump was designed without factory approval.

## ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for Series 12DZ-350/400 pumps must refer to this instruction book number and should be addressed to the nearest IMO Pump Division 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 is shown.
- (4) Give the part number(s) for necessary part(s).

## DISASSEMBLY AND ASSEMBLY PROCEDURES

### DISASSEMBLY PROCEDURES (FIGURES 2 THROUGH 4)

NOTE: Disassembly procedure for Figures 2 through 4 are identical except when specifically noted. Ensure that pump type is properly identified by correct Figure number for disassembly procedures. Refer to Table 1 for proper identification of pump type and applicable Assembly Figure Number.

- STEP 1. Close off suction and discharge piping to pump and disconnect piping. Remove seal piping (042). Remove drain plugs and drain unit. Remove pump from driver, coupling and baseplate. Remove coupling hub and key (028). NOTE: (*Figure 2*) Remove setscrew (030) and checknut (029) prior to removal of coupling hub and key for rotor size 400 only.
- STEP 2. Remove bolts (015) and inlet head (037).
- STEP 3. Remove gasket (036) from case (001) or inlet head (037).
- STEP 4. Remove spiral rings (035) from grooves of case (001).
- STEP 5. (*Figure 3 Only*) Remove spacer (048) from case (001).
- STEP 6. Remove thrust cage or thrust block assembly as follows:
- a. (*Figure 2*) Remove thrust cage (034). Remove vent pin (004) from either cage (034) or inlet housing (007).
  - b. (*Figure 3*) Remove thrust block assembly (051) by removing capscrews (053) and spacers (049). If necessary, remove plate (050) from block (051) by removing capscrews (052).
  - c. (*Figure 4*) Remove thrust cage (034). Remove oil balance tube (063) with O-rings (064) from either cage (034) or inlet housing (007). Remove O-rings (064) from tube (063).
- STEP 7. (*Figures 2 and 4*) Remove idler balance piston housings (033) from idlers (032).

NOTE: (*Figure 3*) Shoes (047) and drill bushings (055) are furnished as part of idler rotors (046 and 031) and are not serviced separately.

- STEP 8. Remove idlers (032 or 046) by unscrewing idlers from inlet end of pump. Remove remaining idlers (031, Figures 2 and 3) or (031 and 060, Figure 4) from housings by rotating power rotor (017) in a counter-clockwise direction. Do not permit idlers (031 and 060) to drop as they emerge from housings.
- STEP 9. Remove bolts (027) and bearing retainer (026) from inboard cover (008).
- STEP 10. Remove assembled power rotor (017). Removal of power rotor (017) includes removal of truarc rings (023), ball bearing (025), spacer (021), spring pin (022), and mechanical seal (019). NOTE: Piston (018) furnished as part of power rotor (017) sub-assembly and is not serviced separately.
- STEP 11. Disassemble power rotor (017) as follows:
- Remove outer truarc ring (023) from groove of power rotor. Press ball bearing (025) from power rotor (017). Remove inner truarc ring (023) from groove of power rotor.
  - Remove spacer (021) from power rotor. NOTE: Removal of spacer (021) will also remove mechanical seal seat and O-ring (1 and 2, Figure 1) and spring pin (022). Remove mechanical seal seat (1, Figure 1) from spacer (021). Remove O-ring (2, Figure 1) from mechanical seal seat.
  - Remove mechanical seal (019) rotating assembly (3, Figure 1) from power rotor (017) shaft by loosening setscrews (3E, Figure 1) and sliding rotating assembly off power rotor.

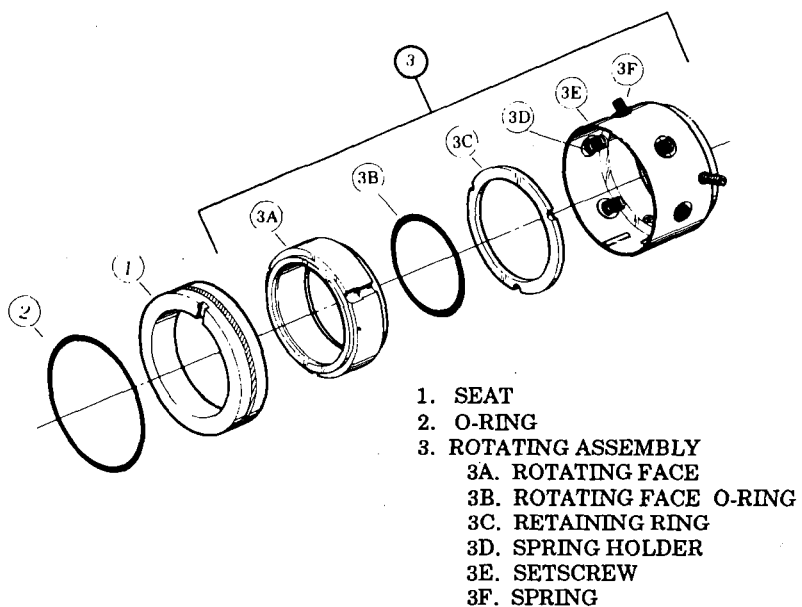


FIGURE 1. Borg Warner Type Q Mechanical Seal

- STEP 12. Remove gasket (024) from seal bore of cover (008).
- STEP 13. Remove bolts (015) and remove assembled cover (008) from case (001). Removal of cover (008) includes removal of balance piston bushing (009), stop (011), spring pins (012 and 013), capscrews (014) and O-ring (003).
- STEP 14. Remove O-ring (003) from groove of cover (008). Remove capscrews (014) and stop (011) from cover (008). Remove spring pins (012 and 013). Remove balance piston bushing (009).
- STEP 15. Remove stop pin (006) with Dyna Seal (005) from case (001).
- STEP 16. Remove inlet housing (007) and outlet housing (002) with O-ring (003) from inlet end of pump case (001).

### **CAUTION**

Do not permit housings to fall as they are removed from pump case.

- STEP 17. Remove O-ring (003) from groove of housing (002).
- STEP 18. *(Figures 2 and 3)* Remove vent pins (004) from housing (002 or 007).
- STEP 19. *(Figure 4 Only)* Remove vent pin (004) and tube (063) with O-rings (064) from housing (002 or 007). Remove O-rings (064) from tube (063).

### **ASSEMBLY PROCEDURES (FIGURES 2 THROUGH 4)**

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 064), gasket (024 and 036), Dyna Seal (005), mechanical seal (019) and ball bearing (025) when these parts are disturbed from their previously installed position. Refer to pump assembly drawings, Figures 2 through 4; mechanical seal drawing, Figure 1; and List of Material, Table 2, during assembly. Coat all parts with light lubricating oil to assist in assembly. Assembly procedures for Figures 2 through 4 are identical except when specifically noted.

- STEP 1. Install O-ring (003) in groove of housing (002). Install housing (002) in pump case (001) properly aligning housing with bore in case (001) for stop pin (006). Install stop pin (006) with Dyna Seal (005) in case (001).
- STEP 2. *(Figures 2 and 3)* Install vent pins in bores of inlet housing (007). NOTE: Figure 2 pumps are equipped with 3 vent pins (004) and Figure 3 pumps are equipped with 2 vent pins (004).
- STEP 3. *(Figure 4)* Install O-rings (064) on oil balance tubes (063). Install oil balance tubes (063) and vent pin (004) in bores of inlet housing (007).
- STEP 4. Install assembled inlet housing (007), ensuring that vent pins (004) and/or tubes (063) engage bores of housing (002).
- STEP 5. Install balance piston bushing (009) on cover (008). Install spring pins (012 and 013) in stop (011). Install stop (011) on cover (008), ensuring that spring pin (012) engages bore in balance piston

bushing (009). Install capscrews (014) in stop (011) and torque capscrew (014) to 36 lbs. in. ( $\pm 2$  lbs. in.).

STEP 6. Install O-ring (003) in groove of cover (008). Install assembled cover (008) on pump case (001) using bolts (015). Torque bolts (015) to 160 lbs. ft. ( $\pm 10$  lbs. ft.).

STEP 7. Assemble power rotor (017) as follows:

- a. Slide rotating assembly (3, Figure 1) of mechanical seal (019) on power rotor next to piston (018). Tighten setscrews.
- b. Install O-ring (2, Figure 1) on mechanical seal seat (1, Figure 1). Install seat and O-ring (1 and 2, Figure 1) in spacer (021) ensuring that spring pin (022) is positioned to engage slot in seal seat (1, Figure 1).
- c. Install assembled spacer (021) on power rotor (017).
- d. Install inner truarc rings (023) in groove of power rotor (017).
- e. Press ball bearing (025) on power rotor (017), pressing only on inner race of bearing.
- f. Install outer truarc ring (023) in groove of power rotor (017) to retain bearing.
- g. Install gasket (024) in bore of end cover (008).

STEP 8. Install assembled power rotor (017) in pump, centering each part as it enters cover (008).

STEP 9. Install bearing retainer (026) on inboard cover (008) using bolts (027). Torque bolts (027) to 35 lbs. ft. ( $\pm 5$  lbs. ft.).

STEP 10. Install idlers (031, Figures 2 and 3) or (031 and 060, Figure 4) in bores of housings (002 and 007) by engaging threads of idlers (031 and/or 060) with threads of power rotor (017) and rotating power rotor (017) in a clockwise direction.

STEP 11. Install idlers (032 or 046) in housing (007) bores as indicated above.

STEP 12. (*Figures 2 and 4*) Install idler balance piston housings (033) on idlers (032).

NOTE: (*Figure 3*) Shoes (047) and drill bushings (055) are furnished as part of idlers (046 and 031) and are not serviced separately.

STEP 13. Install thrust cage or thrust block assembly as follows:

- a. (*Figures 2 and 4*) Install thrust cage (034), ensuring that bore in thrust cage (034) engages vent pin (004) or tube (063).
- b. (*Figure 3 Only*) Install plate (050) on block (051) using capscrews (052). Torque capscrews (052) to 10 lbs. ft. ( $\pm 2$  lbs. ft.). Install assembled block (051) on inlet housing (007) using spacers (049) and capscrews (053). Torque capscrews (053) to 44 lbs. ft. ( $\pm 5$  lbs. ft.).

- STEP 14. *(Figure 3 Only)* Install spacer (048) in case (001).
- STEP 15. Install spiral rings (035) in groove of case (001).
- STEP 16. Install gasket (036) and inlet head (037) on case (001) using bolts (015). Torque bolts (015) to 140 lbs. ft. ( $\pm 5$  lbs. ft.).
- STEP 17. Install coupling hub and key (028) on power rotor (017) shaft.
- STEP 18. *(Figure 2, 400 Rotor Size Only)* Install checknut (029) and setscrew (030).
- STEP 19. Install seal piping (042). Install all plugs removed during disassembly.
- STEP 20. Mount pump on baseplate and align with driver as described in CA-1 manual.

**TABLE 2****LIST OF MATERIALS (FIGURES 2 THROUGH 4)**

<b>PART</b>	<b>DESCRIPTION</b>	<b>PART</b>	<b>DESCRIPTION</b>
001	Case	032 (2)	Idler (2)
002 (2)	Housing	033 (2)	Idler Balance Piston Housing
003 (1)	O-ring (2)	034 (2)	Cage
004 (3)	Vent Pin	035 (2)	Spiral Ring (2)
005 (1)	Dyna Seal	036 (1)	Gasket
006	Stop Pin	037	Inlet Head
007 (2)	Inlet Housing	038	Plug (2)
008	Cover	039	Nameplate
009 (2)	Balance Piston Bushing	040	Drive Screw
011 (2)	Stop	041	Elbow (No-Flare)
012	Spring Pin	042	Seal Pipe
013	Spring Pin	043	Connector (No-Flare)
014	Capscrew (4)	044	Nipple
015	Bolt (16)	045	Elbow
017 (2)	Power Rotor	046 (2)	Idler (2)
018	Piston	047	Shoe
019 (1)	Seal	048	Spacer
021	Spacer	049	Spacer (2)
022	Spring Pin	050 (2)	Plate
023 (1)	Truarc Ring (2)	051	Block
024 (1)	Gasket	052	Capscrew (2)
025 (1)	Ball Bearing	053	Capscrew (2)
026	Retainer	055	Drill Bushing
027	Bolt (4)	060 (2)	Idler (4)
028	Key	061	Plug (3)
029	Checknut	062	Plug
030	Setscrew	063	Tube (2)
031 (2)	Idler (2)	064 (1)	O-ring (4)

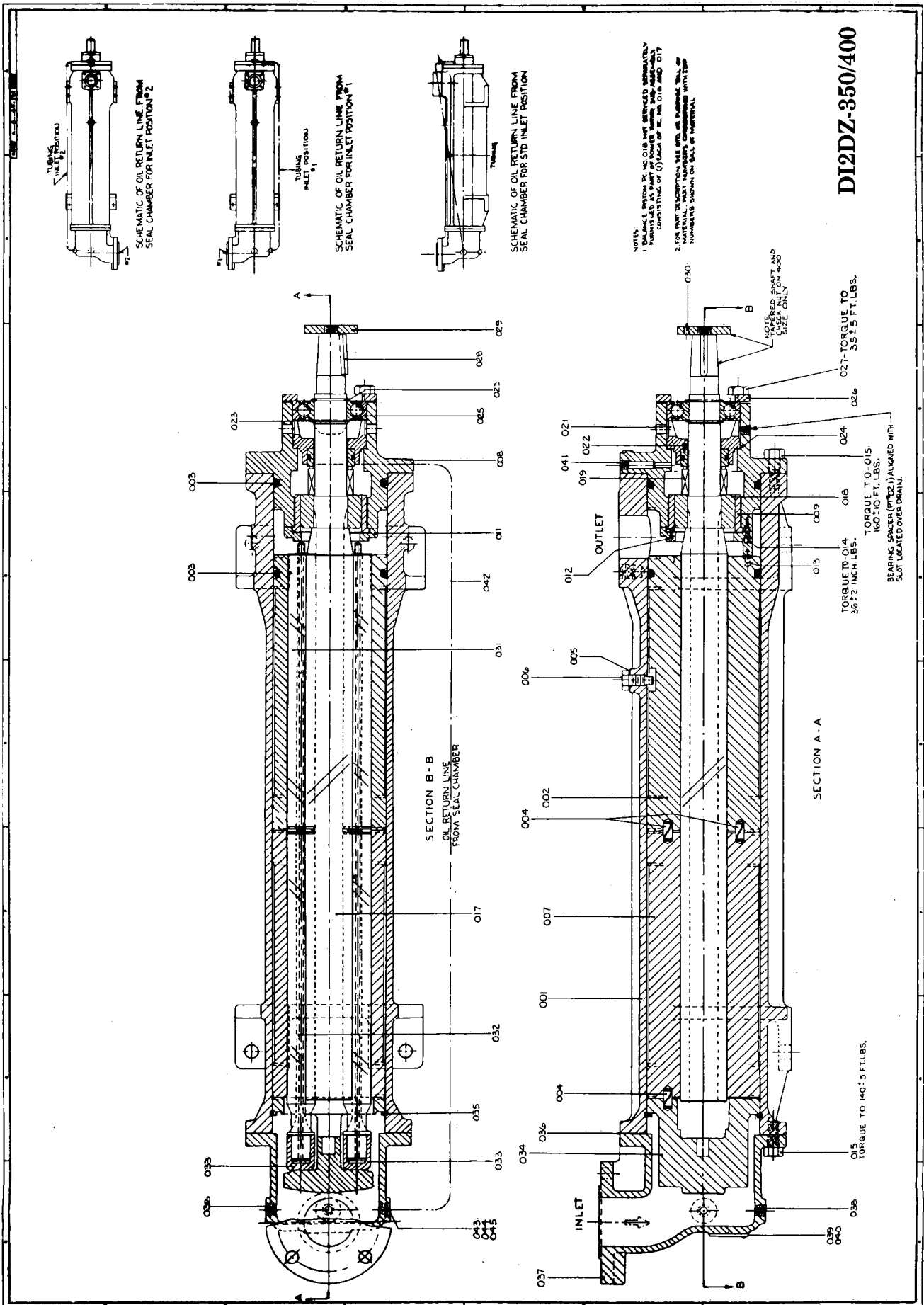
Quantities are one (1) except when noted in parentheses after part description or in notes below.

(1) Minor Repair Kit items.

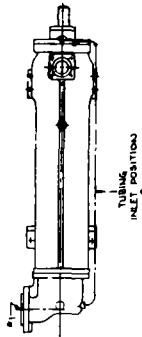
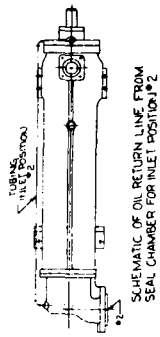
(2) Major Repair Kit items. Items marked (1) also included in Major Repair Kit.

(3) Quantity is three (3) for Figure 2; two (2) for Figure 3; and one (1) for Figure 4.





**FIGURE 2**



SCHEMATIC OF OIL RETURN LINE FROM SEAL CHAMBER FOR INLET POSITION #1

SCHEMATIC OF OIL RETURN LINE FROM SEAL CHAMBER FOR STD INLET POSITION

NOTE: 1. THE MOTOR IS TO BE OIL LUBRICATED SEPARATELY. IT IS SUPPLIED AS PART OF POWER MOTOR SUB-ASSEMBLY. ONE CONSISTS OF (1) EACH OF P.C. NO. 016 AND 017.

2. THE MOTOR SUB-ASSEMBLY IS TO BE OIL LUBRICATED SEPARATELY. IT IS SUPPLIED AS PART OF POWER MOTOR SUB-ASSEMBLY. ONE CONSISTS OF (1) EACH OF P.C. NO. 016 AND 017.

3. SHAFT 047 NOT SERVICED SEPARATELY. IT IS SUPPLIED AS PART OF IDLER MOTOR SUB-ASSEMBLY. ONE CONSISTS OF (1) EACH OF P.C. NO. 016 AND 017.

4. BUSHING 015 NOT SERVICED SEPARATELY. IT IS SUPPLIED AS PART OF IDLER MOTOR SUB-ASSEMBLY. ONE CONSISTS OF (1) EACH OF P.C. NO. 016 AND 017.

5. OIL COMPARTMENT COVER AND BUSHING PUMP. 41202-350 PUMP WITH INLET LINE. 41202-350 PUMP WITH BABBETT LINED HOSE.

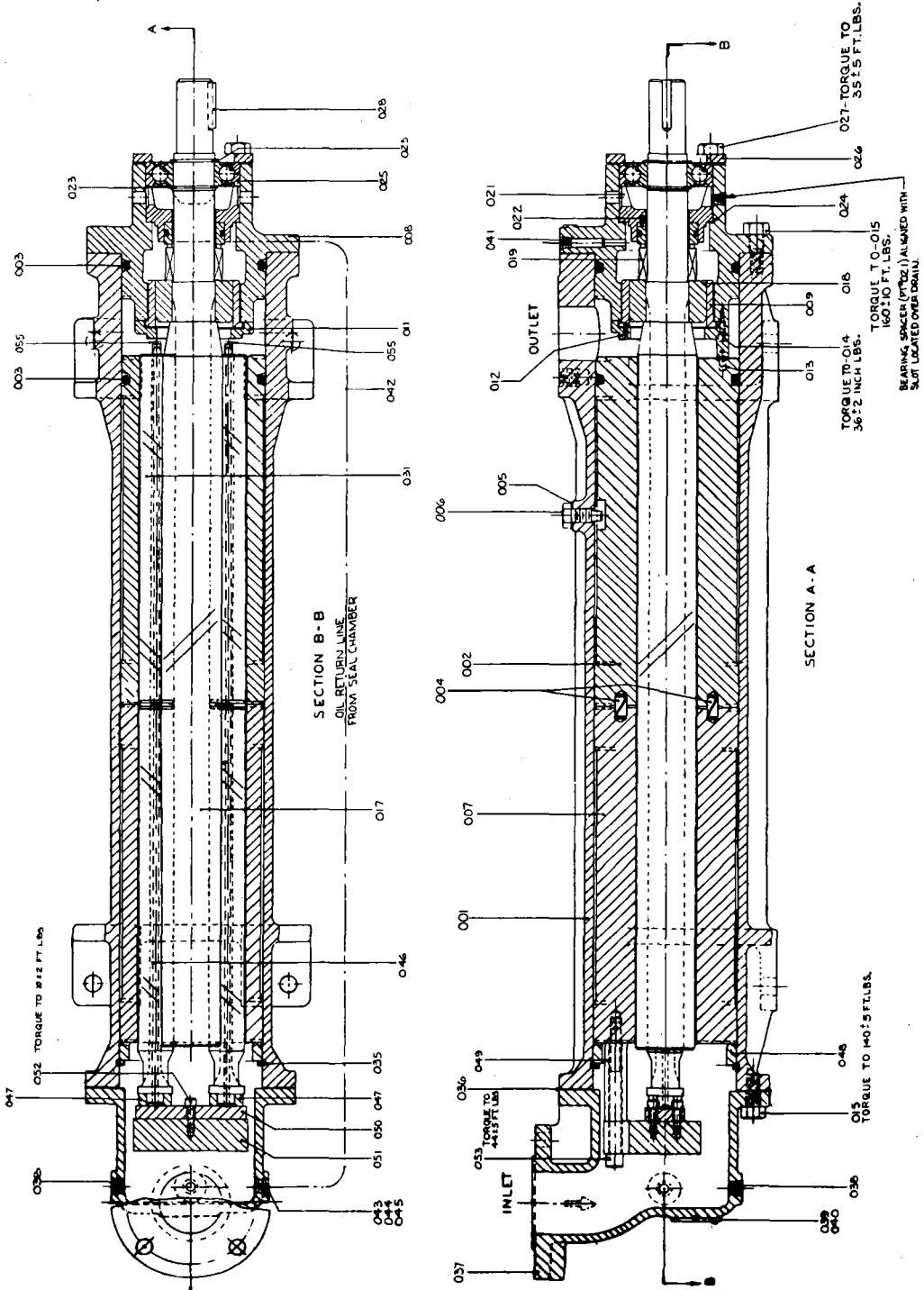
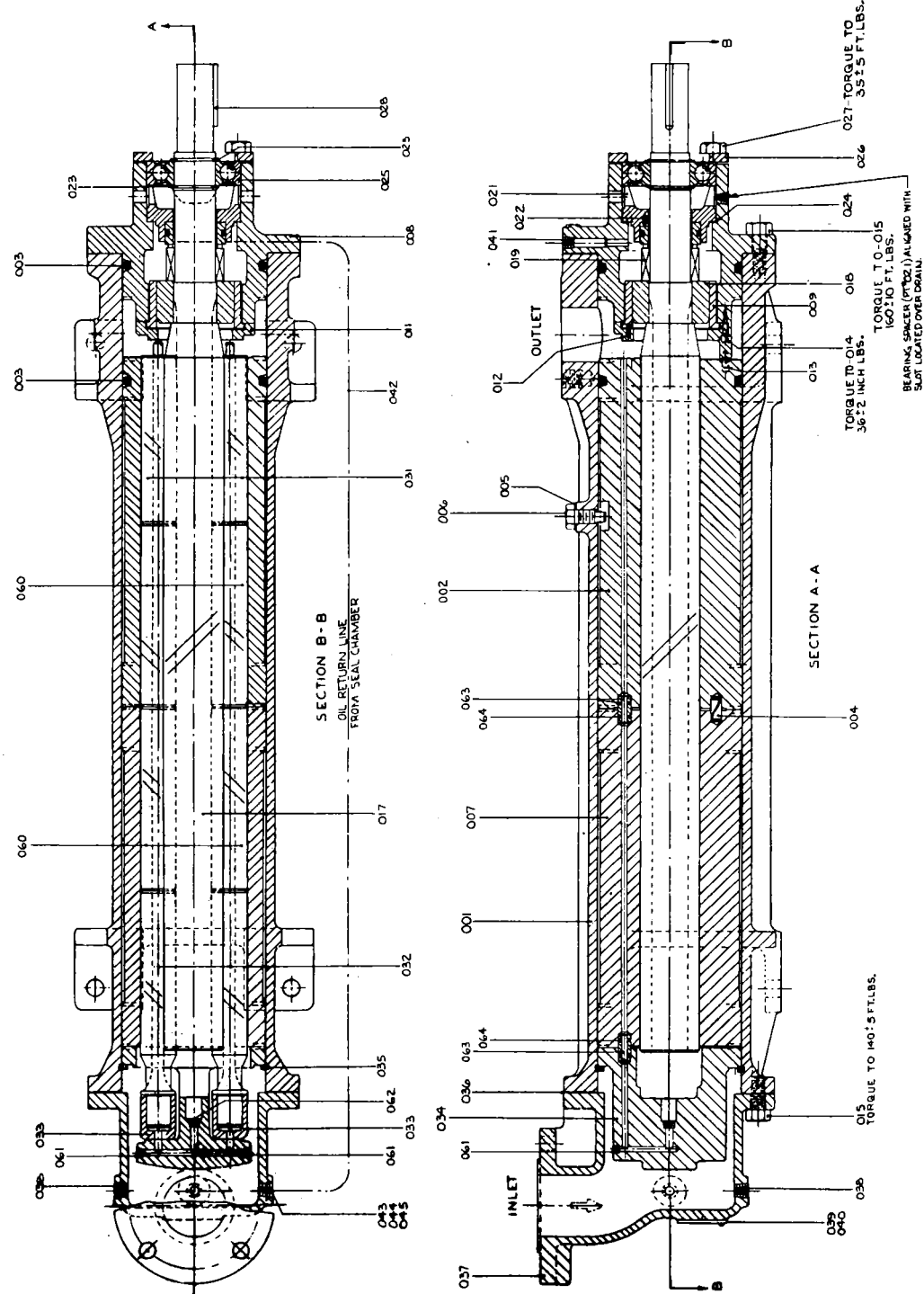
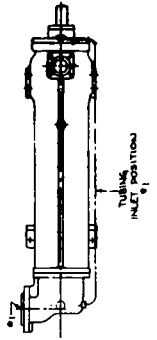
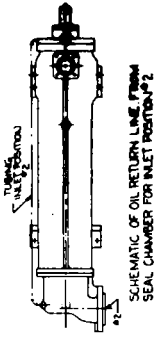


FIGURE 3



NOTES:  
1. BALANCE PISTON IN NO. 018 ARE SERVICED SEPARATELY FURNISHED AS PART OF POWER TRAIN AND MAINTENANCE KIT CONSISTING OF (1) EACH OF NO. 018 AND (1) 2. FOR INLET DESCRIPTION SEE STD. ON INLET END OF MATERIAL. PART NUMBERING CORRELATES WITH THE NUMBERING SHOWN ON BALL OF MATERIAL.

AG12DZ-350

FIGURE 4

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 Division 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 Division, 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 Division 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.