



**INSTRUCTION MANUAL  
AND  
PARTS LIST  
FOR  
A3D SERIES PUMPS**



**WARNING**

This Instruction Manual and General Instructions Manual SRM00046, should be read thoroughly prior to pump installation, operation or maintenance.

**Manual No. SRM00038**

**Rev. 15 (12-0265)**

**JUNE 2012**

## FOREWORD

Instruction manual covers Imo Pump Series A3D pumps. Series of pumps have been designed to meet requirements for hydraulic, distillate, lubricating, residual and crude oil applications. 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. Correct use of manual requires identification of Figure(s) applicable to pump assembly and seal arrangement. Refer to Table 1, assembly drawings, Figures 3, 7, 8, 9, 10 and mechanical seal drawings, Figure 2, for applicable pump seal selection. Packing pumps are illustrated in Figures 4, 5, 6. If pump type is not specifically identifiable in manual, contact Imo Service Department with pump model and serial number for assistance 704-289-6511.

**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 Imo Pump for further detailed information and technical assistance.**

Manual cannot possibly cover every situation connected with operation, adjustment, test, overhaul and maintenance of equipment furnished. Every effort is made to prepare text of manual so that engineering and design data is transformed into most easily understood wording. Imo Pump, in furnishing this equipment and this manual, must presume that 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 Imo Pump furnished equipment is to be integrated with a process or other machinery, these instructions should be thoroughly reviewed to determine proper integration of equipment into overall plant operational procedures. On critical or dangerous equipment, provide suitable safety and emergency systems to protect personnel and property from injury due to pump malfunction. If pump handles flammable, toxic, corrosive or explosive fluids, provide for safety in event of pump leakage or malfunction.

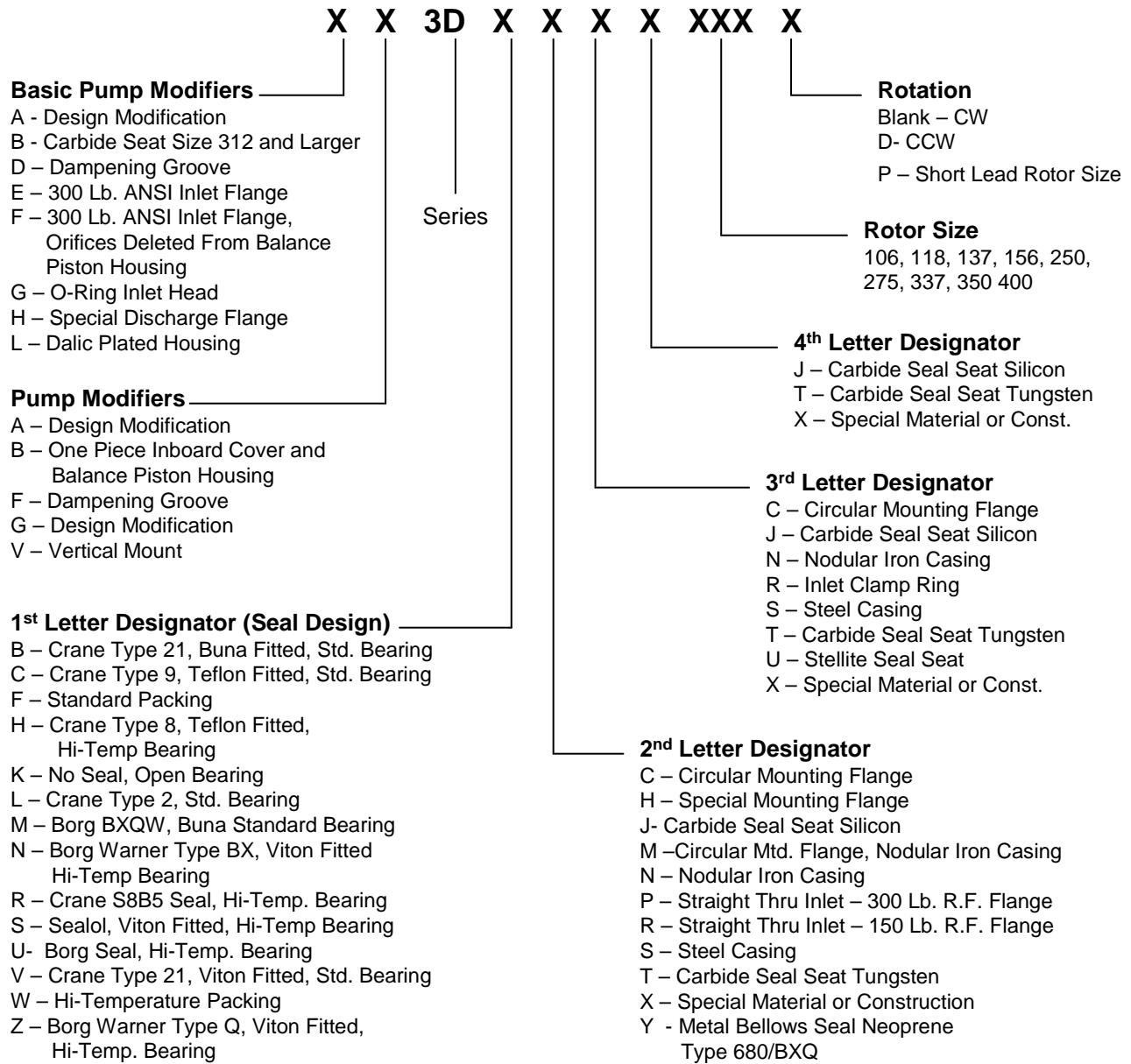
If installation, operation, and maintenance instructions are not correctly and strictly followed and observed, serious damage to pump could result. Imo Pump cannot accept responsibility for unsatisfactory performance or damage resulting from failure to comply with instructions.

**Table 1**

### **SERIES A3D TYPICAL PUMP ASSEMBLY DRAWINGS**

	<b>MECHANICAL SEALS</b>	<b>PACKING PUMPS</b>		
<b>Rotor Size</b>	<b>106, 118, 137, 156, 187, 218, 250, 275, 337, 312, 350, 400</b>	<b>106,118</b>	<b>137,156,187</b>	<b>218,250,275</b>
<b>Figure No.</b>	<b>3, 7, 8, 9, 10</b>	<b>4</b>	<b>5</b>	<b>6</b>

**Figure 1 - Definitions of Model Designators**



**NOTE:** Letter designators following series designator (3D) identify mechanical seal design, construction and special features. Series designator (3D) is followed by 1, 2, 3 or 4 letter designators. Examples of determining a particular pump type from letter designators are given below. Table applies to all designators.

**Examples:** 3DB (Crane 21 Seal)  
 3DBC (Crane 21 Seal, Circular Mounting Flange)  
 3DBCS (Crane 21 Seal, Circular Mounting Flange, Steel Casing)

## 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. Equipment must not be operated without verification that operating requirements are within published capabilities as shown in appropriate pump brochure (available from local Imo Pump Division offices and representatives listed in Manual SRM000

Under no circumstances are the following structural limitations to be exceeded

Maximum Speed (Rpm)						
Rotor Size	Distillate Oils		Lube & Seal Oil		Residual & Crude Oils	
	Type B & H	Type B & H	Type F	Type B & H	Type F	
106-118	5000	5000	3800	1800	1800	
137	4400	4400	3200	1800	1800	
156	4400	4400	3000	1800	1800	
275	3000	3000	1900	1800	1800	
337 to 400	2500	2500	-	1800	1800	
Condition			Limit			
Minimum Viscosity			32 SSU			
Maximum Viscosity (figure 1)			100 SSU Minimum			
1 <sup>st</sup> Letter Designator F			33 SSU Min / 2500 SSU Max			
1 <sup>st</sup> Letter Designator B			33 SSU Min / 15000 Max			
1 <sup>st</sup> Letter Designator H						
Minimum Liquid Temperature			0°F			
Maximum Liquid Temperature (figure 1)			230°F			
1 <sup>st</sup> Letter Designator F			180°F			
1 <sup>st</sup> Letter Designator B			220°F			
1 <sup>st</sup> Letter Designator H						
Maximum Inlet Pressure			75 psig for sizes 137 thru 250 50 psig for sizes 275 and larger 10 Psig for Packing Pumps			
Maximum Discharge Pressure (Continuous Duty)			500 psig			
Filtration			Refer to General Instruction Manual, SRM000			
Drive			Direct or Belt For Seal Pumps Direct Only for Packing Pumps			
Mounting			Mounted in any attitude			

## ORDERING INSTRUCTIONS

All correspondence pertaining to renewal parts for Series A3D pumps must refer to this instruction manual number and should be addressed to the nearest Imo Pump Division representative listed in SRM00046.

The following directions should be followed for renewal part orders:

1. Give number of this instruction manual.
2. Give pump type and serial number of pump for which part(s) is ordered.
3. Give figure number(s) on which pump type and sealing design part(s) is shown.
4. Give part number(s) for necessary part(s).


**Table 4**  
**LIST OF MATERIALS (FIGURES 3 THROUGH 11)**

<b>ITEM</b>	<b>PART DESCRIPTION</b>	<b>ITEM</b>	<b>PART DESCRIPTION</b>
001	Case	036	Tube
002	Inlet Head	036	Lockwasher
003	Packing Box End Cover	037	Spacer
004	(3) Bolt or Capscrew	038 (1)	O-ring (Figure 16)
005	Plug	040	Spacer
006 (2)	Stop Pin	042 (2)	Truarc Ring (2)
007 (1)	Dyna Seal	043	Retainer
008 (2)	Retaining Ring	043	Plug
008	Inboard Cover (Figure 16)	044 (2)	Power Rotor
009 (1)	Gasket (2)	045	Balance Piston Housing
010 (2)	Retainer Plate	046	Inboard Cover
011	Capscrew (4)	047	Bolt (4)
012	Spring Pin (2)	048 (2)	Spacer or Seat Adapter
013	Cotter Pin	049 (1)	Ball Bearing
014	Packing Gland Screw (2)	063 (2)	Power Rotor
014	Spacer (Figure 16)	064	Plug
015	Washer (2)	067	Plug
015 (1)	Ball Bearing (Figure 16)	068	Nipple
016	Nut (2)	069	Coupling
016	Bearing Retainer (Figure 16)	070 (1)	O-ring (Figure 10)
017 (1)	Packing	070	Elbow
017	Bolt (4) Figure 16)	071	Tubing
018	Packing Gland	072	Plug
019 (2)	Power Rotor	073	Plug
020 (1)	Truarc Ring (2)	074	Elbow
021 (2)	Idler Rotor (2)	074	Nameplate
022	Oil Balance Tube External	075	O-ring (Figure 10)
022 (2)	Balance Piston Housing	075	Plug
023 (2)	Idler Balance Piston Housing (2)	075	Nipple
023	Spacer (2) (Figure 16)	076 (1)	O-ring
024 (2)	Rotor Housing	076	Tee
025 (1)	Seal	077	Nipple
026 (2)	Oil Balance Tube (2)	078 (2)	Check Valve
026	Thrust Plate (Figure 16)	079	Elbow
027 (1)	O-ring (4)	080	Elbow
027	Gasket	080	Plug
028 (1)	O-ring (2)	081 (1)	Gasket
029 (2)	Thrust Cage	081	Tubing
029	Bolt (2) (Figure 16)	084	Spacer
029	Thrust Plate (Figures 18 & 19)	086 (2)	Bushing
030	Lockwasher (2) (Figure 16)	090	Spacer
031	Key	091	Washer (4)
032 (2)	Relief Valve	091	Spacer
033	Nameplate	092 (1)	Gasket
034	Drive Screw (2)	092	Spacer (Figure 22)
035	Plug	092	Washer (4)

Quantities are one (1) except when noted in parentheses after description. Items marked (1) are minor kit items. Items marked (2) are major kit items. This is a General Parts List. Refer to specific rotor size for appropriate parts that apply specifically to your pump. When an item number applies to more than one part by noun name, use part as indicated on proper assembly figure for your pump.

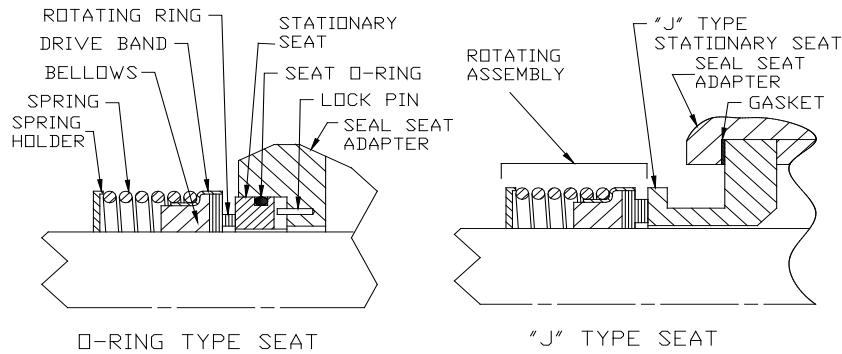
**Note:** For disassembly of Mechanical Seal and Ball Bearing Only, follow steps 1, 2, 3, 9, 10, 11 and 13.  
 For Reassembly of Mechanical Seal and Ball Bearing Only, Follow steps 8, 9, 10 and 11.

**DISASSEMBLY AND ASSEMBLY PROCEDURES (MECHANICAL SEAL PUMPS)**

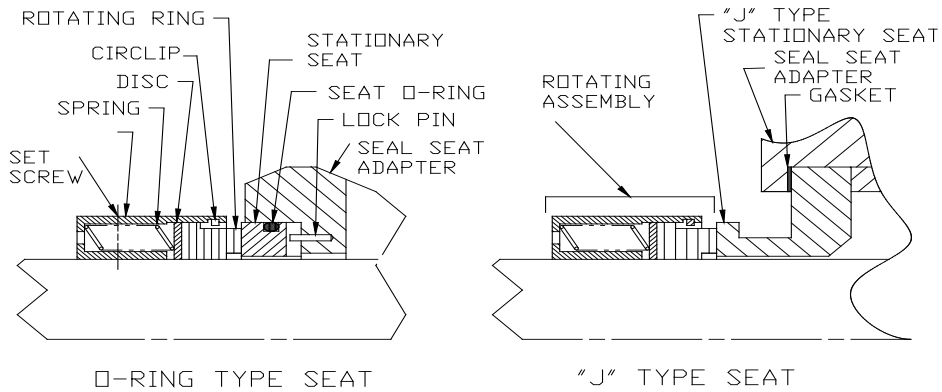
	<p><b>WARNING</b></p> <p>To prevent personnel/equipment injury, power supply to pump driver must be disconnected or positively tagged out prior to starting any disassembly procedure.</p>
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**FIGURE 2 - MECHANICAL SEAL TYPES**

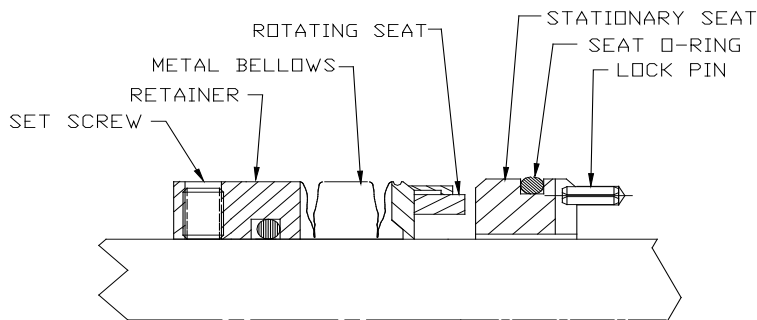
SINGLE SPRING, RUBBER BELLOWS MECHANICAL SEAL



MULTI-SPRING MECHANICAL SEAL



METAL BELLOWS MECHANICAL SEAL



## Disassembly Procedures (Figures 3, 7, 8, 9)



### WARNING

When inspecting/servicing shaft seal and/or bearing, power rotor can be removed as a subassembly with these components installed. Remove four (4) bearing retainer plate bolts and retainer plate, and then remove power rotor sub-assembly. If for any reason pump is disassembled further than this, it is possible idler rotor balance piston housings may fall off. These idler rotor balance piston housings **MUST** be properly in place at reassembly. If idler rotor balance piston housings are not properly installed on idler rotors, pump **WILL** experience catastrophic failure.

Figures listed are basic pump assembly figures. For variations that may apply to your pump, see figure 16 for seal installation variations.

1. Close off suction and discharge piping to pump and disconnect piping.
2. If applicable, remove tubing (071) and, if applicable, check valve (078).
3. Remove inlet drain plugs and drain unit. Remove pump from driver, coupling and mounting bracket. Remove coupling hub and key (031).
4. Remove inlet capscrews (004), inlet head (002) and gasket (009) or O-ring (070 or 075) as applicable.
5. **(Figures 3, 7 and 8)** Remove thrust cage (029). Remove oil balance tube (026) with O-rings (027) from either thrust cage (029) or rotor housing (024). Remove O-rings (027) from oil balance tube (026).
6. **(Figures 3, 7 and 8)** Remove idler balance piston housings (023) from idler rotors (021), and remove idler rotors (021) by unscrewing idlers from rotor housings (024).
7. **(Figures 9)** Remove bolts (029 or 053) with lockwashers (030 or 052). Remove thrust plate (026 or 029) and spacers (023 or 051). Remove spacer (040 or 050) from case (001).
8. **(Figures 9)** Remove idler rotors (021) from housing (024) bores by unscrewing idler rotors from threads of power rotor.
9. Remove bolts (047 or 017) and bearing retainer (043 or 016).
10. Remove power rotor (044 or 063) assembly from case (001).

**NOTE:** Removal of power rotor (044 or 063) will also remove Truarc rings (042), ball bearing (049), spacer (048 or 014), sleeve (037 or 038) if applicable and mechanical seal (025).

**NOTE:** Balance piston furnished as part of power rotor (044 or 063) and is not serviced separately.

11. Remove gasket from bore of inboard cover (046 or 008).
12. Remove inboard cover capscrews (004) and inboard cover (046 or 008) from case (001).

**NOTE:** Removal of inboard cover (046) may include removal of O-ring (028) and bushing (086). Bushing (086) is locked to inboard cover (046) with Loctite retaining compound and should not be removed unless replacement is necessary.
13. Remove gasket (009) from case (001).

14. Remove balance piston housing (022 or 045) with O-ring (028) from case (001). Remove O-ring (028) from balance piston housing (022 or 045).
15. Remove oil balance tube (026 or 036) with O-rings (027 or 038) from rotor housing (024) or balance piston housing (022 or 045) or inboard cover (046 or 008). Remove O-rings (027 or 038) from oil balance tube (026 or 036).
16. Remove stop pin (006) and Dyna Seal (007) from case (001). Remove rotor housing (024) with O-ring (028) from case (001). Remove O-ring (028) from groove of rotor housing (024).
17. Disassemble power rotor (044 or 063), removed in Step 10 as follows:

**(Figures 3, 7, 8, 9)** Remove outer truarc ring (042). Press ball bearing (049) off power rotor (063). Remove inner truarc ring (042).

**(Figures 3, 7, 8, 9)** If seal is J seat type, remove spacer (048 or 014) and mechanical seal stationary seat. If seal is O-ring type, remove seal seat adapter (048 or 014) with stationary seat from power rotor (044 or 063). Remove stationary seat from seal seat adapter (048 or 014)

**NOTE:** Refer to Figure 2 for Mechanical Seal Types for proper disassembly.


**(Figures 3, 7, 8, 9)** Remove mechanical seal rotating assembly from power rotor (044 or 063).

**NOTE:** Refer to Figure 2 for Mechanical Seal Types for proper disassembly.

**(Figures 7, 8, 9)** Remove sleeve (038 or 037) from power rotor (044 or 063).

Assembly Procedures (Figures 3, 7, 8, 9 and 11)

**NOTE:** Prior to pump assembly, 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 (027, 028 and 038), gaskets (009), Dyna seal (007), ball bearing (049 or 015) and mechanical seal (025) when these parts are disturbed from their previously installed position. Refer to pump assembly drawings (Figures 3, 7, 8, 9), and List of Material (Table 4), during assembly. Coat all parts with light lubricating oil to assist in assembly. Assembly procedures for all A3D pumps equipped with mechanical seals are identical except when specifically noted.

	<b>WARNING</b>
<p>When inspecting/servicing shaft seal and/or bearing, power rotor can be removed as a subassembly with these components installed. Remove four (4) bearing retainer plate bolts and retainer plate, and then remove power rotor sub-assembly. If for any reason pump is disassembled further than this, it is possible idler rotor balance piston housings may fall off. These idler rotor balance piston housings <b>MUST</b> be properly in place at reassembly. If idler rotor balance piston housings are not properly installed on idler rotors, pump <b>WILL</b> experience catastrophic failure.</p>	

**Figures 3, 7, 8, 9** are basic pump assembly figures. For variations that may apply to your pump, see Figure 10 for seal installation variations.

1. Install O-ring (028) in groove of rotor housing (024). **(Figures 3, 7, 8, 9 and 11)** Install O-rings (027) on oil balance tube (026), and install oil balance tube (026) in suction end of rotor housing (024).
2. **(Figures 3, 7, 8 and 11)** Install O-rings (027 or 038) on oil balance tube (026 or 036), and install oil balance tube (026 or 036) in discharge end of rotor housing (024).



3. Install assembled rotor housing (024) in case (001), aligning housing (024) to receive stop pin (006). Install stop pin (006) with Dyna seal (007) in case (001).
4. **(Figures 3, 7, 8, 9 and 11)** Install O-ring (028) in groove of balance piston housing (022 or 045), and install balance piston housing (022 or 045) in case (001), ensuring that bore of balance piston housing (022 or 045) engages oil balance tube (026 or 036) installed in rotor housing (024).
5. **(Figures 3, 7, 8, 9)** Install gasket (009) on case (001).
6. Install inboard cover (046 or 008) on case (001) using capscrews (004 or 093). Tighten capscrews (004 or 093) to proper torque value listed in Table 2.

**NOTE:** If applicable, lockwashers (092) will be installed with bolts (004).

**Table 2**  
**TORQUE VALUES – MECHANICAL SEAL PUMPS**

Rotor Size	IDP#	Torque	IDP#	Torque
106	4	49 ± 2 lb-ft	47	108 ± 5 lb-in
118	4	49 ± 2 lb-ft	47	11 ± 2 lb-ft
137	4	64 ± 2 lb-ft	47	11 ± 2 lb-ft
156	4	64 ± 2 lb-ft	47	11 ± 2 lb-ft
187	4	97 ± 2 lb-ft	47	18 ± 2 lb-ft
218	4	167 ± 5 lb-ft	47	24 ± 2 lb-ft
250	4	245 ± 10 lb-ft	47	24 ± 2 lb-ft
275	4	78 ± 2 lb-ft	47	24 ± 2 lb-ft
312	4	78 ± 2 lb-ft	47	38 ± 2 lb-ft
337	4	120 ± 5 lb-ft	17	38 ± 2 lb-ft
350	4	120 ± 5 lb-ft	47	38 ± 2 lb-ft
400	4	170 ± 5 lb-ft	47	38 ± 2 lb-ft

8. Assemble power rotor (044 or 063) as follows:

**(Figures 7, 8, 9)** Install sleeve (038) on power rotor (044 or 063) shaft next to piston.

**(Figures 3, 7, 8, 9)** Install mechanical seal (025) rotating assembly on power rotor (044 or 063) shaft. Tighten set screw if applicable.

**NOTE:** Refer to Figure 2 for Mechanical Seal Types for proper assembly.

**(Figures 6, 10 and 11)** If seal is a J seat design Install stationary seat on power rotor (063 or 044) shaft. Then install spacer (014 or 048). If seal stationary seat is an O-ring design, be sure O-ring is installed on seal seat and then install seat in seal seat adapter (048 or 014). Be sure groove in back of stationary seat mates with pin in seal seat adapter (48 or 14)

**NOTE:** Refer to Figure 2 for Mechanical Seal Types for proper assembly

**(Figures 3, 7, 8, 9)** Install inner truarc ring (042) in groove of power rotor. Press ball bearing (049) on power rotor (063) shaft, pressing only on inner race of bearing. Install outer truarc ring (042) in groove of power rotor shaft.

9. **(Figures 3, 7, 8, 9)** Install gasket or O-ring, based on mechanical seal design, in mechanical seal bore of inboard cover (046 or 008).
10. Install assembled power rotor (044 or 063) in inboard cover (046 or 008), centering each part as it enters pump case (001).

11. Install bearing retainer (043 or 016) using bolts (047 or 017). Tighten bolts (047 or 017) to proper torque value listed in Table 2.
12. Install idler rotors (021) in idler bores of rotor housing (024) by engaging threads of idler rotors with threads of power rotor (044 or 063) and rotating idler rotors (021) while inserting them into rotor housing (024) bores.
13. **(Figures 3, 7, 8)** Install idler balance piston housings (023) on idler rotors (021).
14. **(Figures 3, 7, 8)** Install thrust cage (029), ensuring that bore of thrust cage (029) engages oil balance tube (026) installed in rotor housing.
15. **(Figure 9)** Install spacer (040 or 050) in housing (001). Install spacers (023 or 051) and thrust plate (026 or 029) on rotor housing (024) using bolts (029 or 053) and lockwashers (030 or 052). Tighten bolts (029 or 053).
16. Install gasket (009) and inlet head (002) on case (001) using bolts or capscrews (004). Tighten bolts or capscrews (004) to proper torque value listed in Table 2.
17. Install drain plugs which were removed during pump disassembly.
18. Install key (031) and coupling hub on power rotor (044 or 063) shaft.

## **DISASSEMBLY AND ASSEMBLY PROCEDURES (PACKING PUMPS)**

### **Disassembly Procedures (Figures 4, 5 and 6)**

**NOTE:** Refer to pump assembly drawings, Figures 4 through 6, during pump disassembly. Disassembly procedures are identical for Figures 4 through 6 unless specifically noted.

1. Close off suction and discharge piping to pump and disconnect piping.
2. **(Figures 5 and 6)** Remove tubing (081) from pump, ensuring that tubing (081) is not bent or flattened. Remove drain plugs (005 and 080).
3. Remove pump from driver, coupling and mounting bracket. Remove coupling hub and key (031).
4. Remove packing gland nuts (016) with washers (015) and remove packing gland (018).
5. Using a "packing puller" or sharp pointed brass or copper rod, remove packing (017).
6. Remove bolts or capscrews (004), packing box end cover (003) and gasket (009).
7. Remove bolts or capscrews (004), inlet head (002) and gasket (009) from case (001).
8. Remove thrust cage (029).
9. Remove idler balance piston housings (023) and idler rotors (021).

**NOTE:** Remove idler rotors (021) by unscrewing idler rotors from housing (024) bores.

10. **(Figures 5 and 6)** Remove spacer (090).
11. Remove cap screws (011) and retainer plate (010).

12. **(Figure 4)** Remove retaining ring (008).
13. Remove power rotor (019 or 063). Removal of power rotor (019 or 063) will also remove balance piston housing (022) with O-ring (028) and oil balance tube (026).  
**NOTE:** Balance piston (020) furnished as part of power rotor (019 or 063) and is not serviced separately.
14. Remove balance piston housing (022) from power rotor (019 or 063). Remove O-ring (028) and oil balance tube (026) from balance piston housing (022).
15. **(Figure 4)** Remove O-ring (027) from oil balance tube (026), and remove relief valve (032) from balance piston housing (022).
16. Remove stop pin (006) with Dyna seal (007) from case (001).
17. Remove rotor housing (024) with O-ring (028) and oil balance tube (026) from suction end of pump case (001).
18. Remove O-ring (028) and oil balance tube (026) from rotor housing (024). Remove O-rings (027) from grooves of oil balance tube (026).

#### **Assembly Procedures (Figures 4 through 6)**

**NOTE:** 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 (027 and 028), gaskets (009), Dyna seal (007) and packing (017) when these parts are disturbed from their previously installed position. Refer to pump assembly drawings, Figures 8, 9 and 10, and List of Material, Table 3, during pump assembly. Coat all parts with light lubricating oil to assist in assembly. Assembly procedures for Figures 8 through 10 are identical unless specifically noted.


1. Install O-ring (028) in groove of rotor housing (024), and install rotor housing (024) in suction end of pump case (001), ensuring that bore in rotor housing (024) is aligned with stop pin (006) bore of pump case (001).
2. Install stop pin (006) with Dyna seal (007) in pump case (001) and rotor housing (024).
3. Install O-rings (027) in grooves of oil balance tube (026) and install oil balance tube (026) in bore of suction end of rotor housing (024).
4. Install O-ring (028) in groove of balance piston housing (022), and install balance piston housing (022) on power rotor (019 or 063) shaft.
5. **(Figure 4)** Install relief valve (032) in balance piston housing (022). Install O-rings (027) in grooves of oil balance tube (026).
6. Install oil balance tube (026) in bore of balance piston housing (022).
7. Install power rotor (019 or 063) assembly in bore case (001), ensuring that oil balance tube (026) engages bore of rotor housing (024).
8. **(Figure 4)** Install retaining ring (008) in groove of case (001).
9. Install retainer plate (010) using capscrews (011).
10. **(Figures 5 and 8)** Install spacer (090).

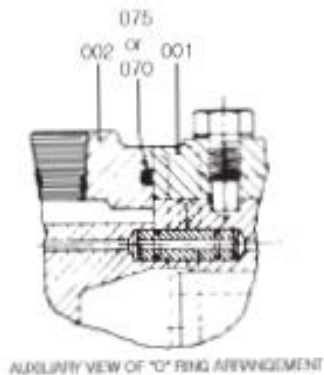
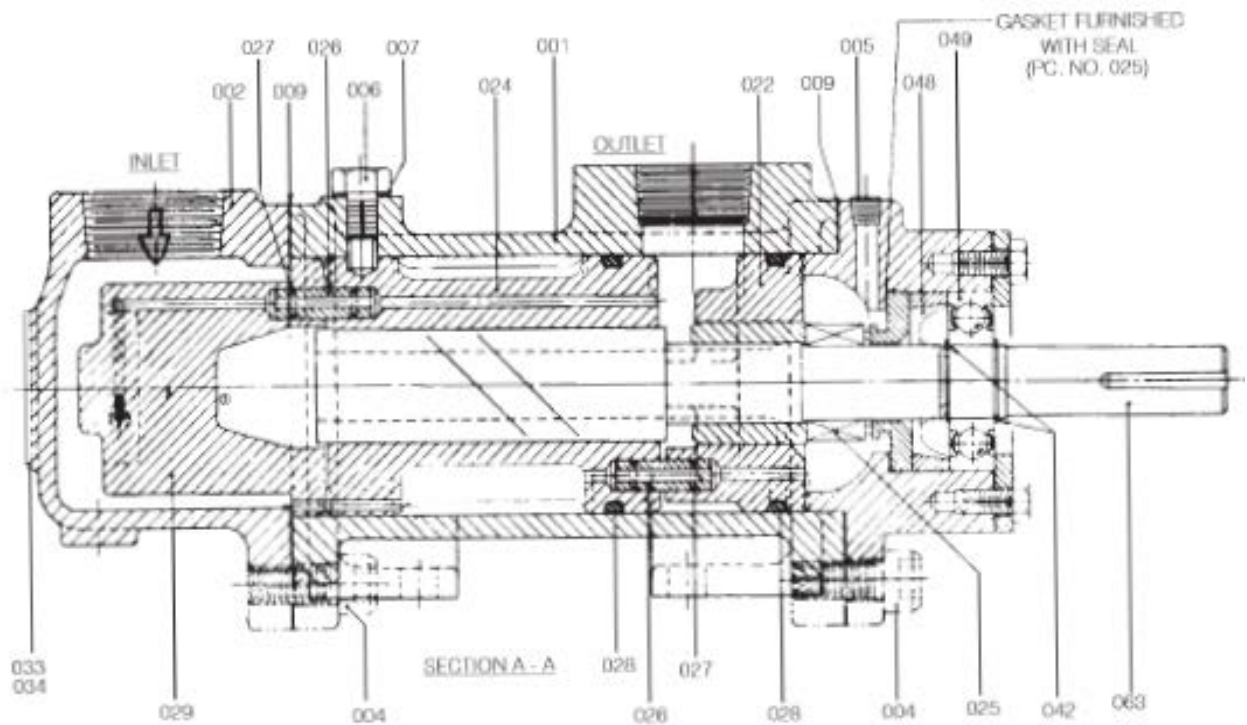
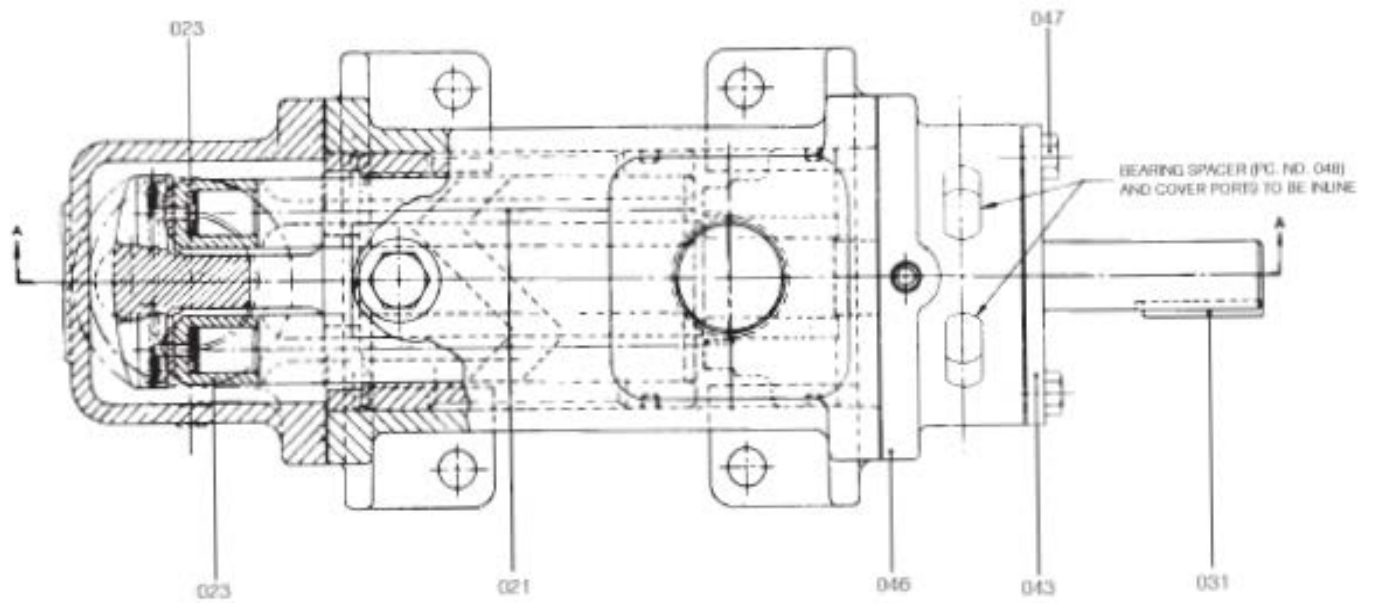
11. Install gasket (009) and packing box end cover (003) using bolts or capscrews (004). Tighten bolts or capscrews (004) to proper torque value listed in Table 3.

**Table 3  
TORQUE VALVES – PACKING PUMPS**

Rotor Size	IDP#	Torque
106 (Installed in inlet)	4	43 ± 2 lb-ft
106 (Installed in packing box cover)	4	24 ± 2 lb-ft
118 (Installed in inlet)	4	49 ± 2 lb-ft
118 (Installed in packing box cover)	4	26 ± 2 lb-ft
137	4	58 ± 2 lb-ft
156	4	64 ± 2 lb-ft
187	4	97 ± 2 lb-ft
275	4	78 ± 2 lb-ft

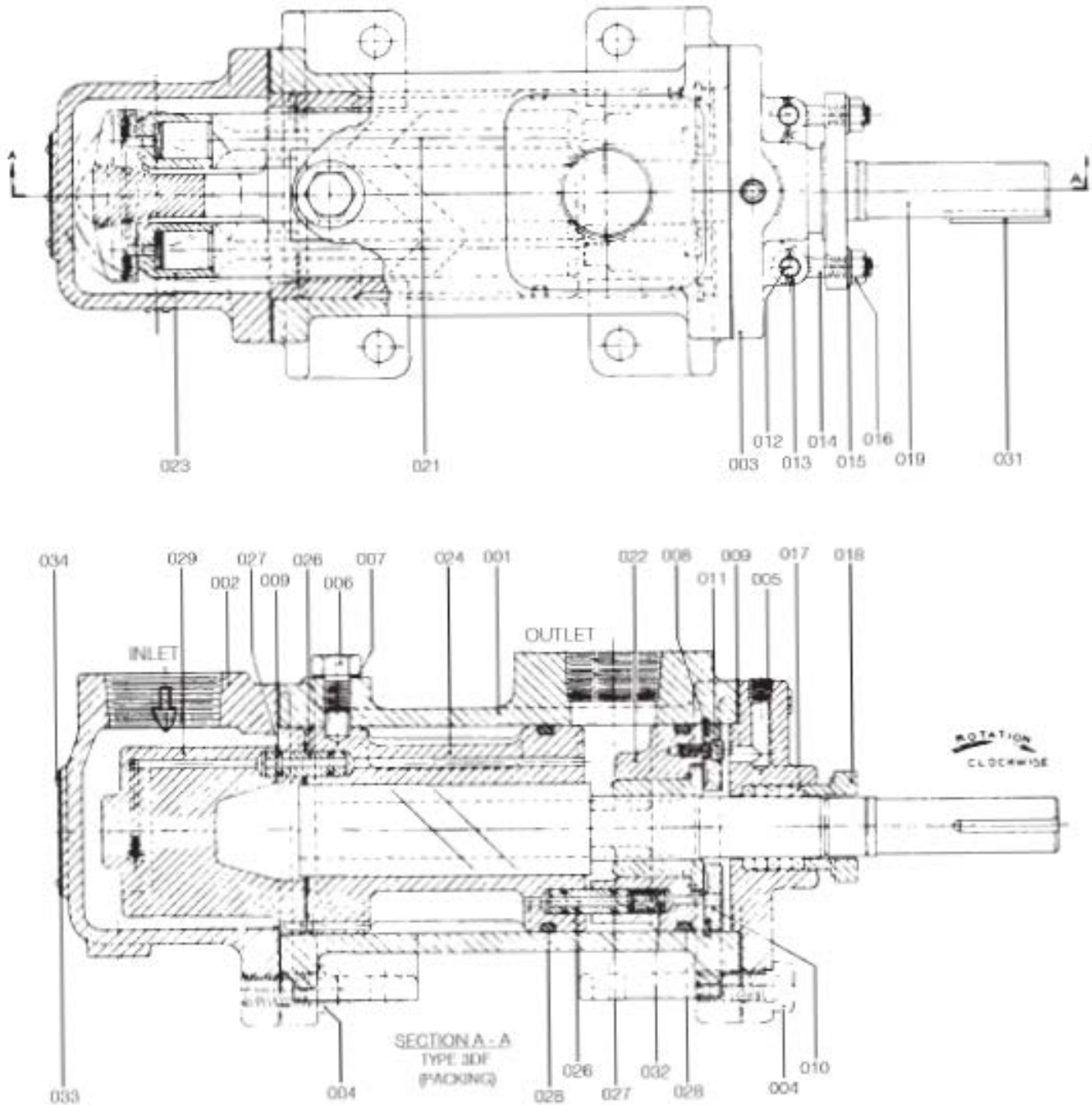
12. Install packing (017) rings in packing bore of packing box end cover (003). Joints of packing (017) ring to be staggered and hard and soft rings alternately inserted, beginning with hard ring of packing.
13. Install packing gland (018). Install washer (015) and nut (016) on packing gland screw (014) and tighten nut (016) hand tight.
14. Install idler rotors (021) into rotor housing (024) idler rotor bores by engaging threads of idler rotors with threads of power rotor (019 or 063) and rotating idler rotors (021) while inserting them into rotor housing (024).
15. Install idler balance piston housings (023) on idler rotors (021).
16. Install thrust cage (029), ensuring that bore in thrust cage (029) engages oil balance tube (026) installed in rotor housing (024).
17. Install gasket (009) and inlet head (002) on case (001) using bolts or capscrews (004). Tighten bolts or capscrews (004) to proper torque value listed in Table 3.
18. Install key (031) and coupling hub on power rotor (019 or 063) shaft.
19. Install drain plugs (005 or 080).
20. **(Figures 5 and 6)** Install tubing (081) and fittings in proper position.
21. Connect pump to mounting bracket and coupling. Align pump with driver as described in Manual CA-1.

	<b>Caution</b>	When starting pump, adjust packing seepage to allow no more than eight (8) drops per minute. <b>DO NOT</b> over-tighten packing. Seepage from packing gland provides cooling and lubrication of packing
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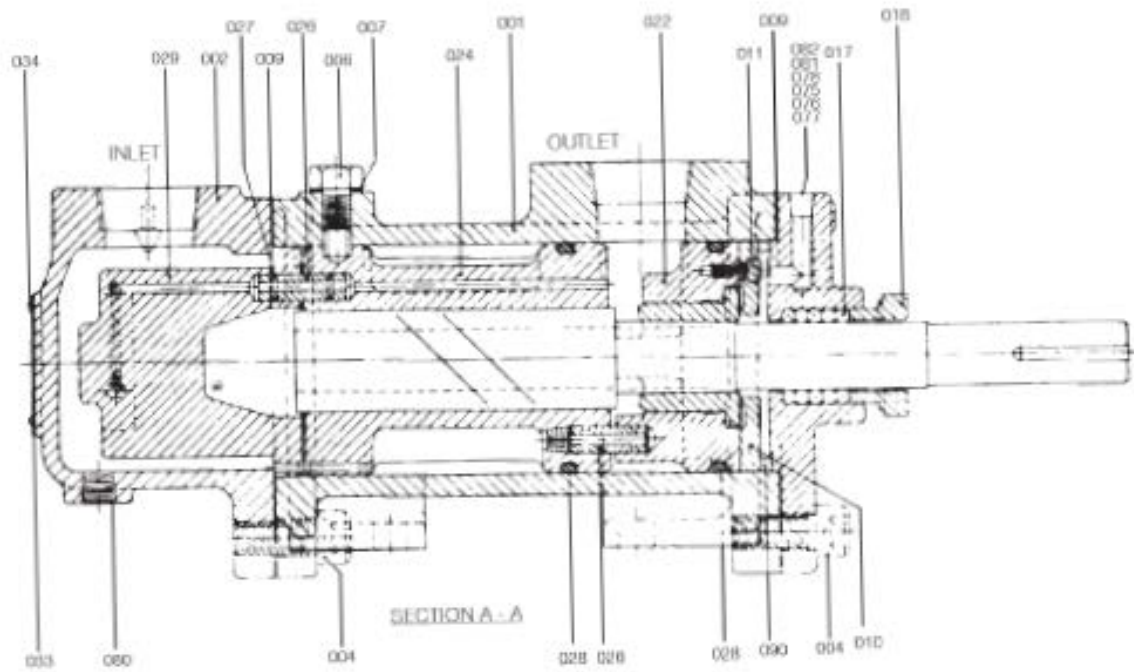
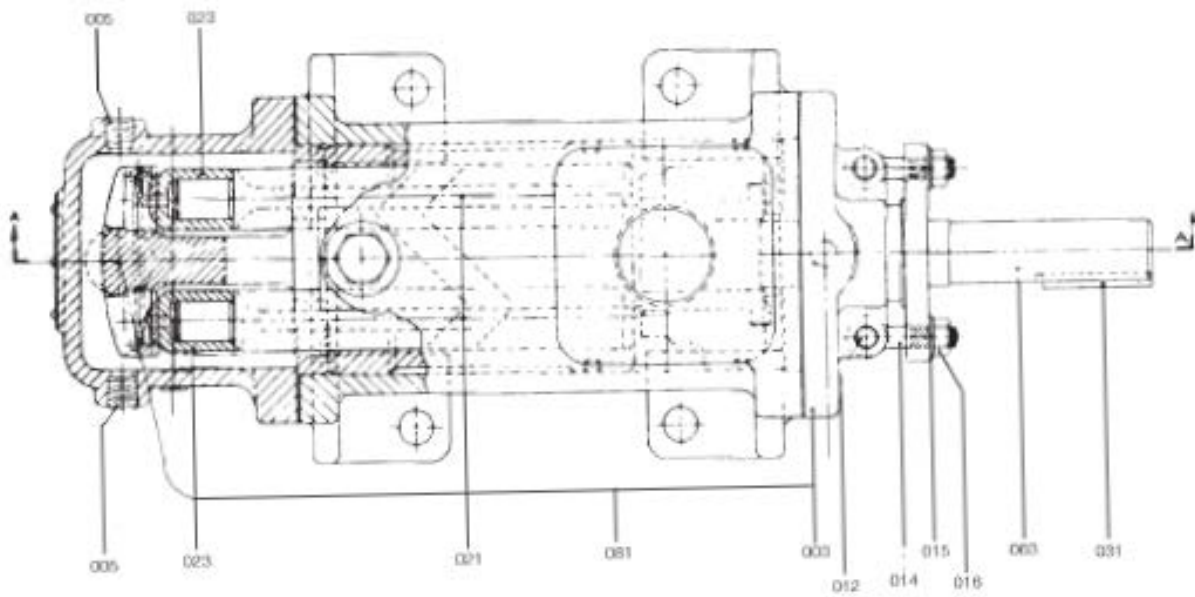
**Figure 3. A3D-106, 118, 137, 156 & 187**

See designated pages in this manual showing variations that may apply to your specific pump type. Use these variations in conjunction with standard pump assembly drawings as required.



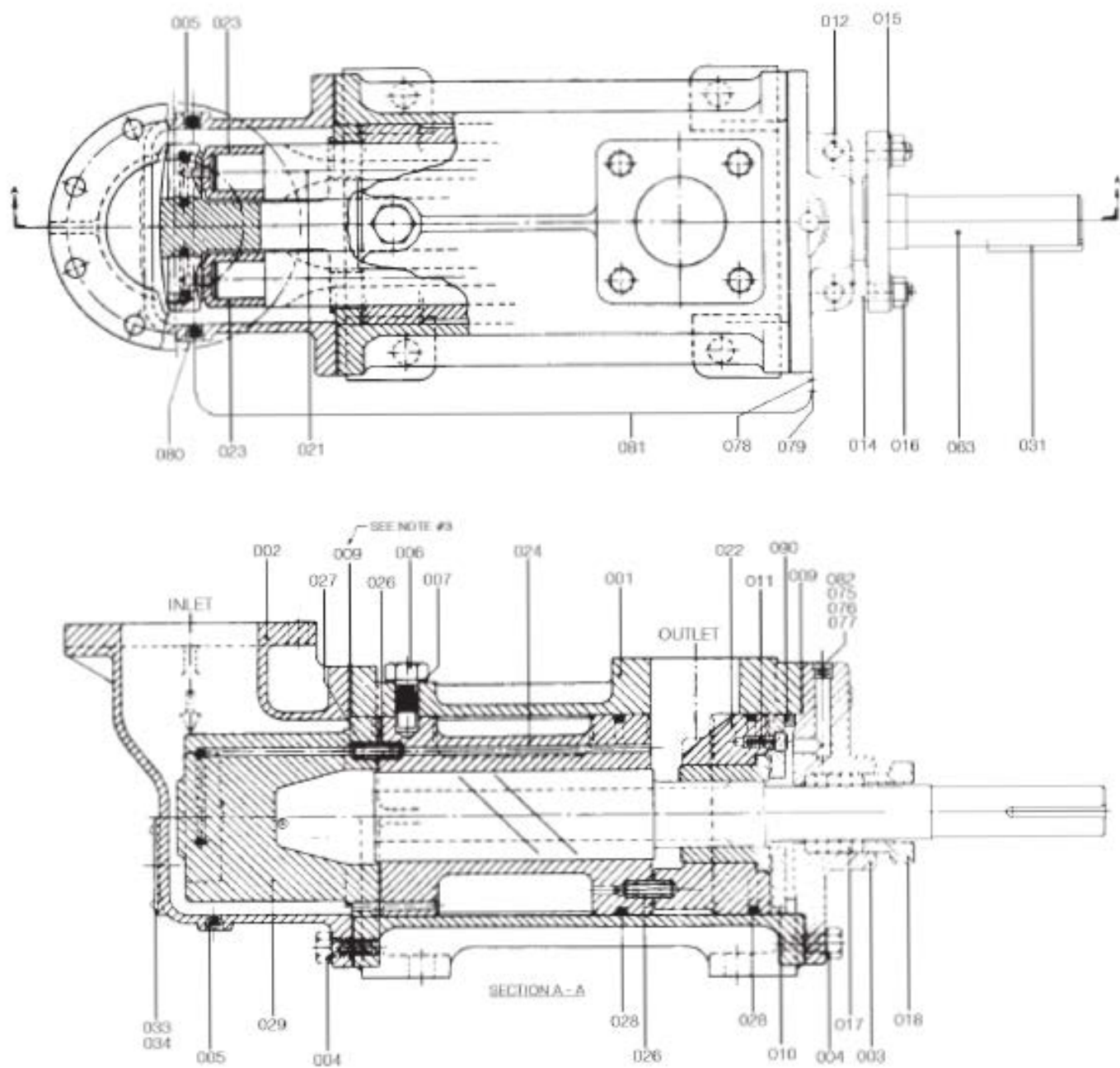
**Figure 4. A3DF-106 & 118**

See designated pages in this manual showing variations that may apply to your specific pump type. Use these variations in conjunction with standard pump assembly drawings as required.



**Figure 5. A3DF-137, 156 & 187**

See designated pages in this manual showing variations that may apply to your specific pump type. Use these variations in conjunction with standard pump assembly drawings as required.



**Figure 6. A3DF-218, 250 & 275**

See designated pages in this manual showing variations that may apply to your specific pump type. Use these variations in conjunction with standard pump assembly drawings as required.



Two gaskets pc. #009 are re-  
quired on inlet end of pump  
for 218 & 250 sizes only.

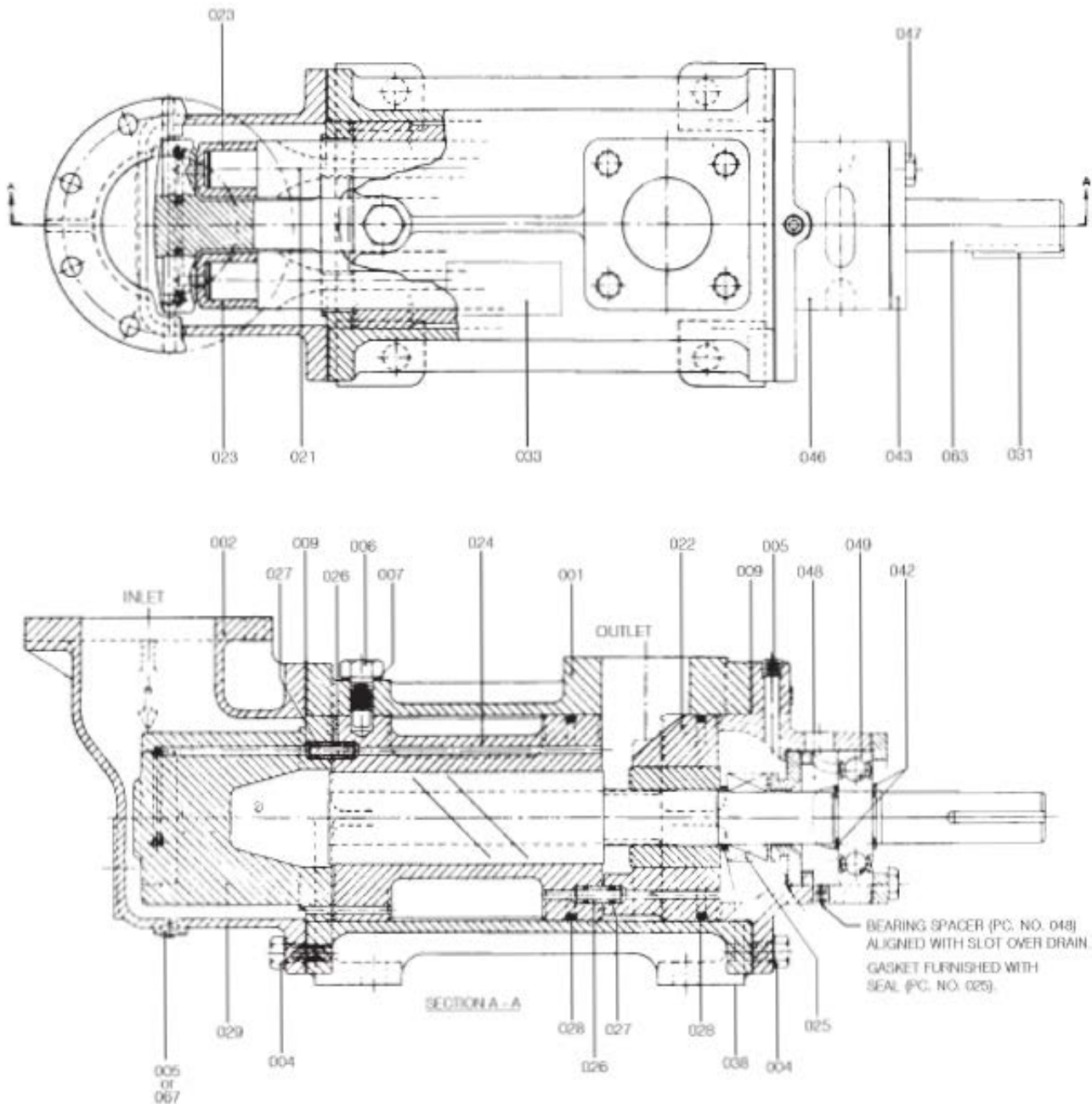
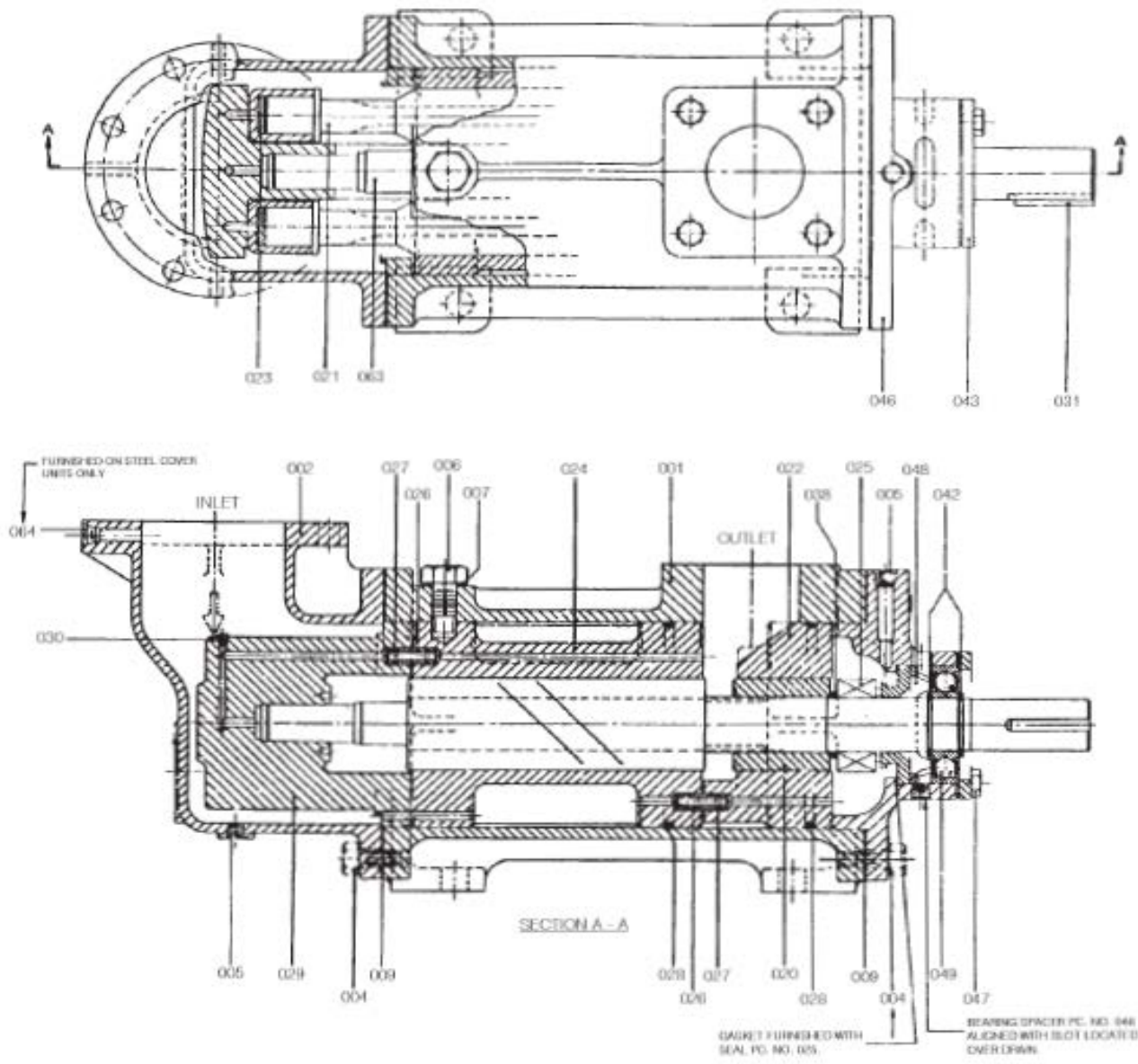


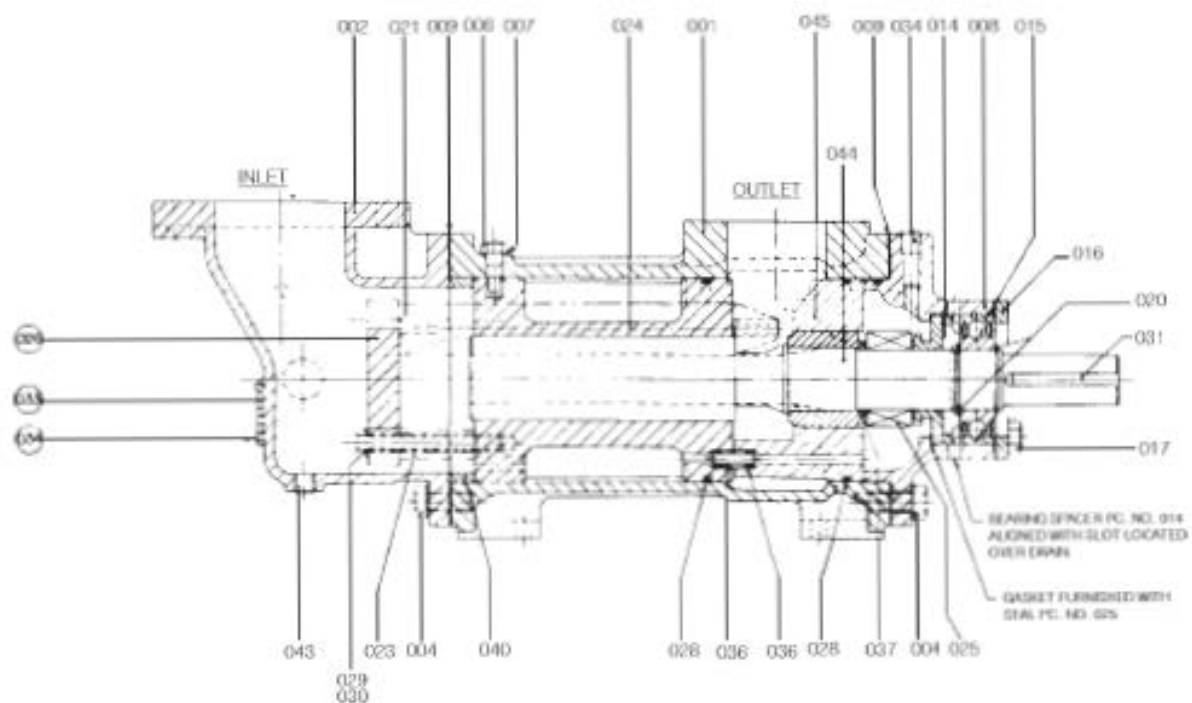
Figure 7. A3D-218, 250, 275, & 312

See designated pages in this manual showing variations that may apply to your specific pump type. Use these variations in conjunction with standard pump assembly drawings as required.



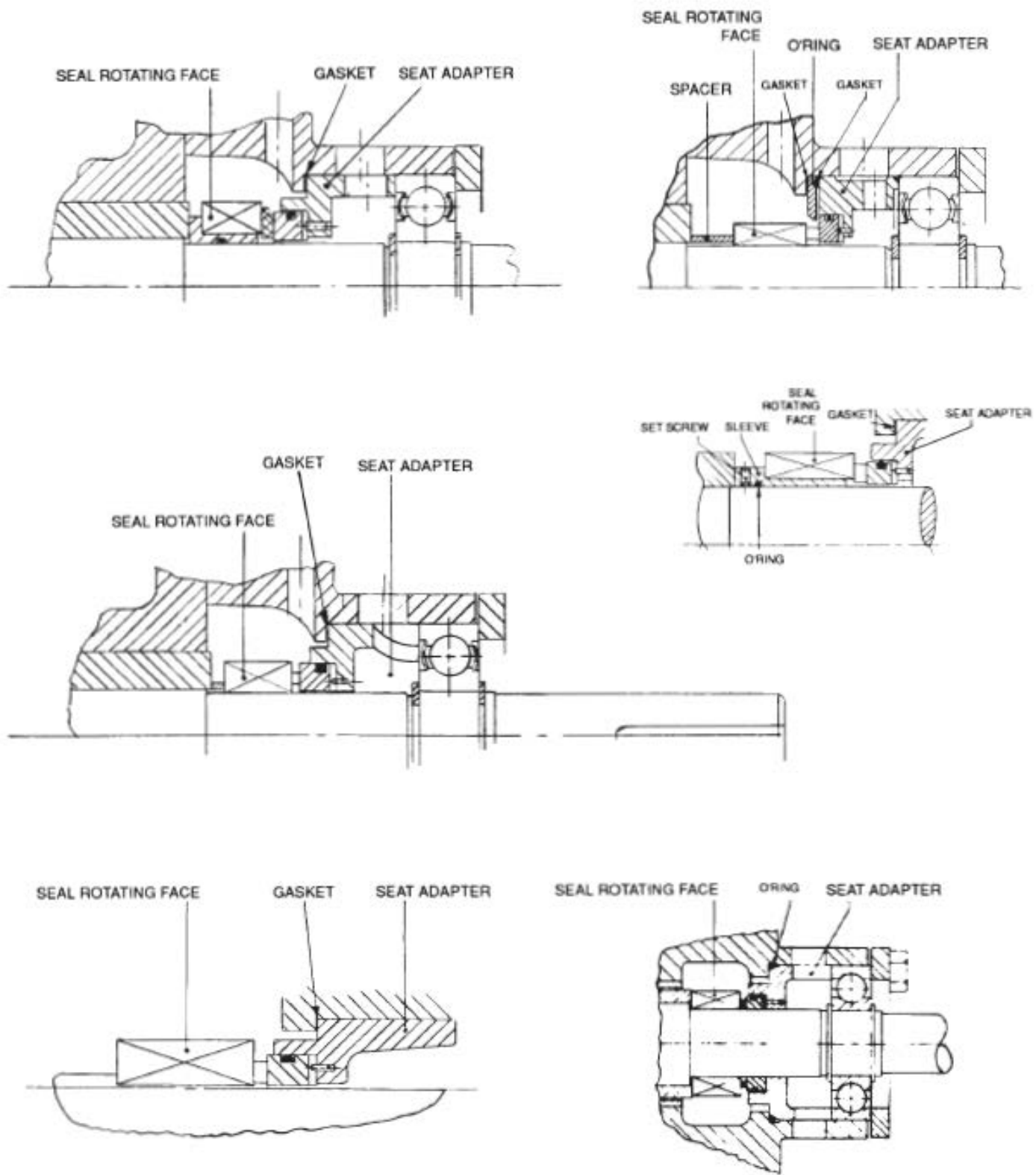
**Figure 8. A3D-350 & 400**

See designated pages in this manual showing variations that may apply to your specific pump type. Use these variations in conjunction with standard pump assembly drawings as required.



**Figure 9. A3D-337**

See designated pages in this manual showing variations that may apply to your specific pump type. Use these variations in conjunction with standard pump assembly drawings as required.



**Figure 10. Seal Installation Variations**

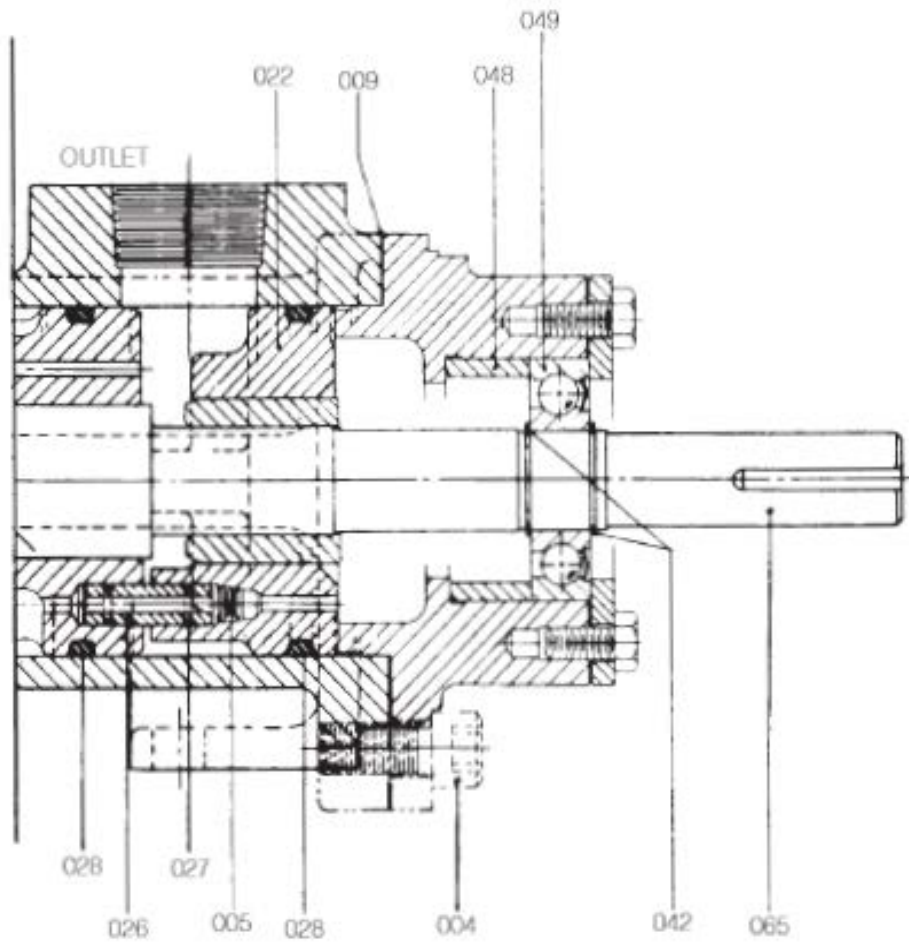


Figure 11

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