



**INSTRUCTION MANUAL
AND
PARTS LIST
FOR
_G3D-350 SERIES PUMPS
(Idler Cup and Hydrostatic Thrust Designs)**



WARNING

This Instruction Manual and General Instructions Manual, CA-1, should be read thoroughly prior to pump installation, operation or maintenance.


Manual No. SRM00080


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READ THIS ENTIRE PAGE BEFORE PROCEEDING

FOR SAFETY OF PERSONNEL AND TO PREVENT DAMAGE TO EQUIPMENT, THE 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.			

Non compliance of safety instructions identified by the following symbol could affect safety for persons:	Safety instructions where electrical safety is involved are identified by:	Safety instructions which shall be considered for reasons of safe operation of pump and/or protection of pump itself are marked by the sign:
		ATTENTION

ATTENTION
If operation of 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

The instructions found herein cover the disassembly, assembly and parts identification of _G3D-350 series pumps. Both the original design with idler cups and the newer design with hydrostatic idlers are covered.

NOTE: Individual contracts may have specific provisions that vary from this manual. Should any questions arise which may not be answered by these instructions, refer to the General Instructions Manual, CA-1, provided with your order. For further detailed information and technical assistance please refer to Imo Pump, Technical/Customer Service Department, at (704) 289-6511.

This manual cannot possibly cover every situation connected with the 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.

In applications where equipment furnished by Imo Pump is to become part of processing machinery, these instructions should be thoroughly reviewed to ensure proper fit of said equipment into overall plant operational procedures.

	WARNING
<p>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.</p>	

B. INTRODUCTION

This instruction manual covers series _G3D-350 Imo pumps. This series of pumps has been designed for use in hydraulic, lubricating, seal, distillate, residual, fuel and crude oil applications. The model and design construction of each pump can be identified by the designator code on the pump nameplate. Definitions of model designators are identified in figure 1.

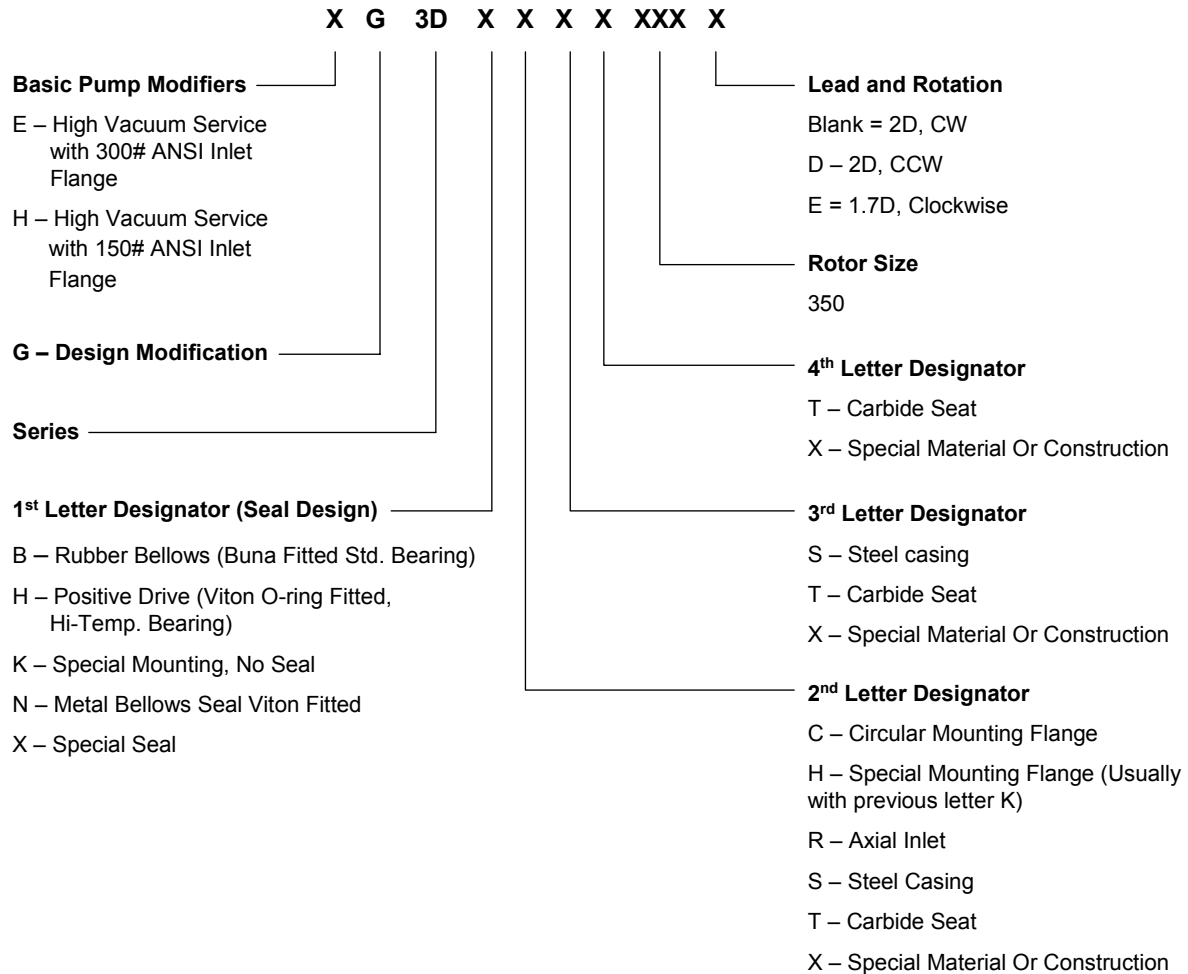
C. DESCRIPTION OF EQUIPMENT

_G3D-350 Series 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

This instruction manual covers Imo Series _G3D-350 pumps. The model of each pump is identified on pump nameplate. Refer to figure 1 and table 1 for instructional keys when using this manual.

Figure 1 – Model Designator Definitions



E. ORDERING INSTRUCTIONS

When corresponding with Imo Pump regarding Series _G3D-350 series pumps, refer to pump nameplate, this instruction manual, and assembly drawing as instructed below:

1. From pump nameplate, record pump model number, serial number, and manufactured date.
2. Record instruction manual number, revision, and date.
3. From instruction manual, record figure numbers that apply to replacement part(s).
4. From assembly drawing or parts list (see table 2) provide IDP number(s) and names for replacement part(s).
5. Give above information to your Imo service representative.

Imo sales and service representatives are listed herein and in General Instruction Manual, CA-1.

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 operating requirements are within pump's capabilities.	

Under no circumstances are the following operating limits (specified in table 1) to be exceeded without specific approval from Imo Pump.

Table 1 – Normal Pump Operating and Structural Limits

Condition	Limit
Maximum Speed	2500 rpm
Minimum Viscosity	32 SSU
Maximum Viscosity (figure 1)	
1 st Letter Designator B	2500 SSU
1 st Letter Designator H	15000 SSU
Minimum Liquid Temperature	0°F
Maximum Liquid Temperature (figure 1)	
1 st Letter Designator B	180°F
1 st Letter Designator H	220°F
Maximum Inlet Pressure	50 psig
Maximum Discharge Pressure (Continuous Duty)	500 psig
Filtration	Refer to General Instruction Manual, CA-1
Drive	Direct or Belt
Mounting	Foot mounted in any attitude


G. PARTS LIST


Table 2 – Pump Parts List

IDP	QTY	DESCRIPTION	KIT	IDP	QTY	DESCRIPTION	KIT
1	1	Case		21	1	Thrust Plate	XX
2	1	Housing	XX	22	2	Thrust Spacer	
4	1	Anti-Rotation Tube	XX	23	2	Hex Cap Screws	
5	2	O-ring	X	24	2	Washer	
6	2	O-ring	X	25	1	Mechanical Seal**	X
8	2	Gasket	X	26	1	Inlet	
9	1	Inboard Cover		30	4	Washers	
10	16	Hex Bolts		32	2	Pipe Plug	
11	1	Power Rotor	XX	33	1	Balance piston Bushing (C-face pumps only)	
13	2	Snap Rings	X	38	1	Seal Spacer **	X
14	1	Spacer/Seal Seat Adapter		43	1	Housing Spacer	
15	1	Bearing	X	44	1	Gasket (O-ring Seat Seals Only)	X
16	1	Key	X	45	1	Fastener Seal	
17	1	Bearing Retainer		46	1	Pin Stop	
18	4	Hex Bolts		47	1	Balance Piston Housing	
19	2	Idlers	XX	88	1	Inlet O-ring (Axial inlet pumps only)	X
20	2	Idler Cups (Idler Cup Design Only)	XX	92	8	Washers	

X = Minor Repair Kit Items.
 XX = Major Repair Kit Items. (Items marked (X) are included in Major Repair Kit.)
 * = This is an O-ring or a gasket depending on pump seal configuration. Gasket supplied with seal.
 ** = Not used in “DKH” pumps.

H. PUMP MAINTENANCE

	WARNING
<p>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.</p>	

	DANGER
<p>BEFORE working on equipment, make sure all power to equipment is disconnected and locked-out.</p>	

H.1 GENERAL COMMENTS

NOTE: Part number identifiers (IDP) contained within parenthesis, such as (9), refer to circled numbers shown on assembly drawings (figures 2 through 4).

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.

H.3 MECHANICAL SEAL AND BEARING MAINTENANCE

The following procedures details servicing the pump mechanical seal and ball bearings only.

Determine the pump model identification identified on the pump nameplate to select the applicable pump assembly shown in Figure 2, 3, or 4. Refer to that assembly from the following instructions.

1. Close suction and discharge piping to pump. Vent pressure from pump. Disconnect piping. Remove drain plugs (32) or seal tubing (35, 36, 37, 42) on C-Face pumps, and drain unit. Remove pump from driver, coupling and base plate. Remove coupling hub and key (16).
2. Remove bearing retainer (17) from inboard cover (9) by removing bolts (18) (and lockwashers (30) if present).
3. Remove assembled power rotor (11) from inboard cover (9). Removal of power rotor (11) includes removal of snap rings (13), ball bearing (15), seal spacers (14 & 38), and mechanical seal (25).
4. Disassemble power rotor (11) as follows:
 - a. Using a flat nosed tool, such as a screw driver, remove snap ring (13) located on coupling side of ball bearing (15) from groove in power rotor (11).
 - b. Sealed ball bearing (15) is assembled to power rotor (11) with light press fit. Ball bearing (15) may be removed by using bearing puller or vertical arbor press. When using press, place two pieces of key stock through openings of mechanical seal seat adapter (14) underneath ball bearing (15) on both sides of power rotor shaft. Key stock should be long enough to support power rotor (11) as it is placed in press. Position press ram against power rotor (11) coupling end face. Gently press power rotor (11) through ball bearing (15). Ensure power rotor (11) does not fall to floor once ball bearing (15) is off of its diameter.
 - c. Remove thread side snap ring (13).
 - d. If pump has no seal (DKH design in figure 3), power rotor disassembly is complete. Skip to step 6. If pump has mechanical seal, proceed with step (e).

For steps (e) - (g), refer to figure 5.

- e. If stationary seal face is “J” type, remove spacer (14) and “J” type stationary seal seat from power rotor (11).
 - f. If stationary seal seat is O-ring type, remove seal seat adapter (14) with stationary seal seat. Remove stationary seat with O-ring from seal seat adapter (14). Discard O-ring.
 - g. If single spring, rubber bellows seal, remove rotating seat from shaft (11), If multi-spring seal, disengage set screw and then remove rotating seal seat.
 - h. Remove spacer (38) from shaft.
5. Remove gasket (44) from inboard end cover (9).
6. Inspect power rotor (11) shaft and remove any nicks or burrs which are present. Polish power rotor shaft to remove any rust or oxidants that may be present under shaft sleeve. Imo pump recommends replacement of ball bearing (15), mechanical seal (25), and gasket (44) when these parts are disturbed from their original installed position. All parts should be coated with light lubricating oil to assist in assembly.
7. Assemble power rotor (11) and mechanical seal (25) as follows:

Note: If no mechanical seal (DKH design in figure 3), skip to step (f) below. If pump has mechanical seal proceed with step (a) below.


- a. Assemble spacer (38) onto shaft (11).

For steps (b) – (e), refer to figure 5.

- b. If seal is a single spring type rubber bellows type, apply light coat of system fluid to inside diameter of bellows and slide mechanical seal rotating assembly on power rotor (11) until it seats against the shoulder of seal spacer (38). Wipe seal face with isopropyl alcohol and a lint free rag.
- c. If seal is a multi-spring seal, coat O-ring inside of rotating seat with system fluid and slide mechanical seal rotating assembly on power rotor (11) until it seats against the shoulder of seal spacer (38). Tighten rotating seat set screw. Wipe seal face with isopropyl alcohol and a lint free rag.
- d. If seal has a “J” type seat, clean it with isopropyl alcohol and a lint free rag. Then put a small amount of clean system fluid or light oil on its running face and install the running face against the stationary seat face.
- e. If seal has O-ring type stationary seat, install O-ring in groove of mechanical seal stationary seat. Install seat including O-ring in seal seat adapter (14) ensuring that groove in back of stationary seat mates to spring pin in seal seat adapter (14). Clean seal face with isopropyl alcohol and a lint free rag. Put a small amount of clean system fluid or light oil on seal running face. Install the rotating ring running face against the stationary seat face.

- f. Install inner snap ring (13) in groove of power rotor (11).
 - g. Press bearing (15) on power rotor (11), pressing only on inner race of ball bearing (15) using an installation sleeve until it is located next to inner snap ring (13).
 - h. Install outer snap ring (13) in groove of power rotor (11).
8. Install gasket (44) in seal bore of inboard cover (9). Gasket may be supplied with seal.
 9. Install assembled power rotor (11) in pump, centering all parts as they enter inboard cover (9). Align one of openings in spacer (14) over drain in inboard cover (9).
 10. Install bearing retainer (17) on inboard cover (9) using bolts (18) (and lockwashers (30) if present). Torque bolts (18) to 38 ± 2 lb-ft.

H.4 PUMP DISASSEMBLY

	CAUTION	Fluid leakage from disassembly of pump may make the floor slippery and can cause personal injury
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NOTE: The _G3D-350 pumps incorporate highly finished precision parts that must be handled carefully to avoid damage to critical machined surfaces. The parts removed should be tagged for identification and their exact positions in the pump carefully noted so that new parts, or the same parts, are properly replaced without damage.

Determine the pump model identification identified on the pump nameplate to select the applicable pump assembly shown in Figure 2, 3, or 4. Refer to that assembly for the following instructions.

1. Close suction and discharge piping to pump. Vent pressure from pump. Disconnect piping. Remove drain plug (32) or seal tubing (35, 36, 37, 42) on C-Face pumps, and drain unit. Remove pump from driver, coupling and base plate. Remove coupling hub and key (16).
2. Remove inlet head (26) from case (1) by removing bolts (10) (and lockwashers (92) if present). Remove and discard gasket (8) or O-ring (88) from inlet head (26).
3. Remove thrust plate (21) and spacers (22) by removing bolts (23) and lock washers (24).
4. If idler cup design, remove cups (20) from idlers (19).
5. Remove idlers (19) from housing (2) by unscrewing them from housing bores.

	CAUTION	ATTENTION	
Do not permit idlers (19) to drop as they emerge from housing (2).			

6. Remove pin stop (46) and fastener seal (45) from case (1).

7. Remove shaft (11), with ball bearing (15) and seal (25) by performing procedures in paragraph H.3 steps (2) through (6).
8. Remove inboard cover (9) by removing bolts (10).
9. On C-flange pumps ONLY, press bushing (33) from cover (9). Cover may require heating to loosen Loctite before bushing (33) can be removed. Do not heat to more than 250°F.

Remove and discard gasket (8) from inboard cover (9). There will be no gasket if pump is C-flange design.
10. If pumps are not C-face design, remove balance piston housing (47) with O-ring (6). This can be accomplished by pushing on suction end of housing (2) until balance piston (47) emerges.
11. Remove and discard balance piston O-ring (6).
12. Remove tube (4) with O-rings (5) from housing (2) or balance piston housing (47). Discard O-rings (5).
13. Remove housing (2) and O-ring (6) from inlet end of case (1). Discard O-ring (6).

H.5 PUMP ASSEMBLY

NOTE: Prior to reassembly of pump, clean and inspect all parts for nicks and burrs. Replace all worn or damaged parts. Imo Pump recommends replacement of all O-rings (6), gaskets (8, 44), mechanical seal (25) and ball bearing (15) when these parts are disturbed from their previously installed positions. Coat all parts with light lubricating oil to assist in assembly.

1. Install O-ring (6) in groove in housing (2). Install O-rings (5) in grooves in tube (4) and install tube (4) in housing (2).
2. Install housing (2) O-ring end first, in pump case (1) from suction end until stop pin (46) slot is properly aligned. Install stop pin (46) with fastener seal (45) in case (1).
3. If pump is C-face version (Figure 4):
 - a. Clean and dry inboard cover (9) and balance piston bushing (33) mating surfaces with solvent. Wipe Loctite "T747" Primer or equivalent onto the mating surfaces of bushing (33) and inboard cover (9). Allow 1 to 5 minutes until primer is visibly dry. Apply Loctite 609 or equivalent to bushing (33) and inboard cover (9) mating surfaces. Assemble bushing (33) into inboard cover (9). Allow 10 minutes to dry before proceeding with assembly.
 - b. Install O-ring (6) on inboard cover. Install inboard cover (9) into discharge port side of case (1) using bolts (10) (and lockwashers (92) if present). Ensure seal vent (37) is facing up and pin (4) in housing mates with hole in inboard cover (9). Torque bolts (10) to 120 ± 10 lb-ft. Skip to step 9.

4. Install O-ring (6) on balance piston housing (47).
 5. Install balance piston housing (47) in case (1) lining up hole in balance piston housing (47) with pin (4) in rotor housing (2).
 6. Install inboard cover (9) into discharge port side of case (1) using bolts (10) (and lockwashers (92) if present). Ensure seal vent (32) is facing up. Torque bolts (10) to 120 ± 10 lb-ft.
 7. Assemble mechanical seal and ball bearings by performing procedures in paragraph H.3, steps 7 through 10.
 8. Install idlers (19) into housing (2) by meshing threads with power rotor thread.
 9. If idler cup design, install cups (20) on idlers (19).
 10. Install spacer (43) on discharge end of case (1) flush with edge of housing (2).
 11. Install bolts (23) and lock washers (24) in thrust plate (21). Install spacers (22) on bolts (23).
 12. Install thrust plate assembly including thrust plate (21), washers (24), bolts (23) and spacers (22) on housing (2). Torque bolts (23) to 70 ± 5 lb-ft.
 13. Install gasket (8) in groove in inlet head (26).
 14. Install inlet head (26) using bolts (10) (and lockwashers (92) if present). Torque bolts to 120 ± 10 lb-ft.
- NOTE:** Inlet head (26) can be rotated and repositioned in 90 degree increments to suit suction piping. To change inlet position remove bolts (10) and rotate inlet head to desired position. Install bolts (10) and torque to proper values indicated on assembly drawing.
15. Install coupling hub key (16). Install and align pump and driver as specified in General Instruction Manual, CA-1.

I. TROUBLESHOOTING

For assistance with troubleshooting see the General Instruction Manual, CA-1.

J. FIELD AND FACTORY SERVICE AND PARTS

Imo Pump maintains a staff of trained service personnel that can provide pump installation, pump start-up, maintenance/overhaul and troubleshooting supervision as well as installation and maintenance training.

Our factories provide maintenance as well as overhaul and test facilities the 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 representative 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 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 2: AG, BG, HG, and EG3D_(S)-350 Assembly

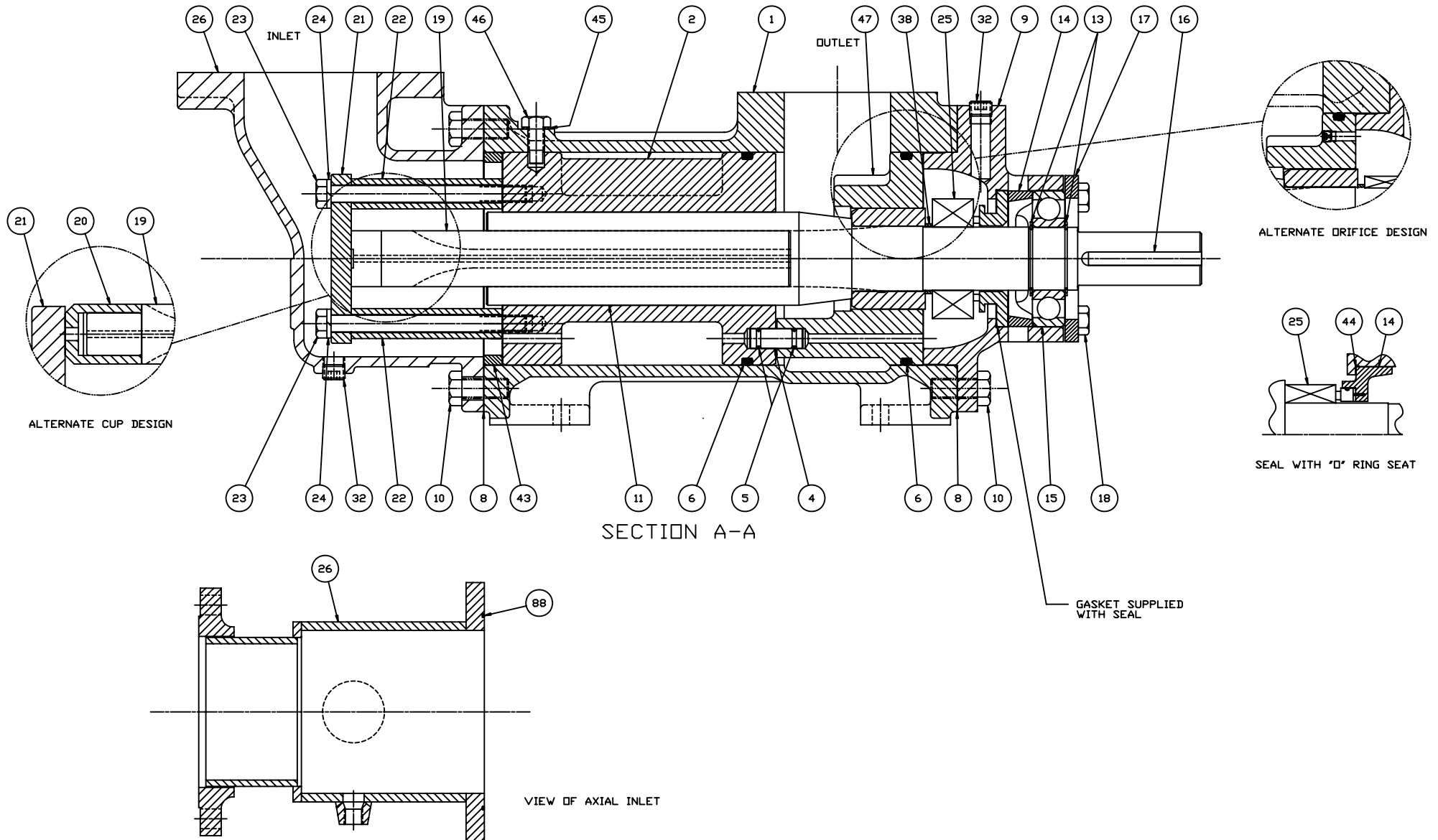


Figure 3: AG3DKH-350 Assembly

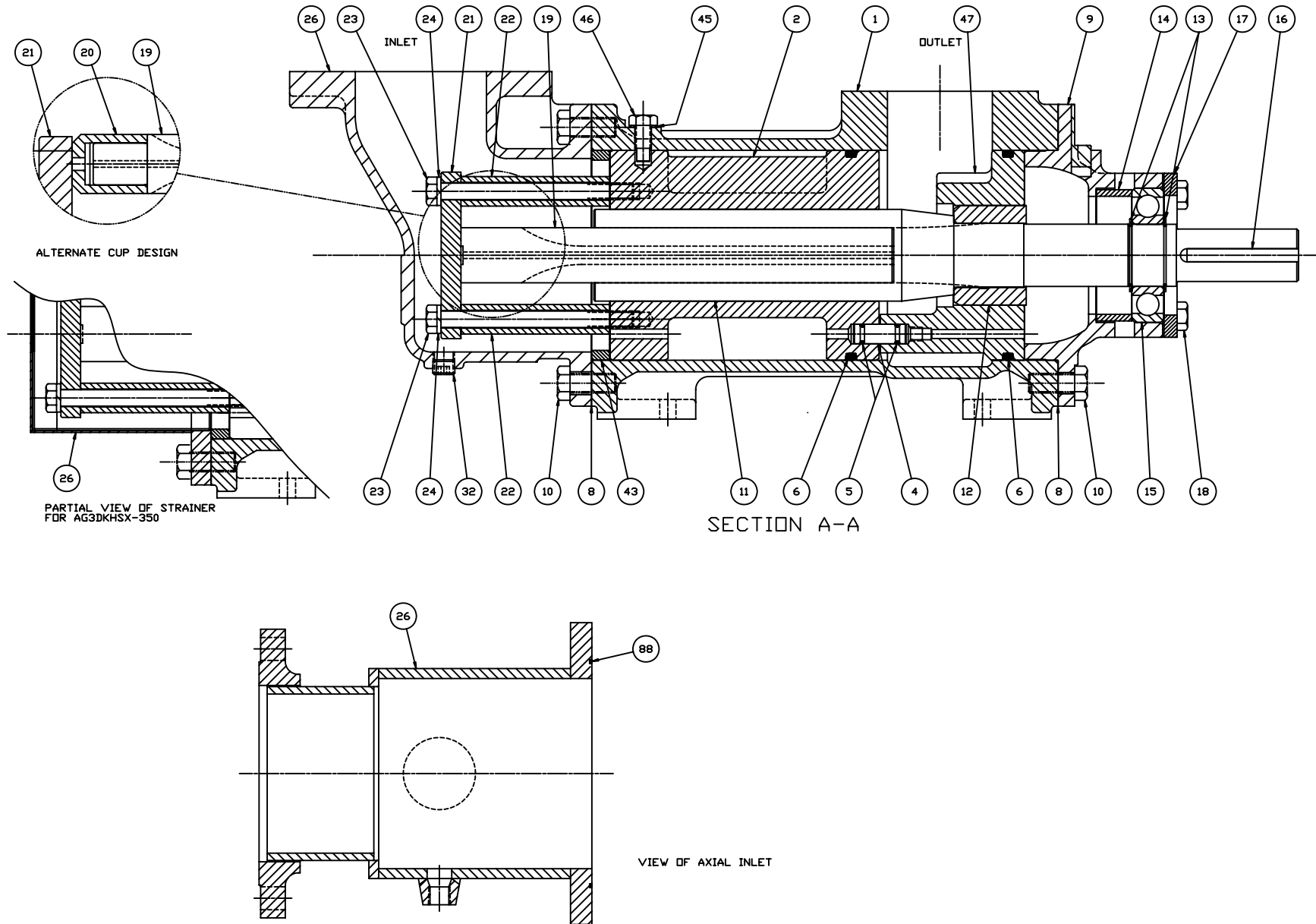


Figure 4: AG and BG3D_C(S)-350 Assembly

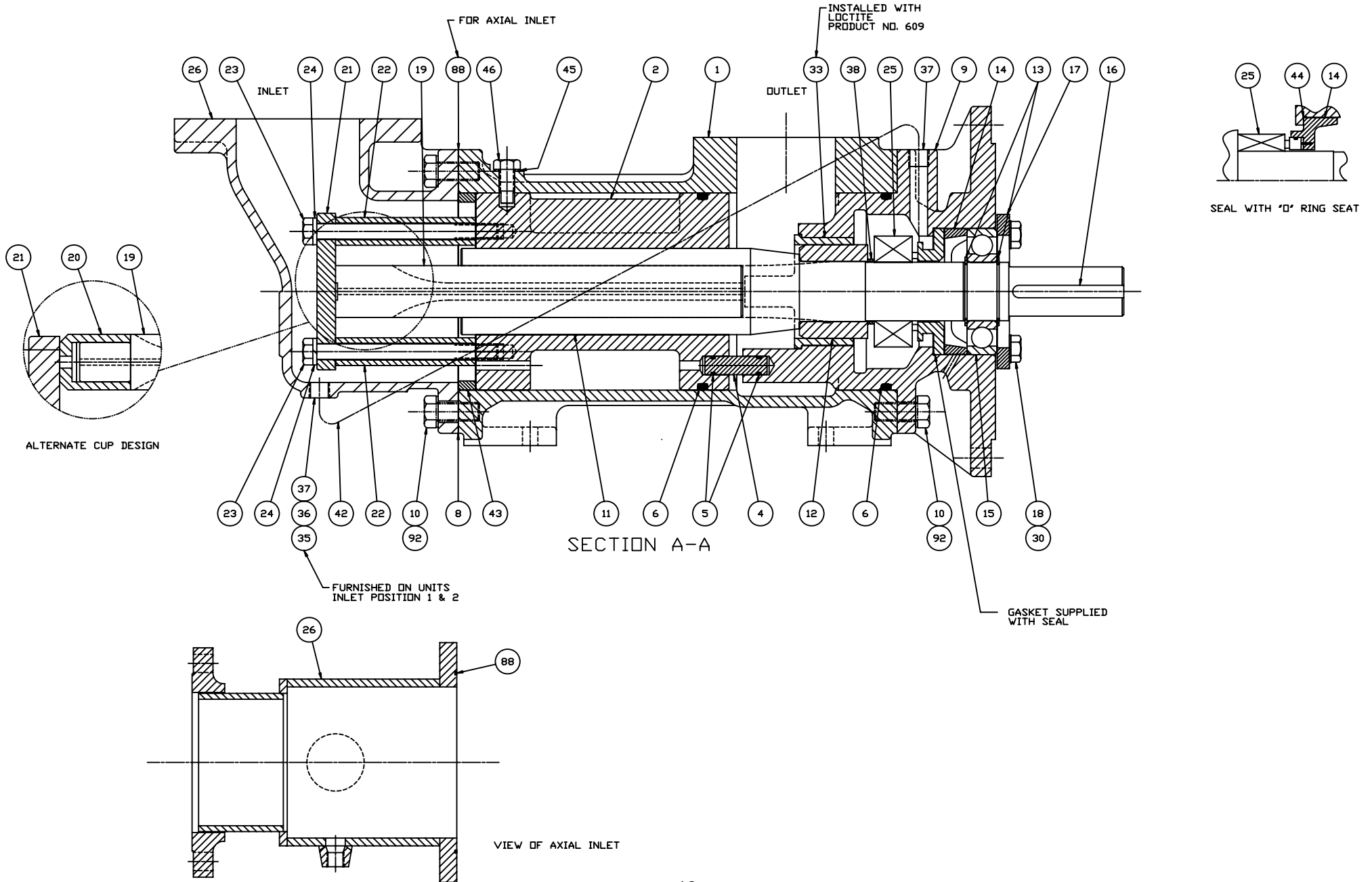
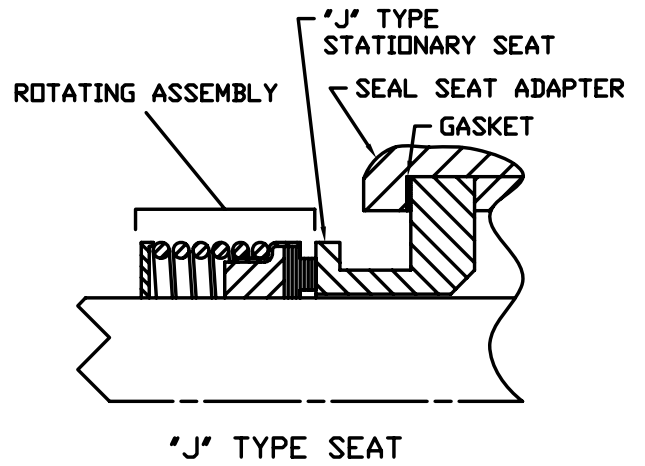
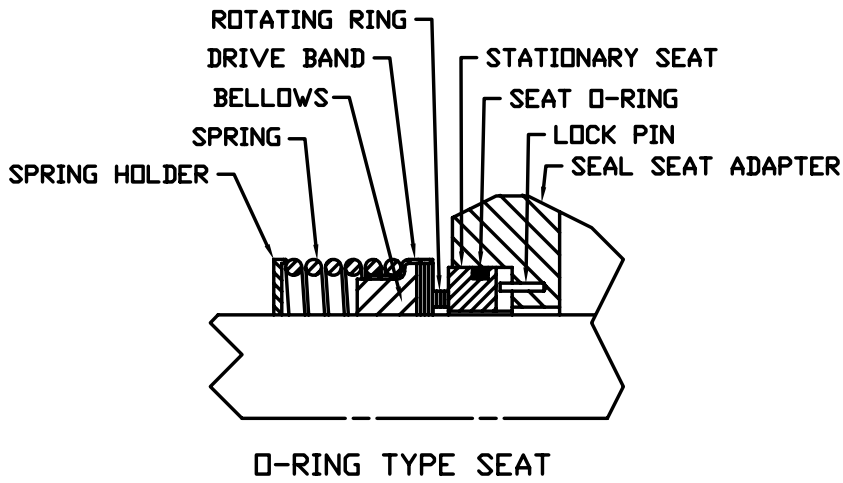
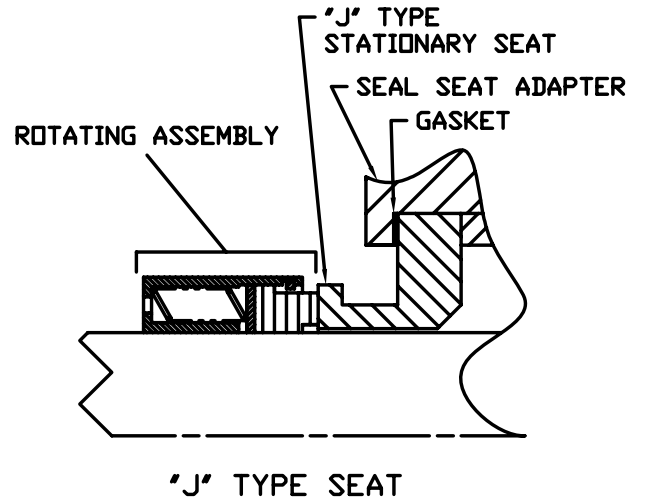
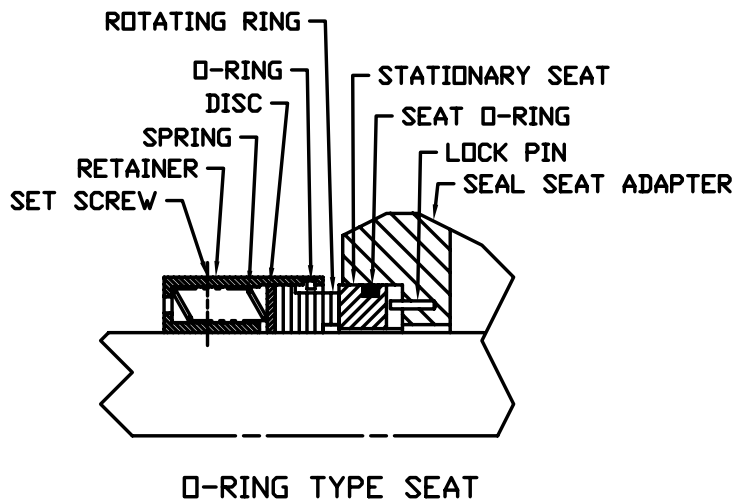


FIGURE 5: MECHANICAL SEAL TYPES

SINGLE SPRING, RUBBER BELLOWS MECHANICAL SEAL



MULTI-SPRING MECHANICAL SEAL





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