



IMO®

**PRODUCT SERVICE MANUAL
SERIES 4U AND 6U
SERIES 4T AND 6T
ROTOR SIZES 118 - 250**



WARNING

The IMO General Installation Operation, Maintenance and Troubleshooting Manual, (No. SRM00046), this manual, and associated component manuals supplied with the unit should be read thoroughly prior to pump installation, start-up, operation, maintenance or troubleshooting.

Manual No. SRM00026

Rev. 06 (21-0182)

Date: August, 2021

READ THIS ENTIRE PAGE BEFORE PROCEEDING

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

	DANGER	
Failure to observe precautions noted in this box can result in severe bodily injury or loss of life.		

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

CAUTION	ATTENTION	
Failure to observe precautions noted in this box can cause damage or failure of equipment.		

Noncompliance of safety instructions identified by the following symbol could affect safety for persons: <div style="text-align: center;"></div>	Safety instructions where electrical safety is involved are identified by: <div style="text-align: center;"></div>	Safety instructions which shall be considered for reasons of safe operation of pump and/or protection of pump itself are marked by sign: <p align="center">ATTENTION</p>
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	ATTENTION	
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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A. GENERAL INSTRUCTIONS

This manual cannot possibly cover every situation connected with installation, operation, inspection, and maintenance of equipment supplied. Every effort was made to prepare text of manual so that engineering and design data is transformed into the most easily understood wording. Imo Pump must assume personnel assigned to operate and maintain 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.



WARNING

If installation, operation, and maintenance instructions are not correctly and strictly followed and observed, injury to personnel or serious damage to pump could result. Imo Pump cannot accept responsibility for unsatisfactory performance or damage resulting from failure to comply with instructions.

B. INTRODUCTION

This instruction manual covers IMO Pump Division Series 4U and 6U and Series 4T and 6T pumps. These two series of IMO pumps have been designed to meet requirements of hydraulic industry in medium flow ranges. Because of large number of operating conditions, it is necessary to have a variety of construction and material combinations to meet job requirements. Model of each pump is identified on 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, 6U, 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				
4TVTFCS	137-200	12	3	4TXCFS	187	15	
6TVTFCS	137-200	12	3	6TXCFS	187	15	

C. DESCRIPTION OF EQUIPMENT

Series 4U and 6U and Series 4T and 6T pumps are positive displacement, rotary screw pumps consisting of a precision bored housing which encloses a driven screw (power rotor) and two intermeshing following screws (idler rotors). These screws when rotating form a succession of closures or cavities. As they rotate, fluid is moved axially from inlet port to outlet port in a continuous, uniform flow with minimum fluid pulsation and pump noise.

D. PUMP MODEL IDENTIFICATION

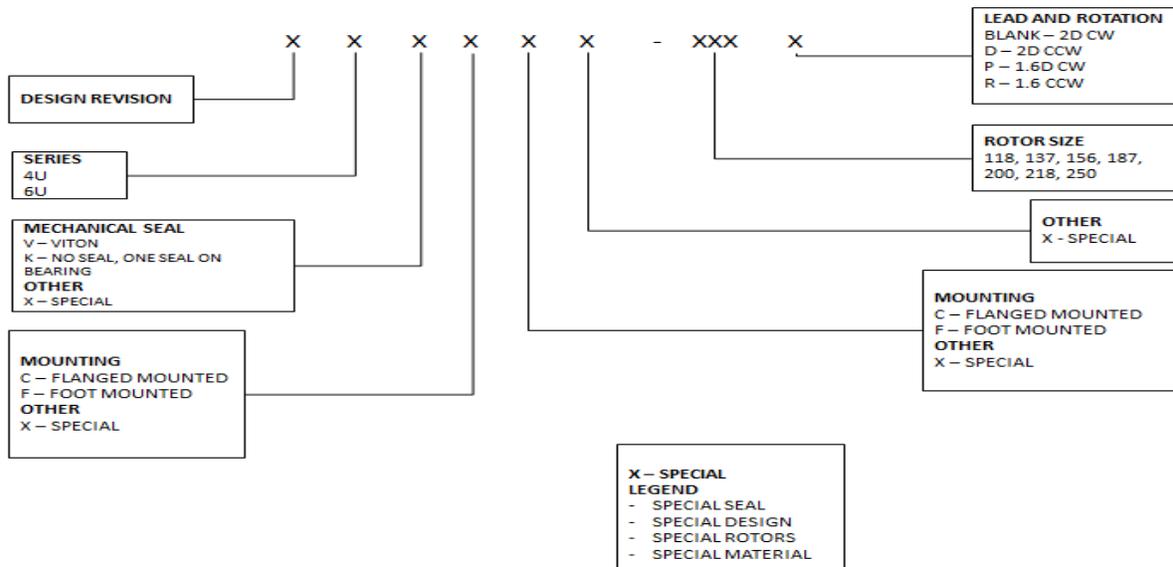


FIGURE 1. DEFINITIONS OF MODEL DESIGNATORS FOR SERIES 4U AND 6U

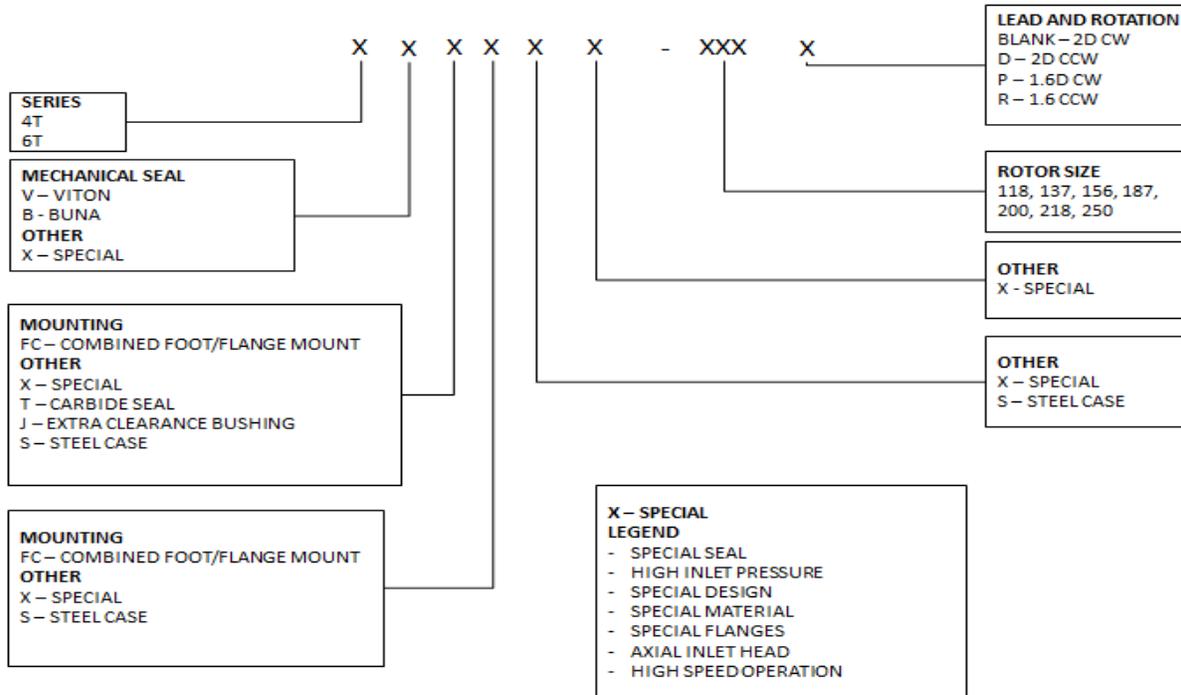


FIGURE 2. DEFINITIONS OF MODEL DESIGNATORS FOR SERIES 4T AND 6T

E. ORDERING INSTRUCTIONS

When corresponding with Imo Pump regarding Series 4U and 6U and Series 4T and 6T pumps, refer to pump nameplate, this instruction manual, and assembly drawing as instructed below:

- From pump name plate, record pump model number, serial number, and manufactured date.
- Record instruction manual number, revision, and date.
- From instruction manual, record figure numbers that apply to replacement part(s).
- From assembly drawing or parts list (Table 3) provide IDP number(s) and names for replacement part(s).
- Give above information to you Imo service representative.

Imo sales and service representatives are listed herein and in the General Instruction Manual, SRM00046.

F. OPERATION

F.1 LIQUID LIMITATIONS

Never operate with thin liquids such as solvents or water. Pump is designed for liquids having general characteristics of oil.

F.2 OPERATING LIMITS

CAUTION	ATTENTION
Operating conditions, such as speed, fluid viscosity, temperature, inlet pressure, discharge pressure, filtration, duty cycle, drive type, mounting, etc., are interrelated. Due to these variable conditions, specific application limits may be different from operational limitations. Equipment must not be operated without verifying system operation requirements are within pump's capabilities.	

Under no circumstances should following operating limits specified in table 2 be exceeded without specific approval from Imo Pump.

MAXIMUM SPEED	ROTOR SIZE	MAXIMUM RPM
	118	5400
	137-156	4400
	187-250	3600
Contact IMO Pump Division for Performance Tables		
VISCOSITY MINIMUM: MAXIMUM:	4U AND 6U	4T AND 6T
	33 SSU	33 SSU
	3000 SSU	3000 SSU
Contact IMO Pump Division for minimum allowable operating viscosity at specific speeds and pressure		
TEMPERATURE	0 - 160° F	
PRESSURE	4U AND 4T	6U AND 6T
MAXIMUM	1500 PSIG	2500 PSIG
Contact IMO Pump Division for Performance Tables		
SUCTION	4U AND 6U	4T AND 6T
MAXIMUM	50 PSIG	100 PSIG
Discharge pressure must always be 50 PSIG above suction pressure		
DRIVE	Direct Only	
FILTRATION	60 Mesh minimum recommended	

Table 2 – Normal Pump Operating and Structural Limits

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 the same as high pressure outlet of the pump. Low pressure outlet of the motor is the same as low pressure inlet of the pump. 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.

G. PART LIST

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

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

(1) Minor Repair Kit items.	(3) Quantity twelve (12) for Figures 12, 14 and 15.	(5) Quantity sixteen (16) for Figures 12, 14 and 15.
(2) Major Repair Kit items. (Items marked (1) are included in Major Repair Kit.)	(4) Part description O-ring for Figures 12, 14 and 15.	

H. MAINTENANCE



DANGER

BEFORE working on equipment, make sure all power to equipment is disconnected and locked-out.



WARNING

Failure to observe precautions while installing, inspecting and maintaining pump can cause injury to personnel from accidental handling of liquids that may harm skin or clothing, or fire hazard risks from flammable liquids, or injury from high pressure fluid jets.

H.1 GENERAL COMMENTS

Note: Part number identifiers (IDP) contained with parenthesis, such as (9), refer to numbers on assembly drawings.

De-energize driver before starting with any maintenance action.

H.2 TOOLS REQUIRED

Procedures described in this manual require common mechanics hand tools, a torque wrench, dial indicators for alignment and a suitable lifting device such as slings, straps, etc.

SINGLE SPRING, RUBBER BELLOWS MECHANICAL SEAL

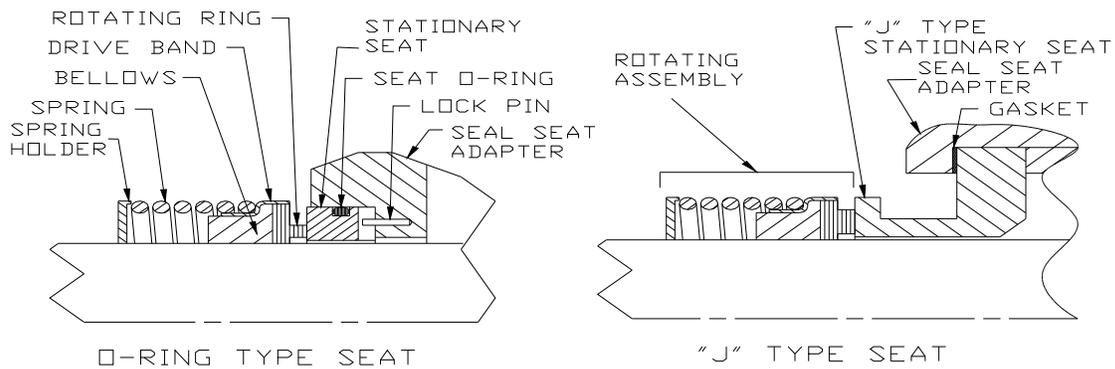


Figure 3. Mechanical Seal Drawing (Single Spring, Bellows Type)
 4T, 6T – O-ring Type ; 4U, 6U – “J” Type

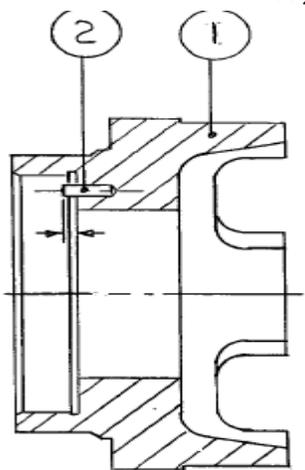


Figure 4. O-Ring Type Seal Seat Adapter

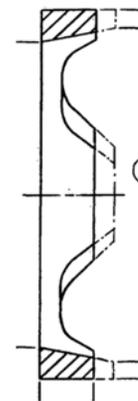


Figure 5. J Seat Seal Spacer

H.3 PUMP DISASSEMBLY

Determine pump model identification on pump nameplate to select applicable pump assembly. Refer to that assembly for the following instructions.

CAUTION

ATTENTION

Fluid leakage from disassembly of pump may make floor slippery and cause personal injury.

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).
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).
3. Remove capscrews (027), plate (028) and spacers (041).
4. Remove idler rotors (011) by unscrewing idler rotors from housing bores.

CAUTION

ATTENTION

Do not permit idlers (011) to drop as they emerge from housing (015).

5. Remove bolts (009) and bearing retainer (008).
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).
7. Remove inboard truarc ring (referencing the pump shaft/keyway as inboard side) from power rotor (010).
8. Using an arbor press, press bearing ½” off shaft in order to access outboard truarc ring (021).
9. Remove outboard truarc ring (021).
10. Using an arbor press, remove bearing from power rotor.
11. Remove seal seat adapter and O-ring (gasket)/spacer, “J” seat, and gasket from power rotor.
12. Slide rotating assembly off the power rotor (assembly consist of spring holder, spring, bellows, drive band, and rotating ring)
13. (Figure 11 Only) Remove spacers (019, 018 and 046) from cover (001).
14. (Figure 15 Only) Remove spacer (019) and gasket (057) from cover (001).
15. 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).
16. 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).
17. Remove capscrews (044) and idler stop (014).
18. (Figures 7, 8, 11, 12, and 15) Slide spacer (043) from cover (001).
19. Remove bushing (007) from cover (001).

H.4 PUMP ASSEMBLY

Prior to assembly of pump, all parts should be cleaned and inspected for nicks and burrs. Replace all worn or damaged parts. CIRCOR recommends replacing all O-rings, gaskets, mechanical seals and ball bearings when these parts are disturbed from their previously installed positions. Refer to proper assembly drawings, Figures 7 through 15, mechanical seal drawing, List of Materials, 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.*

1. Install bushing (007) in cover (001).
2. (Figures 7, 8, 11, 12 and 15) Install spacer (043) in cover (001).
3. Install idler stop (014) to cover (001) using capscrews (044). Torque capscrews (044) to 10 lbs. ft. (± 2 lbs. ft.).
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.

5. Install rotor housing (015) in cover (001).

NOTE: Do not insert housing (015) past clamp ring grooves.

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).

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

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

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

CAUTION	ATTENTION
Coat all parts of mechanical seal with oil prior to assembly on power rotor.	

NOTE: Rotating Assembly: The rotating assembly is normally packaged as an assembly for ease of installation. Ensure that all O-rings are properly positioned in assembly prior to installation.

Assemble the mechanical seal/ bearing assembly onto the power rotor (Steps 10-15)

10. Slide rotating assembly onto power rotor with rotating assembly positioned next to stepcut shoulder of power rotor.

11. (O-ring type)-Install stationary seal seat into seal seat adapter, ensuring that slot in seal face is aligned with roll pin. ("J" type/O-ring type)- Install gasket/O-ring (see drawings for correct IDP number) furnished with mechanical seal on cover (001).

12. Install seal seat adapter/ "J" seat and spacer onto power rotor.

13. Install truarc rings on outboard groove of power rotor.

14. Using an arbor press, press bearing until inner race of bearing makes contact with truarc rings. Install truarc rings in inboard groove of power rotor. This secures bearing inner race into position. (optional) Heat bearing, using a bearing heater/induction heater, to 200° F and slide bearing into position. Mechanical seal must then be manual compressed to install inboard truarc ring.

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

16. Install bearing retainer (008) to cover (001) using bolts (009). Torque bolts (009) to 25 lbs. ft. (± 2lbs. ft.).

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

18. Install spacers (041) and plate (028) using capscrews. Torque capscrews (027) to proper value listed in Table 3.

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

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

21. Install inlet head (002) using capscrews (003) with nuts (004). Torque capscrews (003) to necessary value listed in Table 3.

22. 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, O-rings should be replaced during re-assembly.

TABLE 3 – TORQUE VALUES

Part	Rotor Size	Torque Values	Special Instructions
Capscrew (003)	118	50 lbs. ft. (+ 2 lbs. ft.)	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
	137-156	52 lbs. ft. (+ 2 lbs. ft.)	
	187-200	52 lbs. ft. (+ 2 lbs. ft.)	
	218-250 (U)	100 lbs. ft. (+ 2 lbs. ft.)	
	218-250 (T)	75 lbs. ft. (+ 2 lbs. ft.)	
Capscrew (017)	118	80 lbs. ft. (+ 5 lbs. ft.)	*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 3.*
	137-156	80 lbs. ft. (+ 5 lbs. ft.)	
	187-200	110 lbs. ft. (+ 5 lbs. ft.)	
	218-250	300 lbs. ft. (+ 10 lbs. ft.)	
Capscrew (027)	118	25 lbs. ft. (+ 2 lbs. ft.)	
	137-156	40 lbs. ft. (+ 2 lbs. ft.)	
	187-200	80 lbs. ft. (+ 2 lbs. ft.)	
	218-250	150 lbs. ft. (+ 2 lbs. ft.)	

I. TROUBLESHOOTING

For assistance with troubleshooting see General Instruction Manual, SRM00046.

J. FIELD AND FACTORY SERVICE AND PARTS

Imo Pump maintains a staff of trained service personnel that can provide pump installation, pump startup, maintenance/overhaul and troubleshooting supervision as well as installation and maintenance training. Our factories provide maintenance as well as overhaul and test facilities in event user prefers to return pumps for inspection or overhaul. Factory-overhauled pumps are normally tested and warranted “as-new” for a period of one year from date of shipment. For either field service or factory overhaul assistance, contact your local Imo Sales Office or representatives at Technical/Customer Service Department in Monroe, NC, USA.

Most pumps have repair kits available Minor Repair Kits are used to repair leaking seals, bad bearings and/or for re-assembly after pump tear-down. They include (as applicable) pump shaft seals, packing, all gaskets/O-rings and bearings. Major Repair Kits are sufficient to rebuild completely worn-out pumps to “as-new” condition. They include all parts found in the Minor Repair Kits plus all major internal parts subject to wear. Since kits have all necessary parts, kit purchase is preferred rather than selecting individual parts. When parts are individually selected from Parts List, some needed components are often overlooked. In addition, mixing worn or used parts with new parts risks rapid wear and shortened service life from new parts.

FIGURE 9.

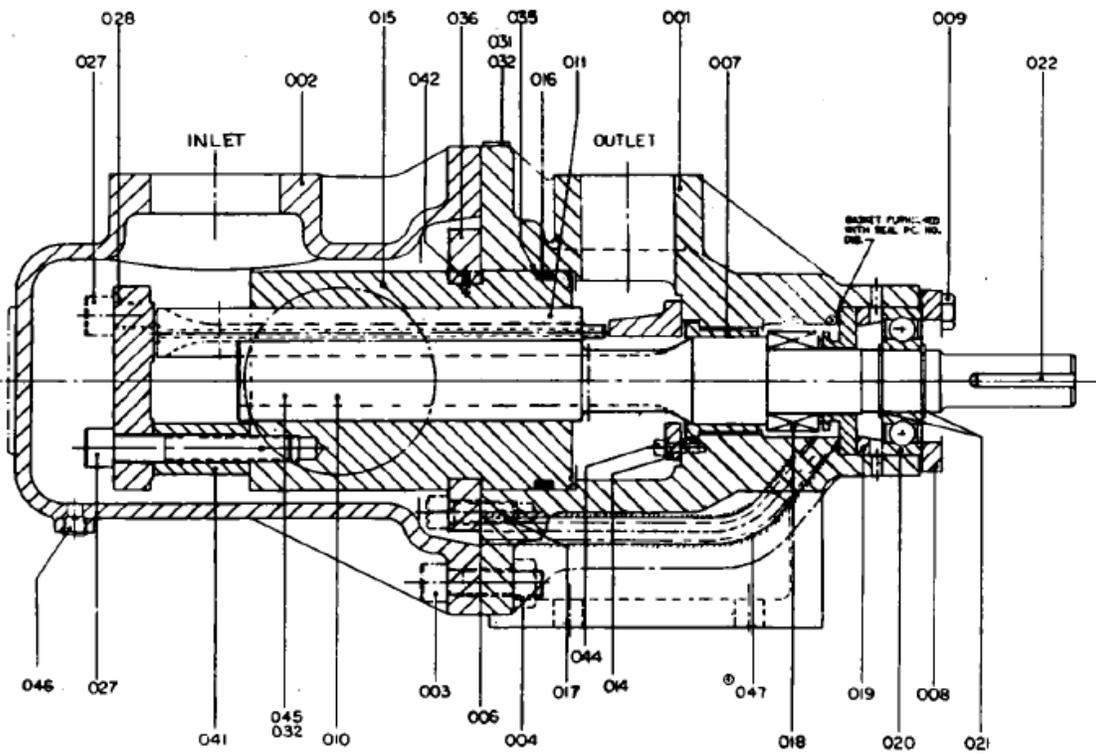
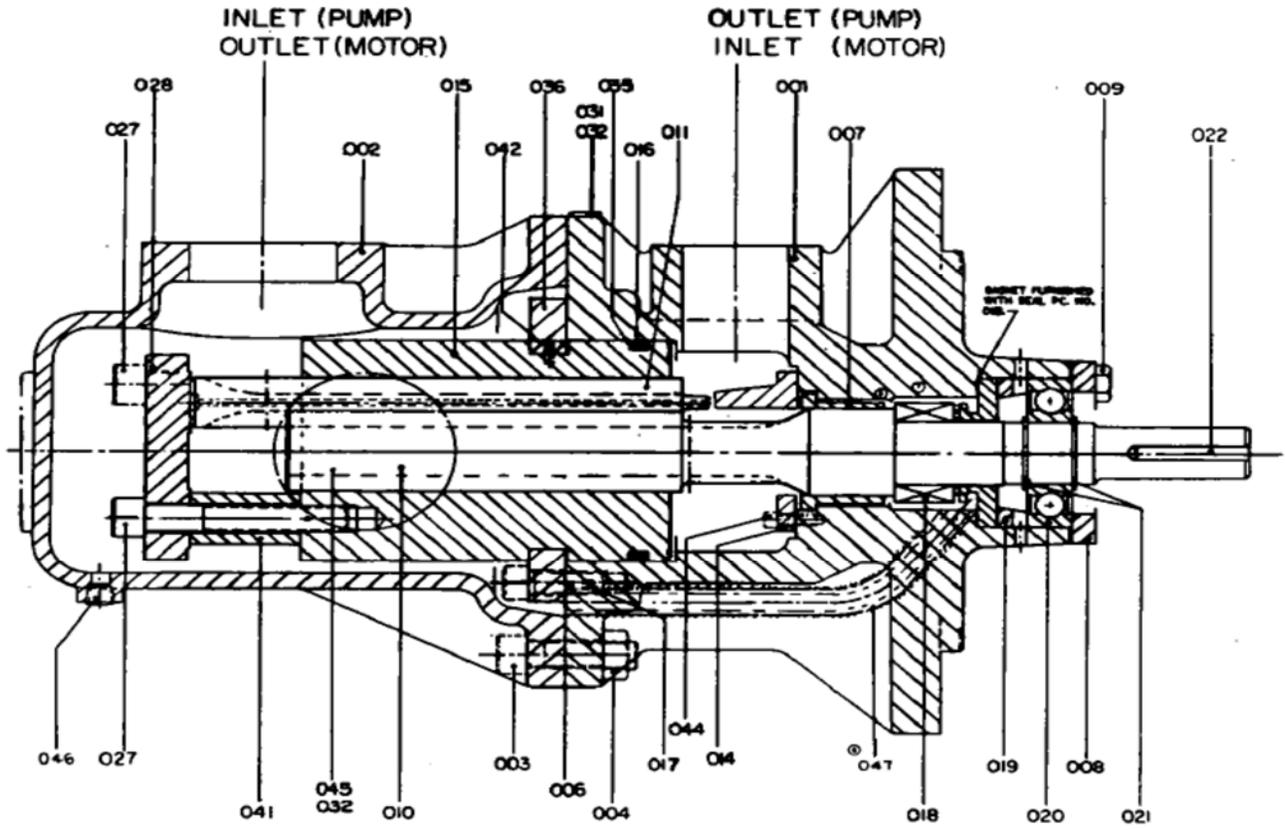


FIGURE 10.

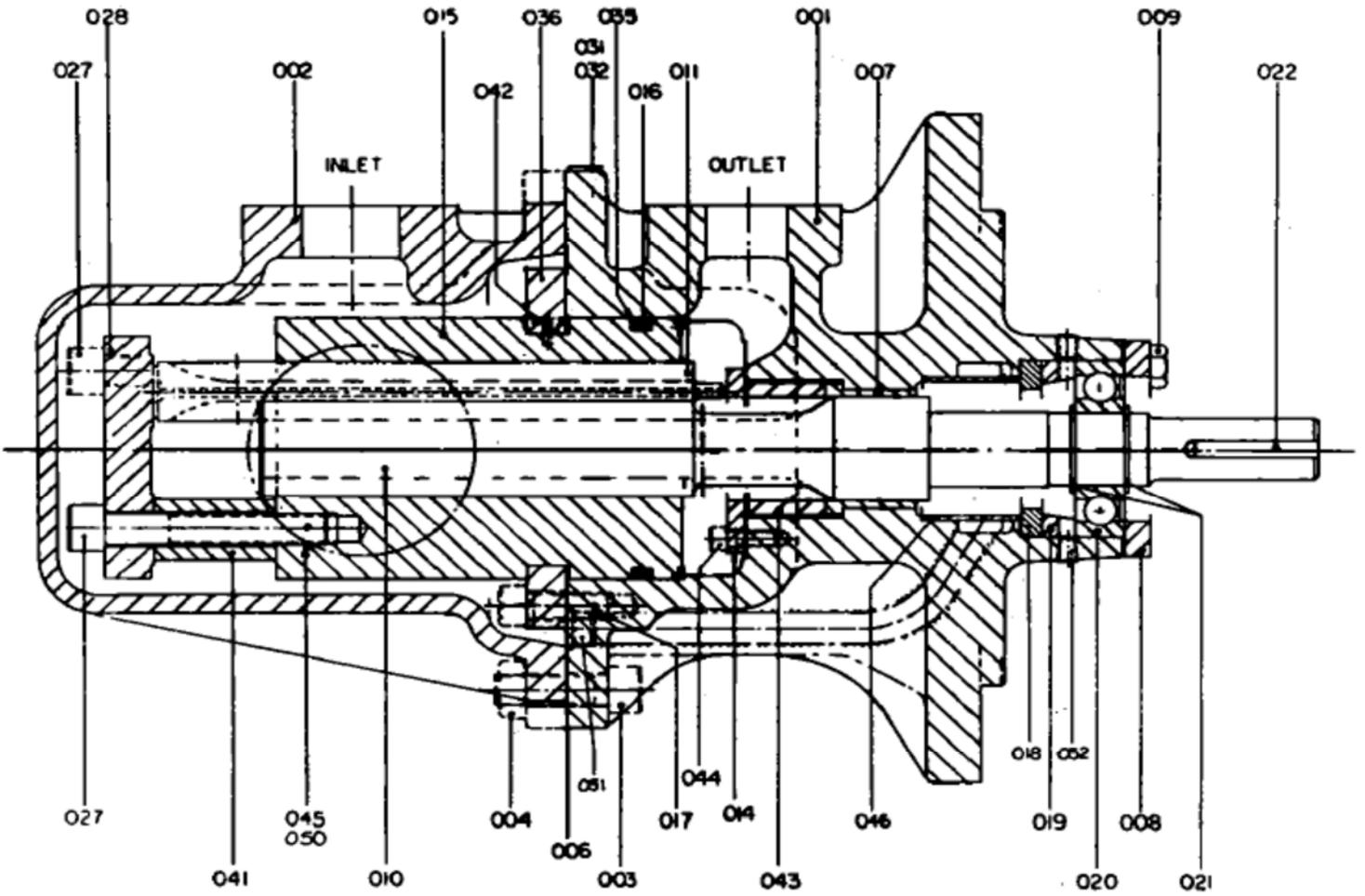


FIGURE 11.

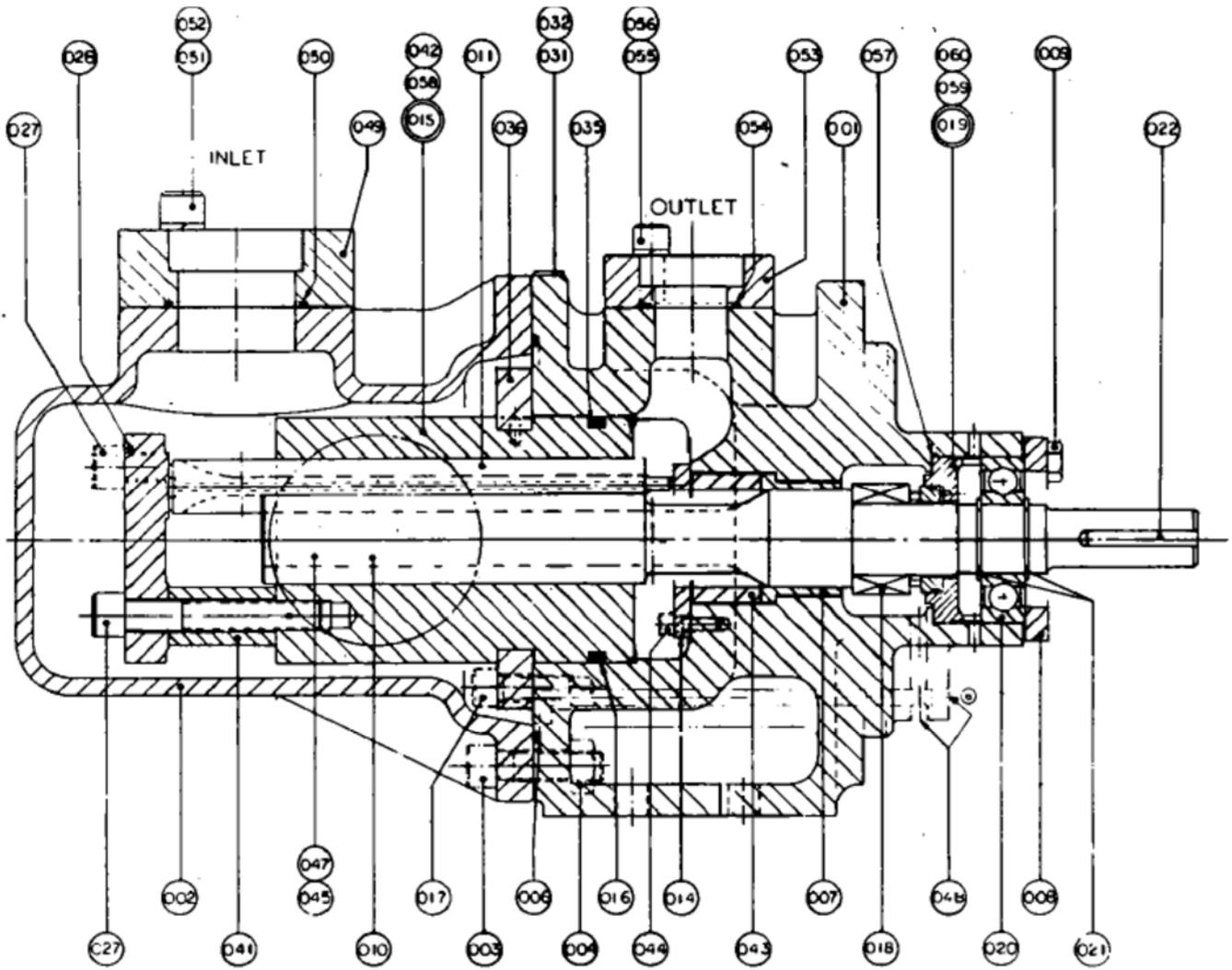


FIGURE 12.

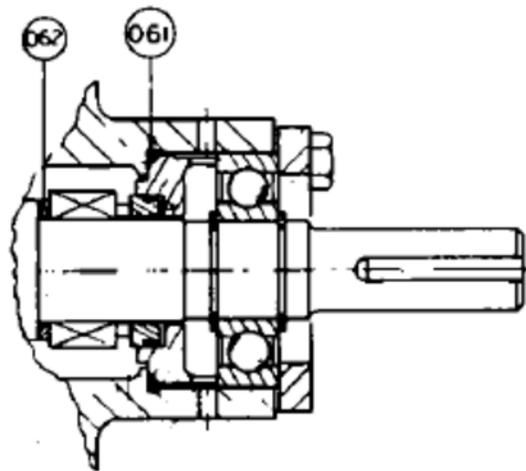


FIGURE 13.

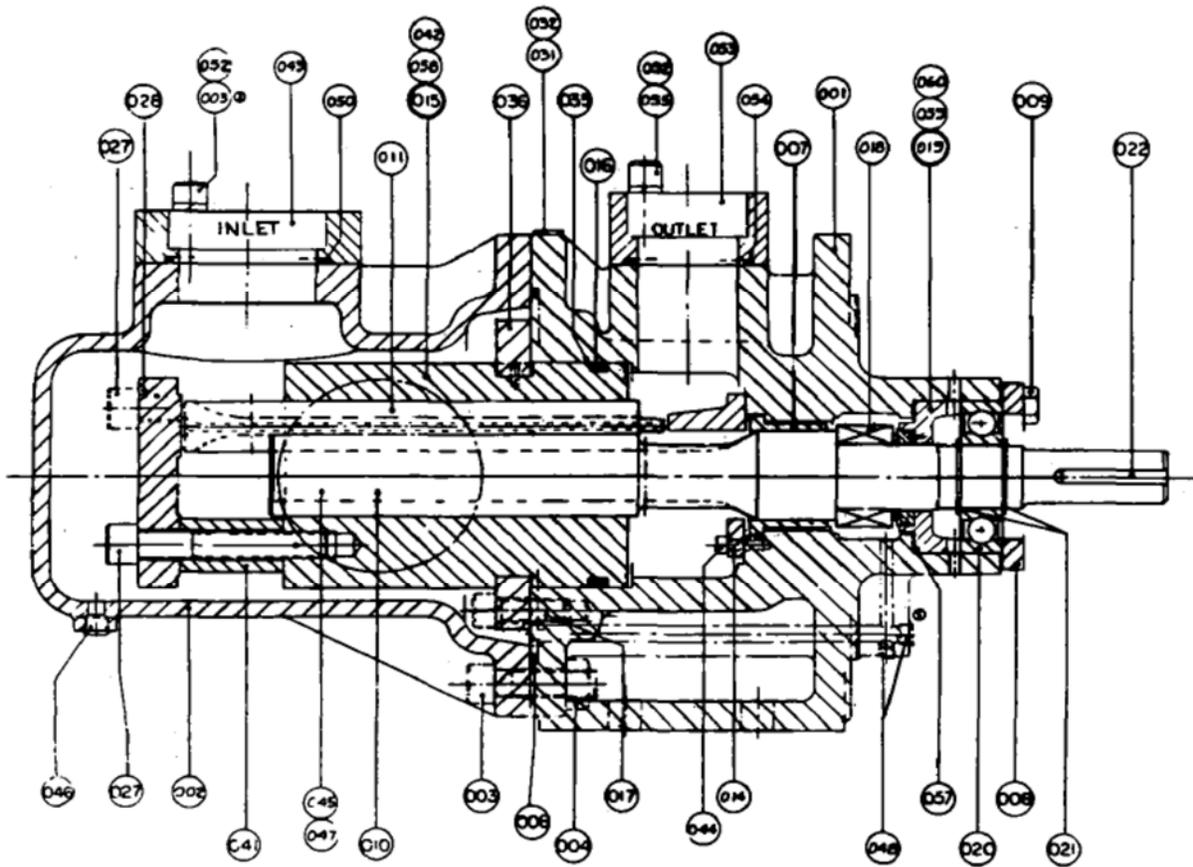


FIGURE 14.

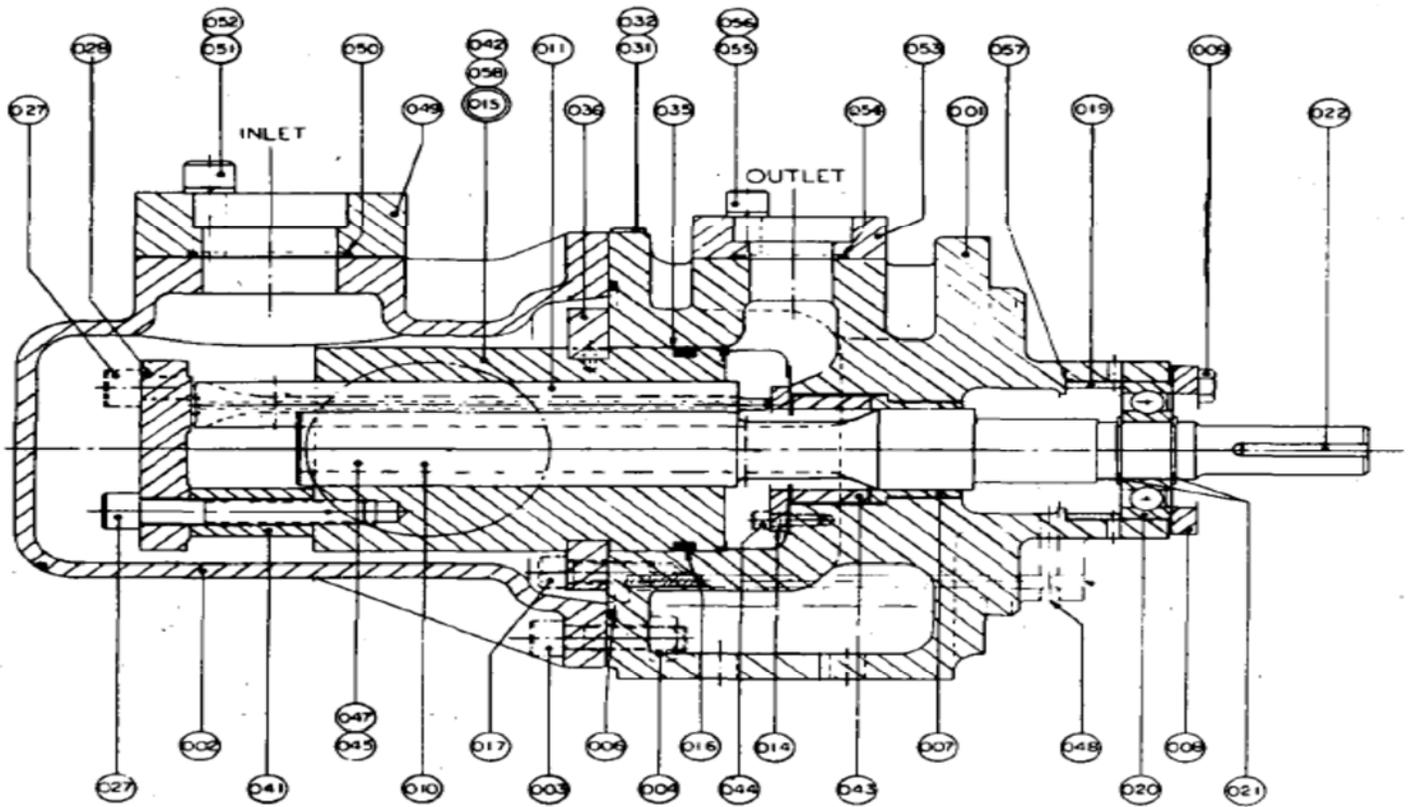
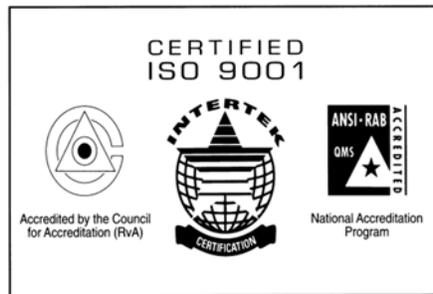


FIGURE 15.

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