



INSTRUCTIONAL MANUAL

Series A313A & C313A

WARNING

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

Instructions 313A (R-5)

This manual now is
identified as part no.
SRM00013

Imo Industries Inc.
IMO Pump Division
P. O. Box 447
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Monroe, NC 28111-5020
USA

June 1987

ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for the equipment must refer to the instruction book number and should be addressed to the nearest IMO Pump Division representative and sales office. See addresses of sales offices listed above.

The handling of renewal orders will be greatly facilitated if the following directions are carefully observed.

1. Give the number of the instruction book.
2. Give the serial number of the machine for which part is desired. This number appears on the nameplate.
3. Designate the desired part by the number and name as listed in this instruction book.
4. Give the drawing number of figure number in which the part is shown. (In the event the part is called out on an unnumbered sketch – the page number on which the sketch appears should be used in lieu of the drawing number as the reference.)

For Example:

Instruction Book No.	A3D-6
Serial Number	505629
Part Number and Name063, Power Rotor
Drawing Number (see item 4 above)	SF-5377

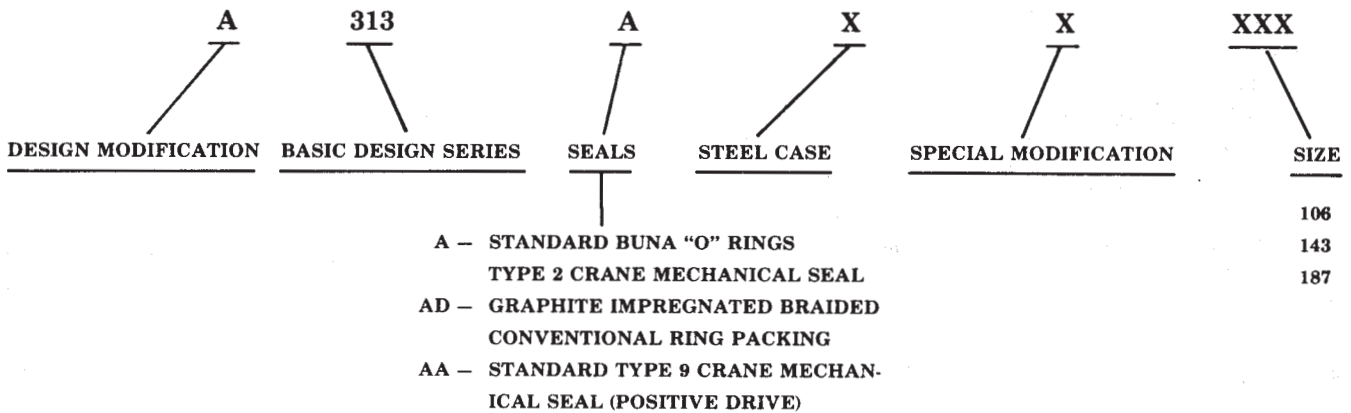
The instructions given herein cover generally the operation and maintenance of subject equipment. Should any questions arise which may not be answered specifically by these instructions, they should be referred to the IMO Pump Division for further detailed information and technical assistance.

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.

FOREWORD

This manual covers all basic models of the A313A and C313A Series IMO Pumps. The model of a particular pump may be found on the nameplate. Basic type of pumps are identified as follows:



SPECIAL INSTALLATION INSTRUCTIONS

Units are shipped with top suction connection unless otherwise specified. Other locations can be obtained in the field by rotating the outboard pump case. **DO NOT REMOVE OR ROTATE ROTOR HOUSING.** Bottom suction should not be used unless positive means are taken to retain liquid in the pump (piping loop or foot valve). All units are for clockwise rotation only (when viewed from coupling end of pump).

SHAFT SEALS

A313A Pump (See Fig. 1)

The vent hole provided in side of the pump case (inboard), will prevent any liquid which might leak past the mechanical seal, from remaining in the bearing chamber. Appearance of the liquid being handled at this vent hole, will indicate that the mechanical seal should be checked.

A313D Pump (See Fig. 2)

New packing rings can be added by removing hex-head cap screws(5) and pulling back packing box end cover (6) with packing gland (16). Be sure you have placed a hard ring next to packing gland and one next to balance piston housing (7) before closing cover. Turn up packing gland moderately tight with screw driver in slot, back off, and reset *finger tight* while pump is running. Packing specifications are tabulated below.

Rotor Size	Packing Size		Number Rings		Code
	Size (Sq.)	Shaft Dia.	Hard	Soft	Ace-O-Pak
A313AD-106	1/4"	7/8"	2	2	3
A313AD-143	1/4"	7/8"	2	2	3
A313AD-187	1/4"	1-1/8"	2	2	6

OPERATIONAL SAFETY, PRECAUTIONS

Structural Limits

Operating conditions, such as speed, fluid viscosity, inlet pressure, discharge pressure, temperature, filtration, duty cycle, mounting, drive type, etc. are interrelated. Due to these variable conditions, the specific application limitations may be different from that of the structural limitations. This equipment must not be operated without verification that operating requirements are within published capabilities are shown in the appropriate pump data book (available from local IMO Pump Division offices and representatives).

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

Maximum Discharge Pressure — 150 PSIG

Maximum Inlet Pressure — 50 PSIG (But not to exceed discharge pressure)
25 PSIG (For packing type pumps)

Maximum Fluid Temperature — 160° F — Mechanical seal type pumps
250° F — Packing Type Pumps

DISASSEMBLY AND REASSEMBLY PROCEDURES

Dissassembly of 313A Pump (See Fig. 1)

Step 1 — Remove the coupling hub and key (15).

Step 2 — Remove the end cover (6) and oil seal (9) from the inboard pump case (2) by removing bolts (5). If necessary, the oil seal can be pressed out of the end cover.

Step 3 — The complete power rotor assembly (consisting of pieces 7, 13, 16, 17, 18 and 19) may be withdrawn from the pump.

Step 4 — Remove the outboard pump case (1) and gasket (11) by removing nut (4) and bolts (3).

Step 5 — Withdraw the idler rotors (14) from the housing (10).

Step 6 — Inspect the rotors (13 & 14) and housing (10) for wear and damage.

NOTE: If the rotor housing (10) is removed, match mark the housing and the inboard pump case (2) to ensure that the idler rotors (14) are installed in correct position.

Step 7 — The power rotor assembly need not be disassembled unless either the ball bearing (16) on the mechanical seal (7) needs replacing or servicing. To remove these parts refer to pages 5 & 7.

Reassembly of 313A Pump (See Fig. 1)

Before beginning the reassembly, inspect and clean all parts. Replace all worn or damaged parts. New gaskets and "O" ring should be installed when the pump is rebuilt. It is also recommended that a new mechanical seal and ball bearing be installed. Coat all internal parts with a light oil to assist in the assembly.

Step 1 — For instructions on assembly of the power rotor assembly refer to pages 6 & 9.

Step 2 — Put gasket (20, when fitted) in counterbore of inboard pump case (2).

Step 3 — If the rotor housing (10) was removed, put internal gasket (11) in place and install the housing to its original position.

Step 4 — Insert the assembled power rotor into the inboard pump case (2) and housing (10).

Step 5 — Press oil seal (9) into end cover (6). Place a minimum amount of grease on inside cavity of the end cover to maintain a constant lubrication of the ball bearing. Install the end cover and secure with bolts (5).

NOTE: The 313A pump is furnished with a prepacked ball bearing which will normally require no attention before or after being placed in operation. If the pump should be disassembled for any reason, repack the bearing with grease before reassembling the pump. Use Socony-Vacuum BRB "Lifetime" grease or an equivalent grease compounded especially for anti-friction bearings.

Step 6 — Screw idler rotors (14) in place.

Step 7 — Put external gasket (11) on rotor housing (10).

Step 8 — Put outboard pump case (1) in place. Secure with bolts (3) and nuts (4).

Step 9 — Put key (15) and coupling hub on shaft.

Step 10 — Be sure the rotors turn freely by hand before remounting the pump.

Disassembly of 313AD Pump (See Fig. 2)

The procedure for disassembly of the pumps is as follows:

Step 1 — Remove coupling hub and key (15).

Step 2 — Remove bolts (5) and withdraw power rotor assembly, consisting of pieces (6, 7, 13, 16, 17 and 18), from the pump.

Step 3 — Remove the outboard pump case (1) and gasket (11) by removing nuts (4) and bolts (3). Thrust block (12) is pressed into the case and need not be removed unless it is worn or scored.

Step 4 — Withdraw the idler rotors (14) from the housing (10).

Step 5 — Inspect the rotors (13 and 14) and housing (10) for wear or damage.

NOTE: If the rotor housing (10) is removed, match mark the housing and the inboard pump case (2) to ensure that the idler rotors (14) are installed in correct position.

Step 6 – If it is necessary to disassemble the power rotor assembly, proceed as follows:

- a. Remove the packing box end cover (6) and packing gland (16) as a unit from the shaft.
- b. Remove packing rings (17).
- c. Remove the balance piston housing (7) with “O” ring (18) and packing rings (17) from the shaft.
- d. The balance piston (9) is shrunk on the power rotor (13). These parts are not serviced separately.

Reassembly of 313AD Pump (See Fig. 2)

Before beginning the reassembly, inspect and clean all parts. Replace all worn or damaged parts. New gaskets, “O” ring and packing should be installed whenever the pump is rebuilt. Coat all parts with a light oil to assist in the assembly.

Step 1 – Put balance piston housing (7) with “O” ring (18) over the power rotor (13) shaft.

Step 2 – Install the packings rings (17) with joints of abutting rings staggered. Put one hard ring next to the balance piston housing (7) and one hard ring next to the packing gland (16).

Step 3 – If the rotor housing (10) was removed, put internal gasket (11) in place and install the housing to its original position.

Step 4 – Insert the assembled power rotor into the inboard pump case (2) and housing (10).

Step 5 – Put the packing box and cover (6) and packing gland (16), as a unit, in place and secure to the inboard pump case (2) with bolts (5).

Step 6 – Tighten the packing gland (16) to seat the packing, back off, and reset finger tight. Make final adjustment when the pump is running to allow slight seepage of fluid past the packing.

Step 7 – Screw idler rotors (14) in place.

Step 8 – Put external gasket (11) on rotor housing (10).

Step 9 – Put outboard pump case (1) and thrust block (12) in place. Secure with bolts (3) and nuts (4). If the thrust block is being replaced, be sure th oil groove is aligned with bleed-off hole in the pump case.

Step 10 – Put key (15) and coupling hub on the shaft.

Step 11 – Be sure rotors turn freely by hand before remounting the pump.



Figure 1



Figure 2

DISASSEMBLY Bearing and Type 2 Mechanical Seal

Step 1 – Remove outer retaining ring (Fig. 1).

Step 2 – Insert the power rotor assembly into a press and press off the spacer and ball bearing from the shaft (by applying pressure against the spacer inner face) (Fig. 2). Be sure the seat of the mechanical seal is not contacted.

Step 3 – Remove the inner retaining ring and slide the stationary seat of the mechanical seal over the shaft.

Step 4 – Slide remaining seal assembly members over the shaft.

Step 5 – Inspect the shaft. If the shaft is pitted or badly scratched or the retaining ring grooves damaged, replace the power rotor.

Step 6 – Discard the old seal, bearing, and retaining rings.

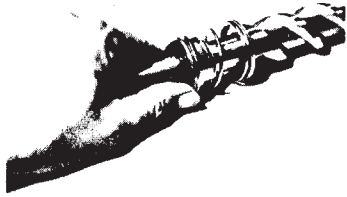


Figure 3



Figure 4



Figure 5

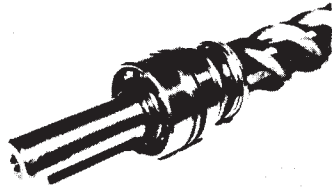


Figure 6

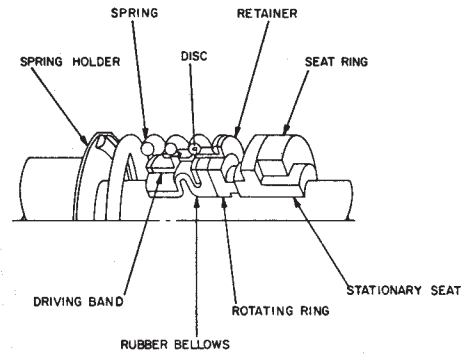


Figure 7

ASSEMBLY

Bearing and Mechanical Shaft Seal Crane Type 2

Step 1 — Clean the power rotor shaft and snap ring grooves prior to installing the new seal and bearing. Wash the shaft in solvent to remove dirt and grease.

To protect the rotating seal member from damage during installation, wrap a piece of shim stock around the power rotor shaft to cover the snap ring grooves and shoulder of the seal diameter. Lubricate the shaft and shim stock with clean hydraulic fluid.

Step 2 — Put spring holder and spring in place on the shaft. Be sure spring is centered in spring holder. Slide the bellows assembly (consisting of bellows, drive bond, disc, retaining shell and protecting ferrule) as a unit along shaft just far enough to center in spring and hold spring in place. Do not compress the spring at this stage. Put on carbon seal ring. Be sure the sealing washer is in proper position with notches on edge of sealing ring mating with lugs in retainer. Make sure that bellows shoulder is not folded under driving band and that the driving faces of the driving band are tight against retainer shell (Fig. 3).

Step 3 — Insert the stationary seat member of the mechanical seal into the spacer using finger pressure only be sure the rubber ring is tight against the shoulder of the seat with the rounded edge at the rear. Oil the "O" ring and put in groove of the spacer. (Fig. 4).

Step 4 — Oil the lapped face of the seal seat and put the spacer-stationary seat assembly onto the shaft.

Step 5 — Put internal snap ring in groove in power rotor shaft.

Step 6 — Place the ball bearing onto the shaft and by using a hollow tube and pressing on the inner races, seat the bearing firmly against the inner snap ring. (Shielded side of bearing facing inward). **DO NOT PRESS THE BEARING ON THE OUTER RACE.** (Fig. 5).

Step 7 — Install outer snap ring in groove (Fig. 6).

NOTE REFERENCE (Fig. 7) FOR DETAILED DRAWING OF MECHANICAL SEAL



Figure 1



Figure 2

DISASSEMBLY

Bearing and Crane Type 9 Mechanical Seal

Step 1 – Remove the outer retaining ring (Fig. 1).

Step 2 – Insert the power rotor assembly into a press and press off the spacer and ball bearing from the shaft (by applying pressure against the spacer inner face (Fig. 2). Be sure the seat of the mechanical seal is not contacted.

Step 3 – Remove the inner retaining ring and slide the stationary seat of the mechanical seal over the shaft.

Step 4 – Loosen set screws on seal spring holder and slide the remaining seal assembly members over the shaft.

Step 5 – Inspect the shaft. If the shaft is pitted or badly scratched on the retaining ring grooves damaged, replace the power rotor.

Step 6 – Discard the old seal, bearing, and retaining rings.

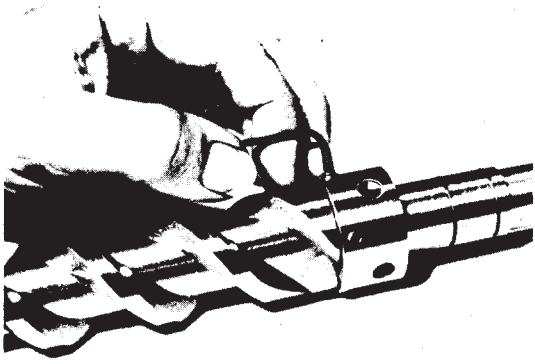


Figure 8

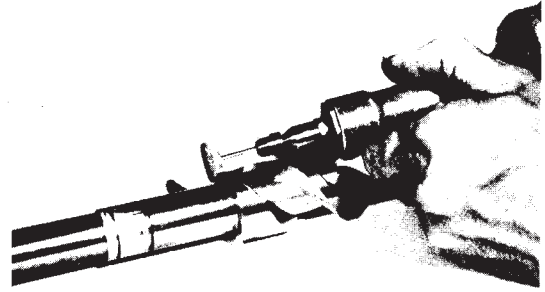


Figure 9

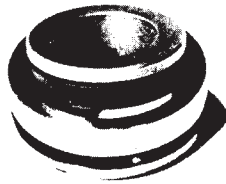


Figure 10

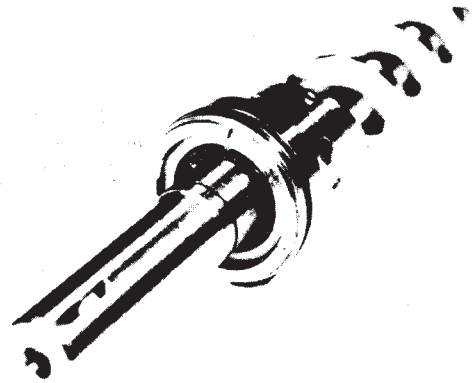


Figure 11



Figure 12



Figure 13

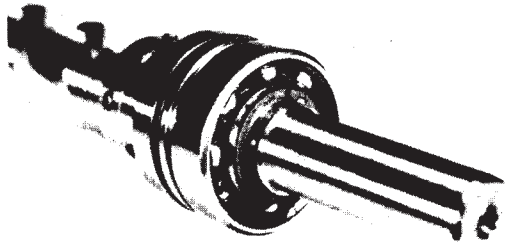


Figure 14

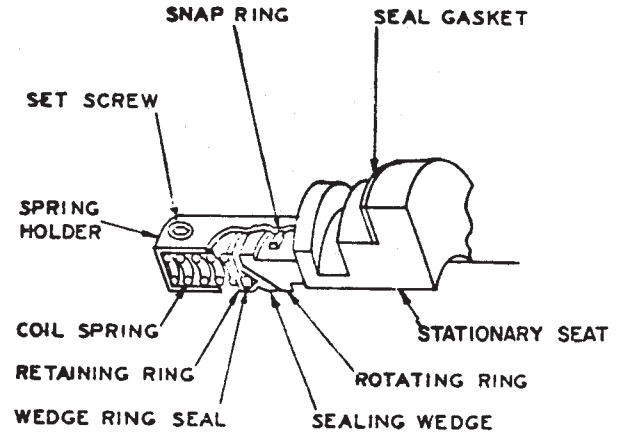


Figure 15

ASSEMBLY

Bearing and Mechanical Shaft Seal Crane Type 9

Step 1 — Clean the power rotor shaft and snap ring grooves prior to installing the new seal and bearing. Wash the shaft in solvent to remove dirt and grease.

To protect the rotating seal member from damage during installation, wrap a piece of shim stock around the power rotor shaft to cover the snap ring grooves and shoulder of the seal diameter. Lubricate the shaft and shim stock with clean hydraulic fluid.

Step 2 — Loosen set screws on seal spring holder and with clips in place install onto shaft. Tighten set screws to spot shaft (Fig. 8).

Step 3 — Loosen set screws on seal spring holder and remove seal member from shaft. Provide surface for set screws to lock onto shaft by grinding flats at the spotted areas with a pencil grinder (Fig. 9).

NOTE: The shaft material has been hardened and high speed drills are unsatisfactory. Remove any sharp edges raised by the grinding by local stoning of the area. Wipe shaft clean and re-oil.

Step 4 — Re-install rotating seal member onto the shaft and tighten set screws into spotted areas so that the seal member is locked into position (Fig. 8). Lock set screws with center punch to prevent loosening.

Step 5 — Insert stationary seat into the stationary seat carrier and place the “O” ring gasket onto the stationary seat carrier. (Fig. 10).

Step 6 — Install stationary seat carrier member onto the shaft and install retaining ring (Fig. 11).

Step 7 — Remove retaining clips from seal by applying pressure against carbon rotating ring and prying off with a screwdriver (Fig. 12).

NOTE: Clips must be removed with care so they do not pop off abruptly and injure someone.

Step 8 — Place the ball bearing onto the shaft and by using a hollow tube and pressing on the inner race, seat the bearing firmly against the inner snap ring. **DO NOT PRESS THE BEARING ON THE OUTER RACE** (Fig. 13) (Unshielded scale of bearing—all facing outward).

Step 9 — Install outer snap ring (Fig. 14).

NOTE: Reference Fig. 15 for detailed drawing of mechanical seal.

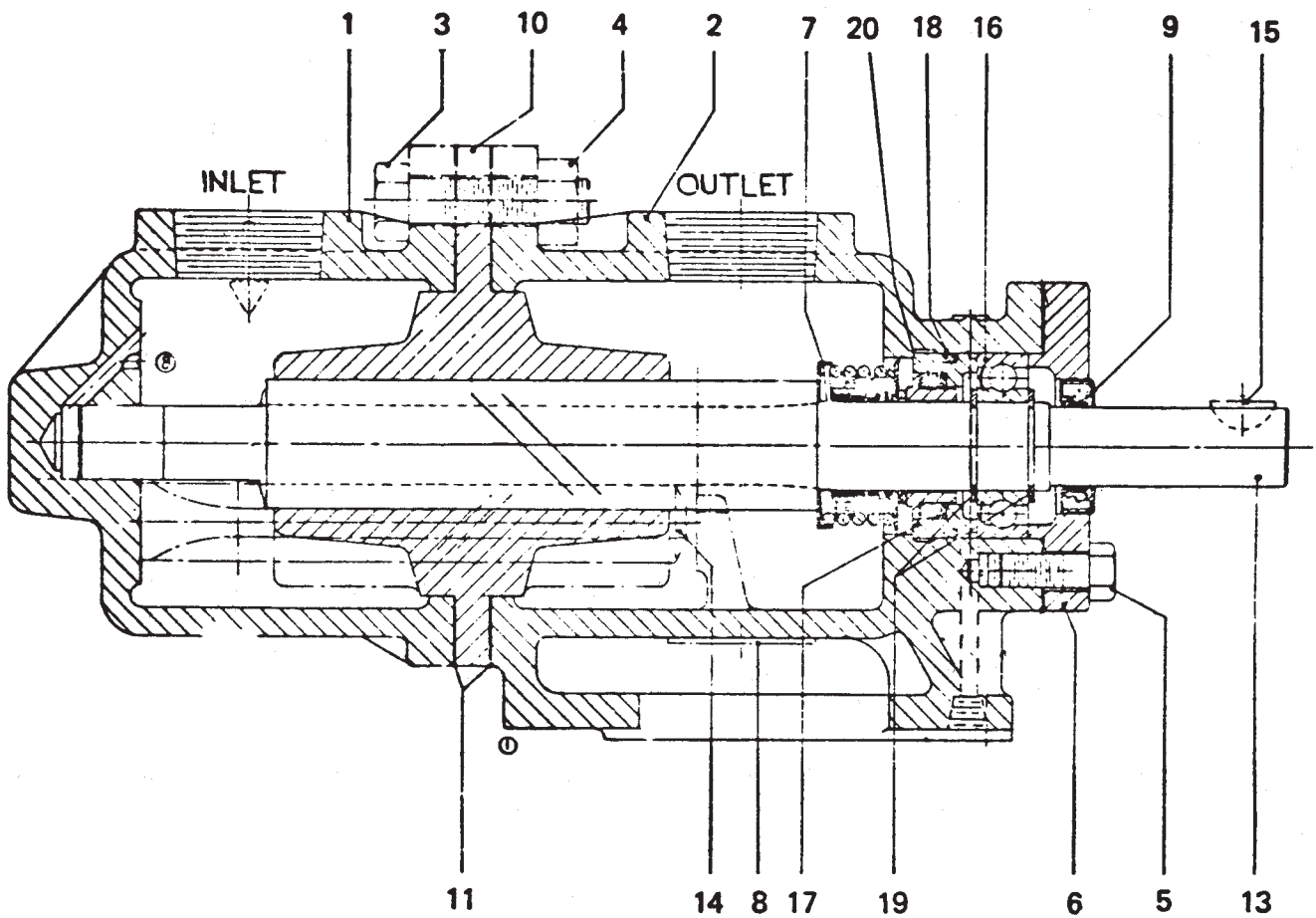


Fig. 1. Assembly of Series A313A Pump

PARTS LIST

Part No.	Description	Part No.	Description
1	Pump Case (Outboard)	11	Gasket X (2)
2	Pump Case (Inboard)	13	Power Rotor XX
3	Hex. Hd. Bolt (4)	14	Idler Rotor XX (2)
4	Hex. Nut (4)	15	Woodruff Key XX
5	Hex. Hd. Bolt (3)	16	Ball Bearing X
6	End Cover	17	Spacer XX
7	Mechanical Seal X	18	"O"Ring ° X
8	Name Plate	19	Snap Ring X, (2)
9	Oil Seal X	20	Gasket* X
10	Rotor Housing XX		

° Used on sizes 106 and 143 only

*Used on size 187 only

Recommended Spare Parts

All parts marked X make up a minor repair kit
 All parts marked X and XX make up a major repair kit
 All quantities are one except when noted in parentheses.

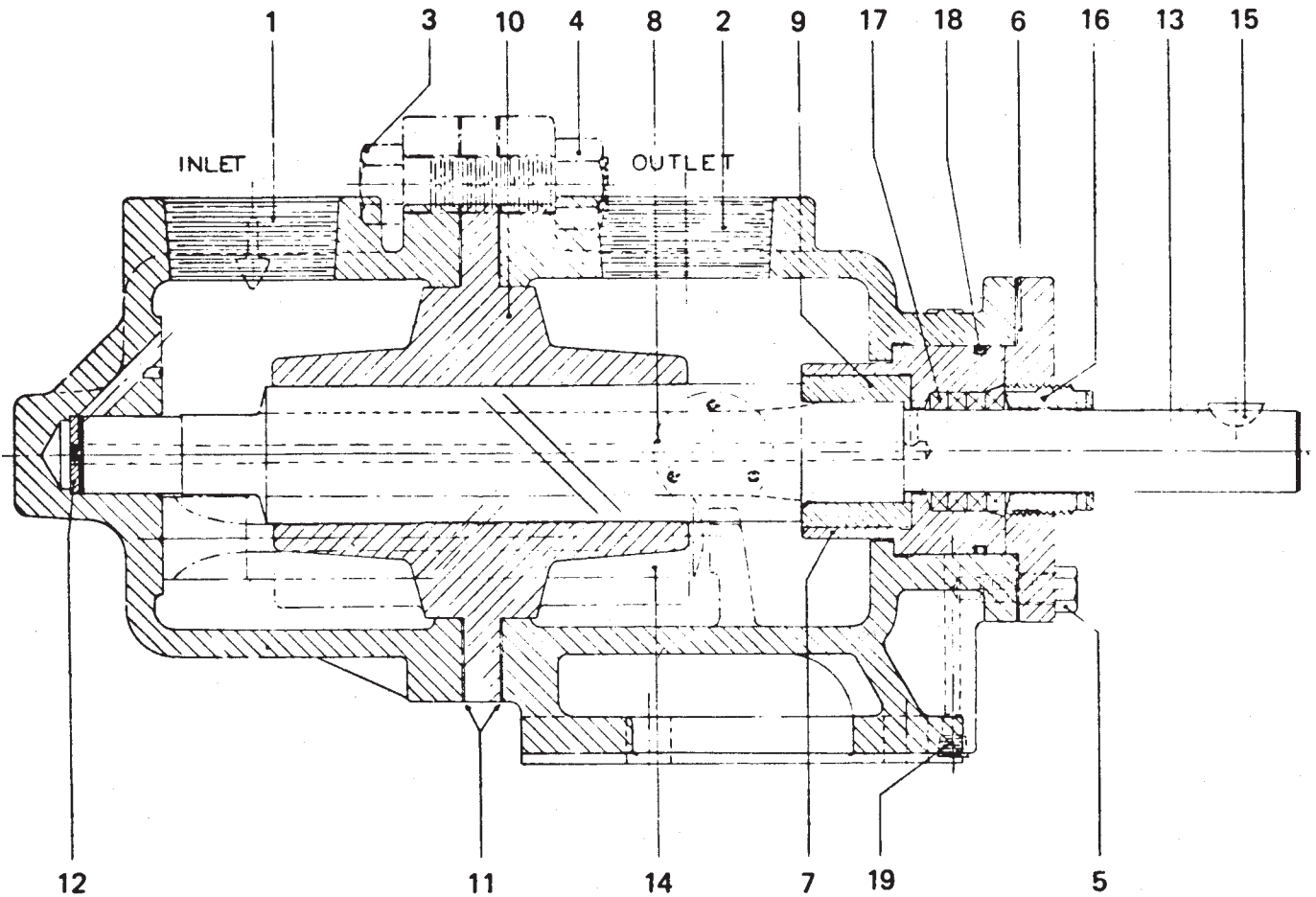


Fig. 2. Assembly of Series A313AD Pump

PARTS LIST

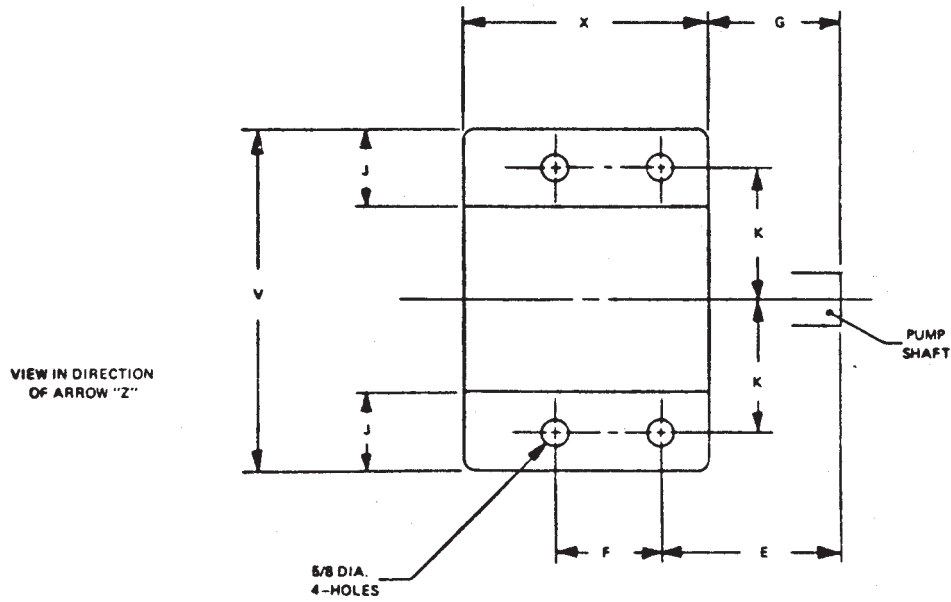
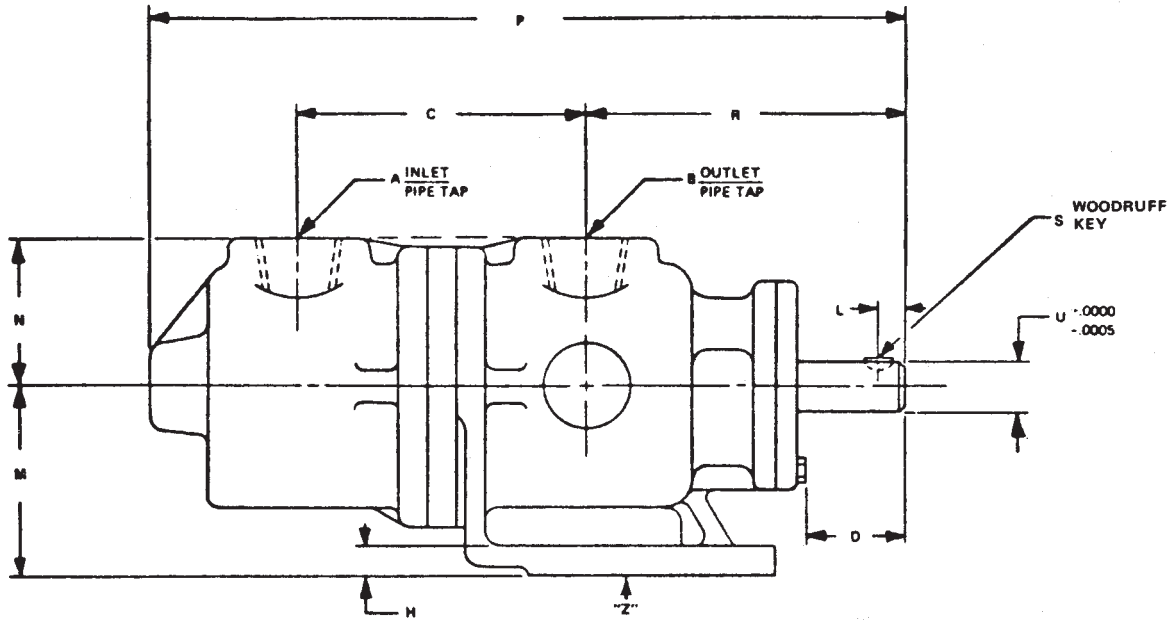
Part No.	Description	Part No.	Description
1	Pump Case (Outboard)	11	Gasket X (2)
2	Pump Case (Inboard)	12	Thrust Block
3	Hex. Hd. Bolt (4)	13	Power Rotor*
4	Hex. Nut (4)	14	Idler Rotor (2)
5	Hex. Hd. Bolt (3)	15	Woodruff Key
6	Packing Box End Cover	16	Packing Gland
7	Balance Piston Housing	17	Packing X
8	Name Plate	18	"O" Ring X
9	Balance Piston*	19	Pipe Plug
10	Rotor Housing XX		

*Not serviced separately.

Recommended Spare Parts

All parts marked X make up a minor repair kit
 All quantities are one except when noted in parentheses.
 No major repair kits are available.

SERIES A313A/AD PUMP DIMENSIONS



PUMP SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	U	V	X	EST. PUMP WEIGHT
A313A-106	1-1/4	1-1/4	4 3/8	1-7/8	3-5/8	2-1/2	3	1/2	1-3/8	2-3/8	1/2	3-1/4	2-5/16	11-15/16	5-3/8	#8	.875	6	4-1/2	25
A313A-143	1-1/4	1-1/4	5 3/8	1 7/8	3-5/8	2-1/2	3	1/2	1-3/8	2-3/8	1/2	3-1/4	2-9/16	14	6	#8	.875	6	4-1/2	32
A313A-187	2	2	5-13/16	2-15/16	5 3/8	3-1/2	4-5/8	5/8	1-3/4	3-1/2	7/8	4-1/4	3-1/2	17-3/8	8-3/8	#9	1.125	8 1/2	6	70

NOTE 1 ALL DIMENSIONS ARE IN INCHES TO THE NEAREST 1/16 INCH.
 NOTE 2 STANDARD ROTATION CLOCKWISE.
 NOTE 3 TOP INLET POSITION IS STANDARD.



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