



Imo Industries Inc.

INSTRUCTION MANUAL

**SERIES 4U and 6U
SERIES 4T and 6T
ROTOR SIZES 118 - 250**

This manual now is
identified as part no.
SRM00026

WARNING

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

Instructions 4-6U/4-6T (R-3)

MANUFACTURING FACILITIES

IMO Industries Inc.
IMO Pump Division
P.O. Box 5020, Airport Road
Monroe, NC 28111-5020
USA
Phone: 704-289-6511

IMO Industries Inc.
IMO Pump Division
Industrial Park Road
Columbia, Kentucky 42728
USA

D cember 1991

FOREWORD

This instruction manual covers the IMO Pump Division Series 4U and 6U and Series 4T and 6T pumps. These two series of IMO pumps have been designed to meet the requirements of the hydraulic industry in the medium flow ranges. 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. Specific models discussed in this manual are identified in Table 1 below by Figure Numbers only. Correct use of this manual requires proper identification of Figure(s) applicable to pump assembly and seal arrangement. Refer to assembly drawings, Figures 7 through 15, for pump identification and mechanical seal drawings, Figures 3 through 6 for applicable seal selection. Model designators are identified in Figures 1 and 2.

**TABLE 1
SERIES 4U AND 6U AND SERIES 4T AND 6T PUMPS**

Pump Model	Rotor Size	Pump Fig. No.	Seal Fig. No.	Pump Model	Rotor Size	Pump Fig. No.	Seal Fig. No.
4UVC	137-200	7	3	4TVFCS	218-250	14	3
6UVC	118-200	7	3	6TVFCS	218-250	14	3
4UVF	137-200	8	3	4TVTFCS	218-250	14	3
6UVF	118-200	8	3	6TVTFCS	218-250	14	3
4UVC	218-250	9	3	4TXS	137-156	12	4
6UVC	218-250	9	3	6TXS	137-156	12	4
4UVF	218-250	10	3	4TXS	187-200	12/13	5
6UVF	218-250	10	3	6TXS	187-200	12/13	5
6UKC	156	11		4TXS	218-250	14	6
4TVFCS	137-200	12	3	6TXS	218-250	14	6
6TVFCS	137-200	12	3	4TXCFS	187	15	
4TVTFCS	137-200	12	3	6TXCFS	187	15	
6TVTFCS	137-200	12	3				

NOTE: "T" designator in 4U and 6U pump models indicates carbide mechanical seal seat.

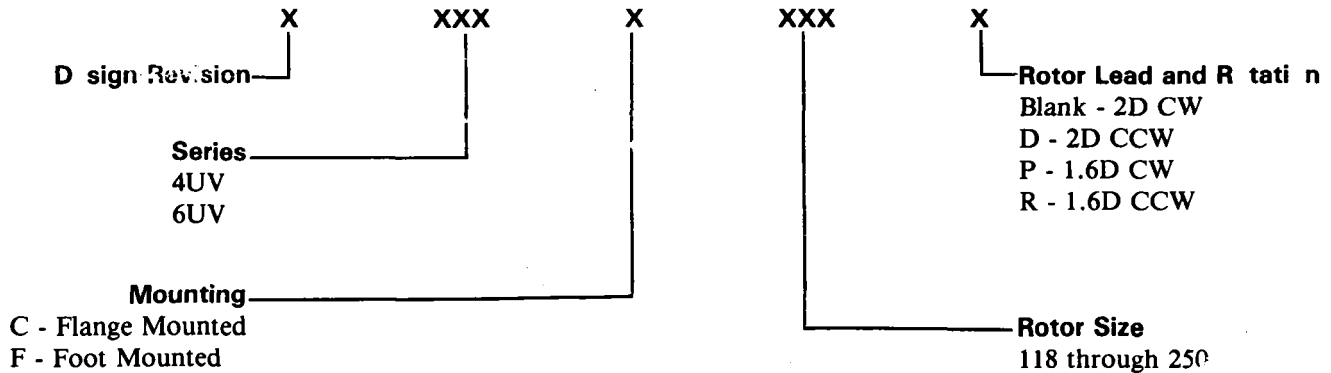


FIGURE 1. Definitions of Model Designators for Series 4U and 6U.

ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for Series 4U and 6U and Series 4T and 6T pumps must refer to this instruction book number and should be addressed to the nearest IMO Pump Division representative listed in CA-1 manual.

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 for which part(s) is ordered.
3. Give the figure number on which pump type is shown.
4. Give the part number(s) for necessary part(s).

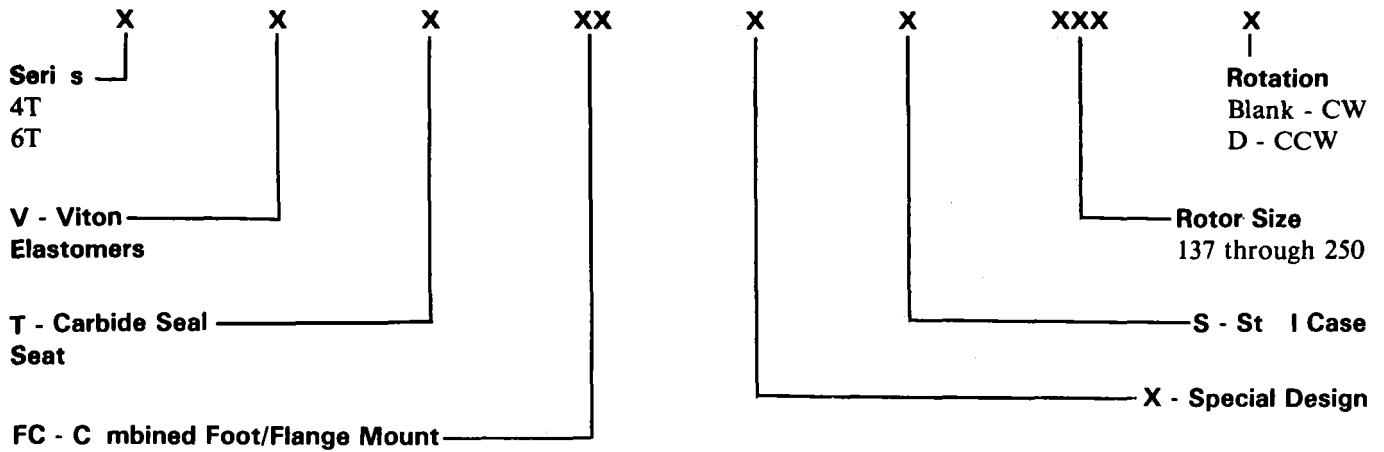


FIGURE 2. Definitions of Model Designators for Series 4T and 6T.

STRUCTURAL LIMITS

Operating conditions such as speed, fluid viscosity, inlet pressure, temperature, filtration, duty cycle, mounting, drive type, etc. are interrelated. 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).

Under no circumstances are the following structural limitations to be exceeded.

MAXIMUM SPEED:	Rotor Size	Maximum RPM
	118	5400
	137-156	4400
	187-250	3600

Special pumps available under controlled conditions.
Contact the IMO Pump Division for Performance Tables.

VISCOSITY:	4U and 6U	4T and 6T
MINIMUM:	33 SSU	33 SSU
MAXIMUM:	3000 SSU	3000 SSU

Contact the IMO Pump Division for minimum allowable operating viscosity at specific speeds and pressure.

TEMPERATURE: 0-160°F

PRESSURE:	Series 4U - 2000 PSIG	Series 4T - 2000 PSIG
	Series 6U - 3000 PSIG	Series 6T - 3000 PSIG

Above pressure for special temperature and viscosity conditions.
Contact IMO Pump Division for Performance Tables.

SUCTION:	Series 4U and 6U - 50 PSIG MAXIMUM
	Series 4T and 6T - 100 PSIG MAXIMUM

Discharge pressure must always be 50 PSIG above suction pressure.

DRIVE: Direct only

FILTRATION: 60 mesh minimum recommended

SPECIAL NOTE

Series 4U and 6U and Series 4T and 6T units can be operated as hydraulic motors by reversing the rotation of the unit when used as a pump. High pressure inlet of motor is same as high pressure outlet of pump. Low pressure outlet is same as low pressure inlet of pump. Motor inlet pressure must always be 50 PSIG above motor outlet pressure. When ordering replacement parts for units used as motors, refer to List of Materials, Table 3, keeping in mind that parts listed are for pump units. Example: (001) Outlet Cover is Inlet Cover for unit used as a hydraulic motor.

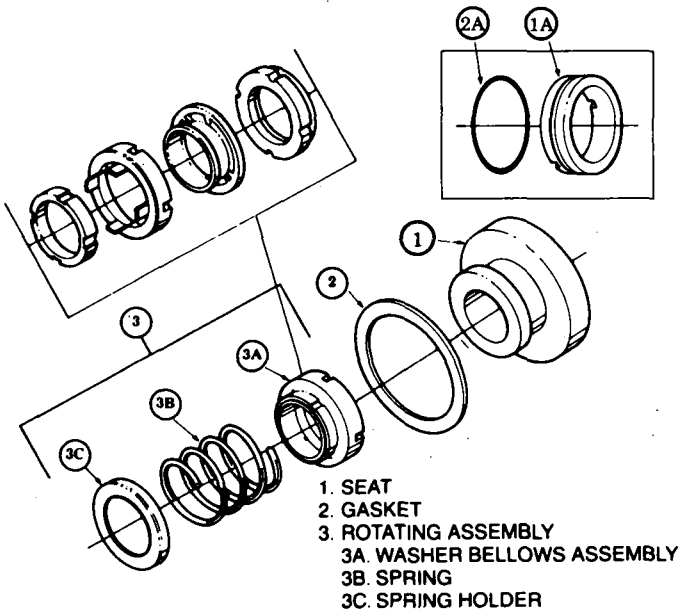


FIGURE 3. Crane Type 21 Mechanical Seal—Clamped Seat

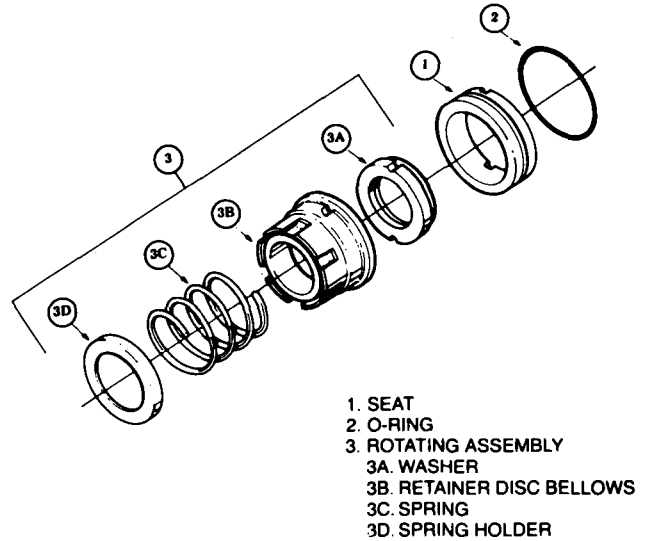


FIGURE 4. Crane Type 2 Mechanical Seal—O-ring Seat

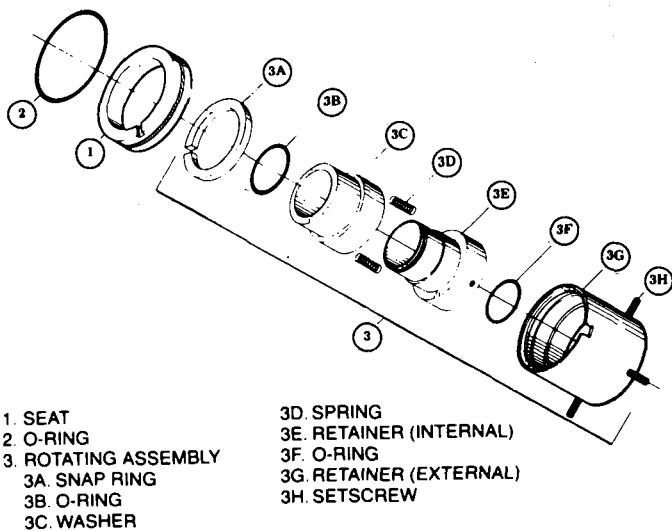


FIGURE 5. Crane Type 8B3 M Mechanical Seal

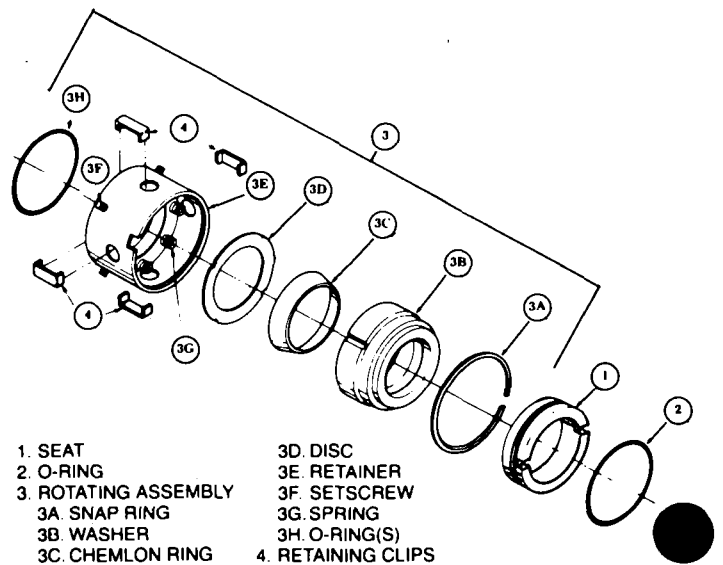


FIGURE 6. Crane Type 9B3 M Mechanical Seal

MECHANICAL SEALS

Series 4U and 6U pumps are equipped with Crane Type 21 Mechanical Seals, Figure 3. Series 4T and 6T pumps are equipped with Crane Types 21 (O-ring seat), 2, 8B3 and 9B3 Seals, illustrated in Figures 3 through 6 and 8B5, not illustrated. Disassembly and assembly procedures for mechanical seals are as follows:

SEAL DISASSEMBLY

Stationary Assembly:

- A. *Type 21* - Remove seal seat (1) and gasket (2) from power rotor. Gasket furnished with mechanical seal.
- B. *Type 21 (O-ring Seat), Types 2, 8B3, 8B5 and 9B3* - Stationary assembly, including seat (1, Figures 4, 5, and 6 or 1A, Figure 3) and O-ring (2, Figures 4, 5 and 6 or 2A, Figure 3), is removed with spacer (019).

Rotating Assembly:

- A. *Types 2 and 21* - Slide rotating assembly (3) off power rotor.
- B. *Types 8B3, 8B5 and 9B3* - Loosen setscrews and slide rotating assembly (3) off power rotor.

SEAL ASSEMBLY

Rotating Assembly: The rotating assembly (3) is normally packaged as an assembly for ease of installation. Ensure that all O-rings are properly positioned in assembly prior to installation. Coat all parts of mechanical seal with oil prior to assembly on power rotor.

Types 2 and 21 - Slide rotating assembly (3) on power rotor (010) with rotating assembly positioned next to stepcut shoulder of power rotor.

Types 8B3, 8B5 and 9B - Slide rotating assembly (3) on power rotor (010) with rotating assembly positioned next to stepcut shoulder of power rotor, 8B3 or 9B3, or next to sleeve (062), 8B5. Slide rotating assembly (3) on power rotor and tighten setscrews.

NOTE: If applicable for 9B3 seal, remove and discard retaining clips (4) prior to final tightening of setscrews.

Stationary Assembly:

Type 21 - Install gasket furnished with mechanical seal (2) on cover (001) and slide mechanical seal seat (1) on power rotor next to seal bore of cover (001).

Types 2, 21 (O-ring Seat), 8B3, 8B5 and 9B3 - Stationary assembly, including seat (1, Figures 4, 5, and 6 or 1A, Figure 3) and O-ring (2, Figures 4, 5 and 6 or 2A, Figure 3), is installed with spacer (019). NOTE: Ensure that spring pin in spacer is properly positioned to receive slot of mechanical seal seat.

DISASSEMBLY AND ASSEMBLY PROCEDURES

Disassembly and assembly procedures are given for pump types and mechanical seals by Figure Numbers. Ensure that pump type is identified by proper Figure for correct disassembly and assembly procedures. Refer to Table 1 for proper identification of pump types and applicable Figure Numbers.

DISASSEMBLY PROCEDURES (FIGURES 7 THROUGH 15)

NOTE: Unless noted, disassembly procedures apply to all pumps, Figures 7 through 15.

STEP 1. Close off suction and discharge piping to pump and disconnect piping. Remove pump from driver, coupling and mounting bracket. Remove coupling hub and key (022).

STEP 2. Remove nuts (004), capscrews (003), and inlet head (002). Remove gasket (006, Figures 7, 8, 9, 10, and 11) or O-ring (006, Figures 12, 14 and 15) from cover (001).

STEP 3. Remove capscrews (027), plate (028) and spacers (041).

STEP 4. Remove idler rotors (011) by unscrewing idler rotors from housing bores. NOTE: Ensure that idlers are not dropped during removal.

STEP 5. Remove bolts (009) and bearing retainer (008).

STEP 6. Slide assembled power rotor (010) from pump. Removal of assembled power rotor includes:

(Figures 7, 8, 9, 10, 12, 13 and 14) - truarc rings (021), ball bearing (020), spacer (019), mechanical seal (018) and spacer (062, Figure 13 only).

(Figures 11 and 15) - truarc rings (021) and ball bearing (020).

STEP 7. *(Figure 11 Only)* Remove spacers (019, 018 and 046) from cover (001).

STEP 8. *(Figure 15 Only)* Remove spacer (019) and gasket (057) from cover (001).

STEP 9. Remove gasket or O-ring from mechanical seal bore of cover (001).

(Figures 7, 8, 9 and 10) - Gasket furnished with mechanical seal (018).

(Figures 12, 13 and 14) - Gasket (057, Figures 12 and 14), O-ring (061, Figure 13).

STEP 10. Remove capscrews (017) and slide housing (015) from outlet end of cover (001). Removal of housing (015) also removes clamp rings (036), spring pin (042), O-ring (016) and backup ring (035). Remove O-ring (016), backup ring (035) and clamp rings (036) from housing (015).

STEP 11. Remove capscrews (044) and idler stop (014).

STEP 12. *(Figures 7, 8, 11, 12, and 15)* Slide spacer (043) from cover (001).

STEP 13. Remove bushing (007) from cover (001).

STEP 14. Disassemble power rotor (010) as follows:

a. Remove outer truarc ring (021).

b. Using a bearing puller, remove ball bearing (020) from power rotor (010).

c. Remove inner truarc ring (021) from power rotor (010).

d. *(Figures 7, 8, 9 and 10)* Remove spacer (019) and mechanical seal stationary assembly (1 and 2, Figures 3 and 4). Slide mechanical seal rotating assembly (3, Figures 3 and 4) off power rotor (010).

e. *(Figures 12, 13 and 14)* Remove spacer sub-assembly (019) from power rotor (010). Removal of spacer sub-assembly (019) includes removal of mechanical seal stationary assembly (1 and 2, Figures 4, 5 and 6) or (1A and 2A, Figure 3). Remove mechanical seal seat and O-ring from spacer (019). Remove mechanical seal rotating assembly (3, Figures 3 through 6) from power rotor (010).

NOTE: Refer to Mechanical Seals and Figures 3 through 6 for seal disassembly procedures.

f. *(Figure 13 Only)* Remove sleeve (062) from power rotor (010).

ASSEMBLY PROCEDURES (FIGURES 7 THROUGH 15)

Prior to assembly of pump, all parts should be cleaned and inspected for nicks and burrs. Replace all worn or damaged parts. IMO Pump Division recommends automatic replacement of O-rings, gaskets, mechanical seals and ball bearings when these parts are disturbed from their previously installed position. Refer to proper pump assembly drawing, Figures 7 through 15, mechanical seal drawing, Figures 3 through 6, and List of Material, Table 3, during assembly. Coat all parts with light lubricating oil to assist in assembly.

NOTE: Unless noted, assembly procedures apply to all pumps, Figures 7 through 15.

STEP 1. Install bushing (007) in cover (001).

STEP 2. (Figures 7, 8, 11, 12 and 15) Install spacer (043) in cover (001).

STEP 3. Install idler stop (014) to cover (001) using capscrews (044). Torque capscrews (044) to 10 lbs. ft. (\pm 2 lbs. ft.).

STEP 4. Insert O-ring (016) and backup ring (035) into groove of housing (015). NOTE: Backup ring (035) must be positioned on side of groove toward clamp ring (036) slot.

STEP 5. Install rotor housing (015) in cover (001). NOTE: Do not insert housing (015) past the clamp ring grooves.

STEP 6. Install clamp rings (036) in grooves of housing (015). NOTE: Clamp ring (036) with slot on inside diameter fits over spring pin (042) in housing (015).

STEP 7. Install capscrews (017) in clamp rings (036) and torque capscrews (017) to proper value shown in Table 2.

**TABLE 2
TORQUE VALUES**

Part	Rotor Size	Torque Value
Capscrew (003)	118	50 lbs. ft. (\pm 2 lbs. ft.)
	137-156	52 lbs. ft. (\pm 2 lbs. ft.)
	187-200	52 lbs. ft. (\pm 2 lbs. ft.)
	218-250 (U)	100 lbs. ft. (\pm 2 lbs. ft.)
	218-250 (T)	75 lbs. ft. (\pm 2 lbs. ft.)
Capscrew (017)	118	80 lbs. ft. (\pm 5 lbs. ft.)
	137-156	80 lbs. ft. (\pm 5 lbs. ft.)
	187-200	110 lbs. ft. (\pm 5 lbs. ft.)
	218-250	300 lbs. ft. (\pm 10 lbs. ft.)
Capscrew (027)	118	25 lbs. ft. (\pm 2 lbs. ft.)
	137-156	40 lbs. ft. (\pm 2 lbs. ft.)
	187-200	80 lbs. ft. (\pm 4 lbs. ft.)
	218-250	150 lbs. ft. (\pm 10 lbs. ft.)

STEP 8. (Figure 11 Only) Install spacers (046, 018 and 019) in cover (001).

STEP 9. (Figure 15 Only) Install gasket (057) and spacer (019) in cover (001).

STEP 10. Assemble power rotor (010) as follows:

- a. (Figure 13 Only) Slide sleeve (062) on power rotor next to step-cut shoulder of power rotor.
- b. (Figures 7, 8, 9, 10, 12, 13 and 14) Install mechanical seal rotating assembly on power rotor (010). NOTE: Refer to Mechanical Seals for assembly procedures.

- c. (Figures 7, 8, 9, and 10) Slide mechanical seal seat on power rotor (010) next to seal rotating assembly. Install spacer (019) on power rotor (010) next to mechanical seal seat. NOTE: Direction of spacer (019) lobes must be toward ball bearing (020).

NOTE: Refer to Mechanical Seals for assembly procedures.

- d. (Figures 12, 13 and 14) Install mechanical seal seat (1, Figures 4, 5 and 6 or 1A, Figure 3) and O-ring (2, Figures 4, 5 and 6 or 2A, Figure 3) in spacer (019). Ensure that spring pin in spacer (019) is aligned to receive slot in mechanical seal seat. Slide assembled spacer (019) on power rotor (010).
- e. Install inner truarc ring (021) in power rotor (010) groove.

- f. Press ball bearing (020) on power rotor (010) with the ball bearing firmly against the truarc ring (021). CAUTION: Press only on the inner race of ball bearing (020).
- g. Install outer truarc ring (021) in power rotor (010) groove.

STEP 11. (Figures 7, 8, 9, 10, 12, 13 and 14) Install gasket or O-ring on mechanical seal bore of cover (001).

(Figures 7, 8, 9 and 10) - Gasket furnished with mechanical seal.

(Figures 12, 13 and 14) - Gasket (057, Figures 12 and 14), O-ring (061, Figure 13).

STEP 12. Slide assembled power rotor (010) into outlet cover (001) ensuring that all parts are properly positioned.

STEP 13. Install bearing retainer (008) to cover (001) using bolts (009). Torque bolts (009) to 25 lbs. ft. (\pm 2 lbs. ft.).

STEP 14. Insert idlers (011) by screwing them into rotor housing (015) bores.

STEP 15. Install spacers (041) and plate (028) using capscrews (027). Torque capscrews (027) to proper value listed in Table 2.

STEP 16. (Figures 12, 14 and 15) Install O-ring (006) in groove of cover (001).

STEP 17. (Figures 7, 8, 9, 10 and 11) Install gasket (006) on cover (001).

STEP 18. Install inlet head (002) using capscrews (003) with nuts (004). Torque capscrews (003) to necessary value listed in Table 2.

NOTE: Inlet head (002) can be rotated to suit suction pipe arrangements as follows:

4U and 6U, Rotor Sizes 118 through 156 - 60° increments

4U and 6U, Rotor Sizes 187 through 250 - 45° increments

4T and 6T - 90° increments

Remove capscrews (003) with nuts (004) and rotate inlet head (002). Ensure that gasket (006) or O-ring (006) between inlet head and cover (001) is not damaged. If gasket or O-ring is damaged, it must be replaced to prevent air leakage. When replacing capscrews (003), torque capscrews to value given in Table 2.

STEP 19. Mount pump to bracket. Install key (022) and coupling hub. Connect driver and piping.

NOTE: (Figures 12, 14 and 15) If inlet and outlet connectors were removed from pump covers, O-rings should be replaced during re-assembly.

TABLE 3
LIST OF MATERIALS FOR FIGURES 7 THROUGH 15

IDP NO.	PART DESCRIPTION	IDP NO.	PART DESCRIPTION	IDP NO.	PART DESCRIPTION
001	Cover	019 (2)	Spacer Sub-Assembly (Includes Items 059 and 060)	046	Tube
002	Inlet Head	020 (1)	Ball Bearing	047	Drive Screw (3)
003 (3)	Capscrew (6)	021 (1)	Truarc Ring (2)	048	Plug
004	Nut (6)	022	Key	049	Connector
006 (1)(4)	Gasket	027 (2)	Capscrew (2)	050 (1)	O-ring
007 (2)	Balance Piston Bushing	028 (2)	Plate	051	Capscrew (4)
008	Retainer	031	Nameplate	052	Lockwasher (4)
009	Bolt (4)	032	Drive Screw (2)	053	Connector
010 (2)	Power Rotor	035 (1)	Back-Up Ring	054 (1)	O-ring
011 (2)	Idler (2)	036 (2)	Clamp Ring	055	Capscrew (4)
014 (2)	Stop	041	Spacer (2)	056	Lockwasher (4)
015 (2)	Housing Sub-Assembly (Includes Items 042 and 058)	042	Spring Pin	057 (1)	Gasket
016 (1)	O-ring	043	Spacer	058	Housing
017 (5)(2)	Capscrew (12)	044 (2)	Capscrew (2)	059	Spacer
018 (1)	Seal	045	Nameplate	060	Spring Pin
				061	O-ring
				062	Sleeve

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) are included in Major Repair Kit.)

(3) Quantity twelve (12) for Figures 12, 14 and 15.

(4) Part description O-ring for Figures 12, 14 and 15.

(5) Quantity sixteen (16) for Figures 12, 14 and 15.

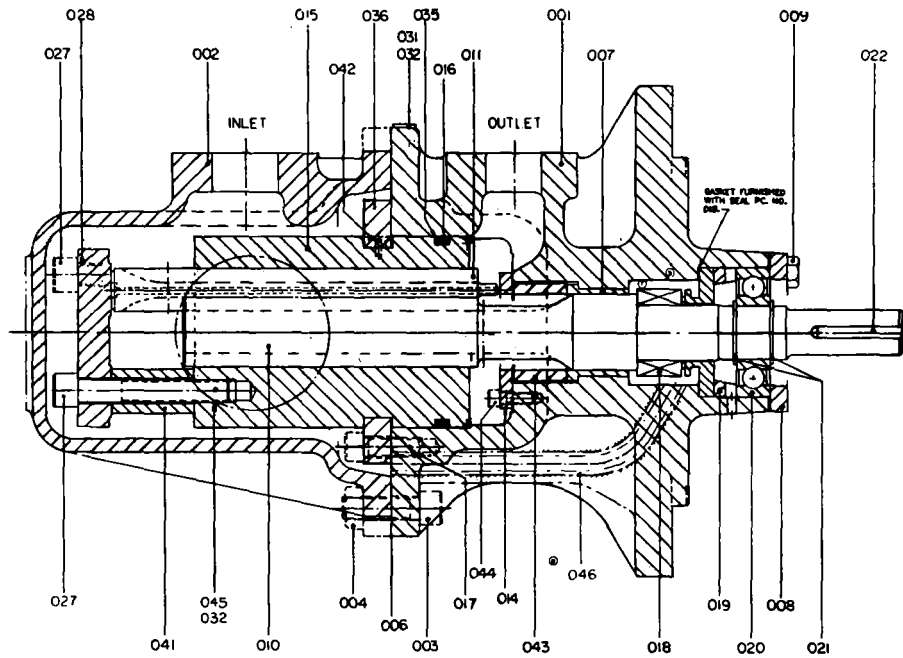


FIGURE 7.

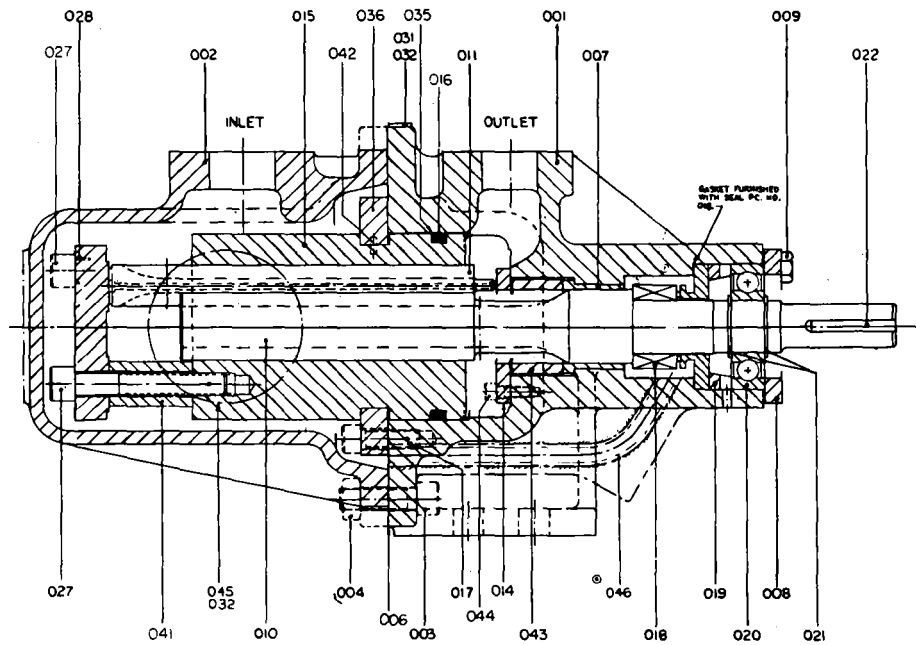


FIGURE 8.

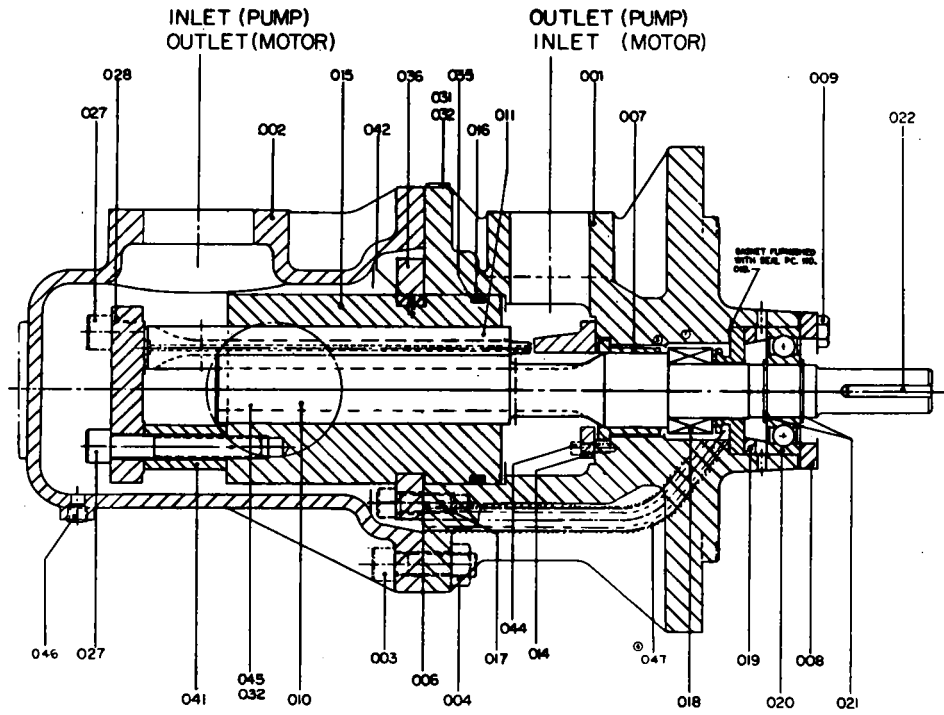


FIGURE 9.

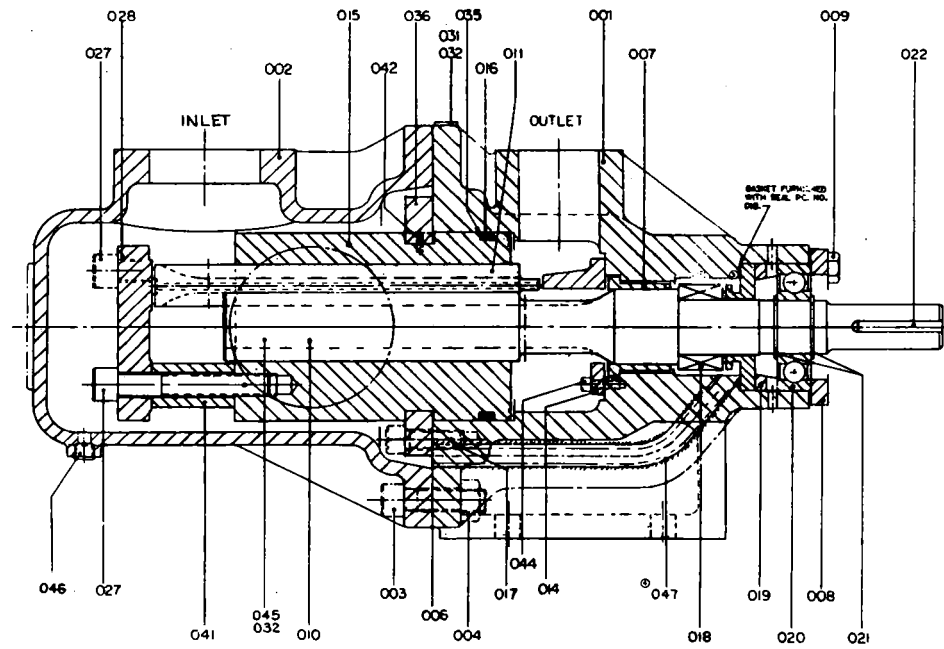


FIGURE 10.

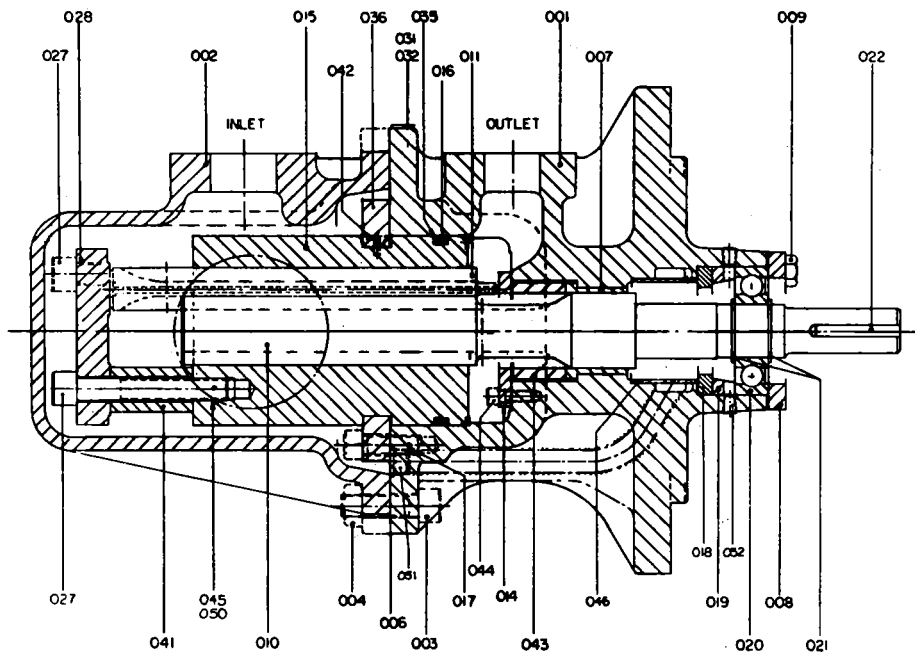


FIGURE 11.

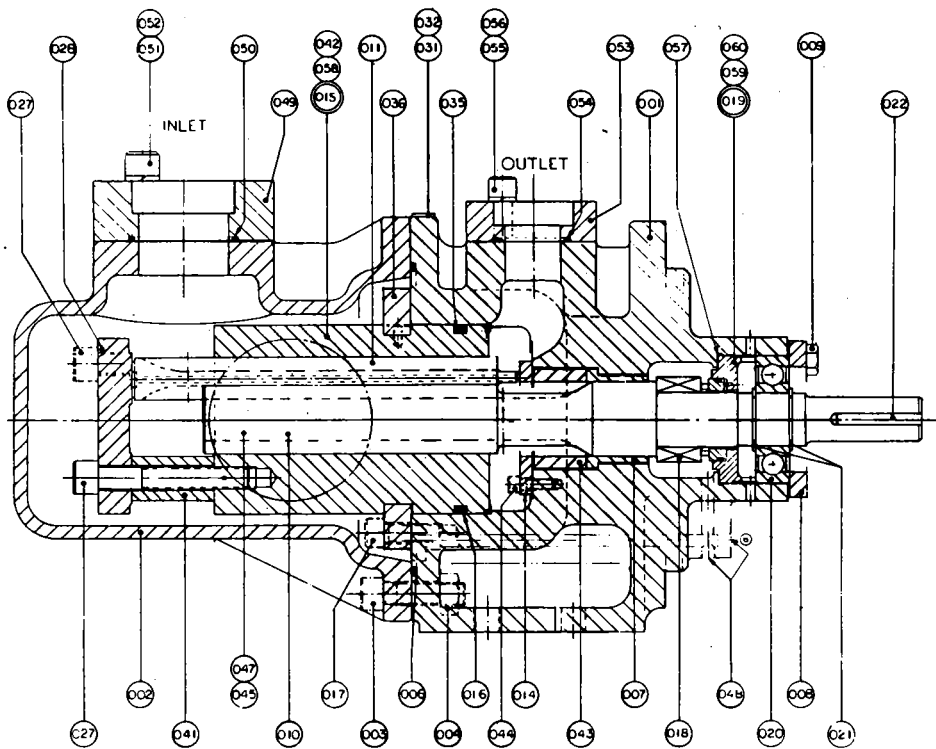


FIGURE 12.

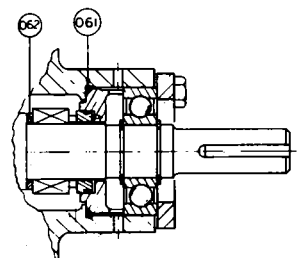


FIGURE 13.

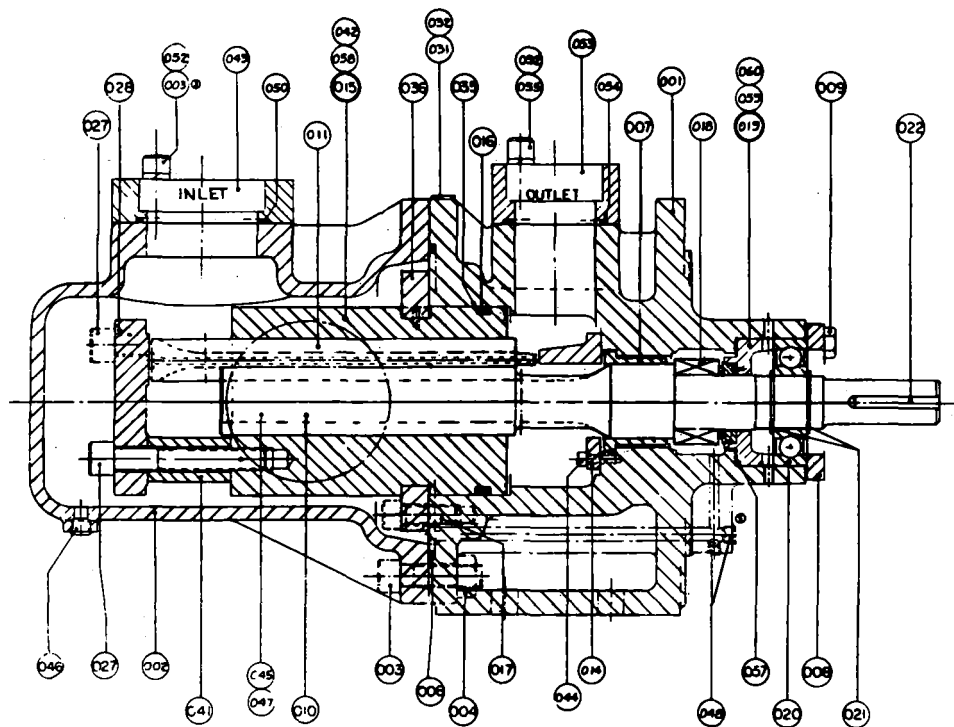


FIGURE 14.

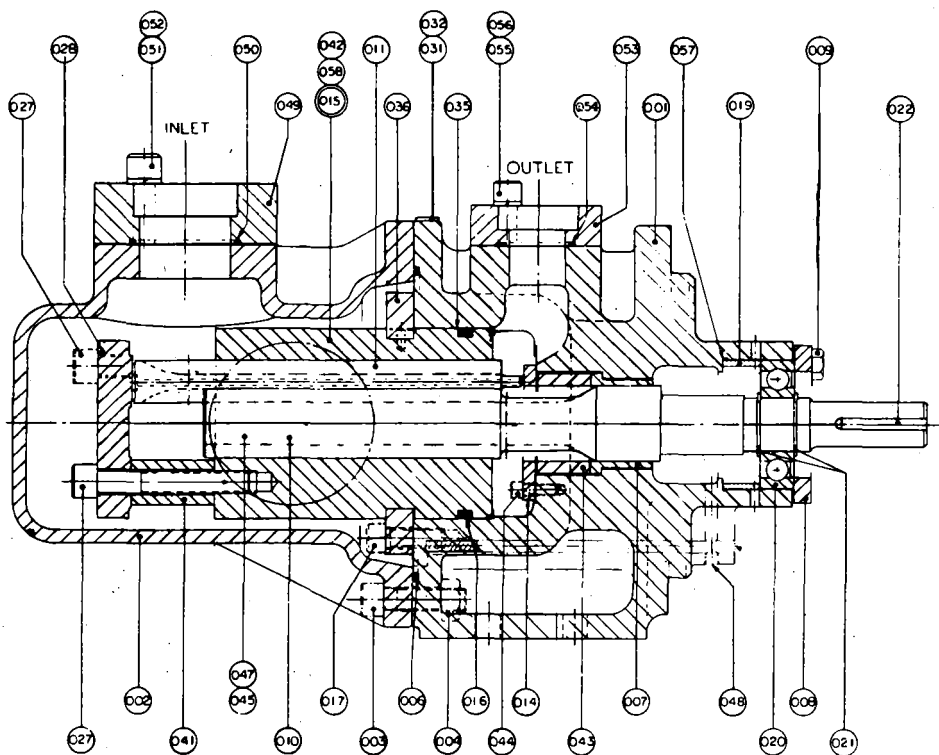


FIGURE 15.