



INSTRUCTION MANUAL

AND

PARTS LIST

FOR

E3LB-187, -200, and -250 SERIES PUMPS

E3LBK-187, -200 and -250 SERIES PUMPS





WARNING

This Manual and GENERAL INSTRUCTIONS MANUAL, CA-1 should be read thoroughly prior to pump installation, operation or maintenance.



READ THIS ENTIRE PAGE BEFORE PROCEEDING

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

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

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

	CAUTION	ATTENTION	
Failure to observe the precautions noted in this box can cause damage or failure of the 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 the pump and/or protection of the pump itself are marked by the sign:
		ATTENTION

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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.


A. GENERAL INSTRUCTIONS

The instructions found herein cover the disassembly, assembly and parts identification of Series E3LB and E3LBK-187, -200, and -250 pumps.

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 information and technical assistance please refer to Imo Pump, Technical/Customer Service Department, at 1-877-853-7867.

This manual cannot possibly cover every situation connected with the installation, operation, inspection, and maintenance of the equipment supplied. Every effort was made to prepare the text of the manual so that engineering and design data is transformed into the most easily understood wording. Imo Pump must assume the personnel assigned to operate and maintain the 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
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 Series E3LB and E3LBK -187, -200, and -250 Imo pumps. This series of pumps has been designed for use in hydraulic, lubricating and seal applications requiring high inlet pressure capabilities. 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.

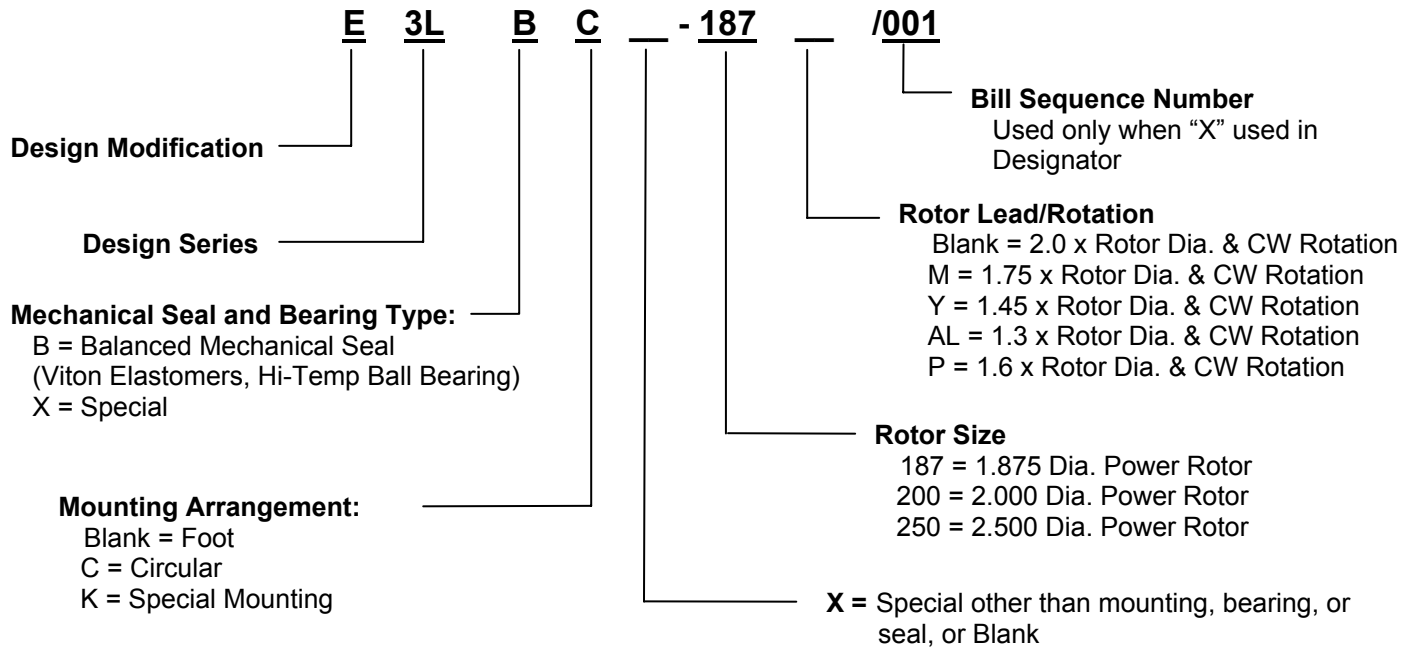
C. DESCRIPTION OF EQUIPMENT

The E3LB and E3LBK -187, -200, and -250 Series pumps are positive displacement, rotary screw pumps consisting of a precision bored housing that encloses a driven screw (power rotor) and four intermeshing following screws (idler rotors). These screws when rotating form a succession of closures or cavities. As they rotate, the fluid is moved axially from the inlet port to the outlet port in a continuous, uniform flow with minimum fluid pulsation and pump noise.

D. PUMP MODEL IDENTIFICATION

This instruction manual covers the Imo Series E3LB-187, -200, and -250 pumps. The model of each pump is identified on the 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 E3LB-187, -200, and -250 pumps, refer to the pump nameplate, this instruction manual, and the assembly drawing as instructed below:

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

F. OPERATION

F.1 LIQUID LIMITATIONS

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

F.2 OPERATING LIMITS

CAUTION	ATTENTION
<p>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 that of operational limitations. Equipment must not be operated without verifying system's operating requirements are within pump's capabilities.</p>	

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

MAXIMUM SPEEDS	187 - 4400 RPM, 200 – 4100 RPM, 250 – 3600 RPM
VISCOSITY	60 SSU (10.3 cSt) Minimum – 5000 SSU (1079 cSt) Maximum
NOTE: Consult factory for allowable operating viscosities at specific speeds and pressures.	
DO NOT alter design viscosity without prior consultation with Imo Pump.	
MINIMUM – MAXIMUM LIQUID TEMPERATURE.....	0 to 250° F (-18 to 121° C)
STANDARD MAXIMUM INLET PRESSURE.....	700 psig
NOTE: Series E3LB pumps are designed for positive inlet pressures. The unit should not be operated for extended periods of time with inlet pressure less than atmospheric.	
NOTE: Higher inlet pressures available with special seals. Contact Factory for selection.	
MAXIMUM DIFFERENTIAL PRESSURE.....	500 psi
FILTRATION.....	(See General Instruction Manual, CA-1)
MOUNTING.....	Foot or Flange mounted in any attitude

G. PARTS LIST

Table 2 – Pump Parts List

IDP	QTY	DESCRIPTION	KIT	IDP	QTY	DESCRIPTION	KIT	
1	1	Pump Case		19	2	Cap Screw s (Nylok)		
2	1	Rotor Housing	XX	20	3	Housing and Cover Back-Up Rings (250 Only)	X	
3	3	Housing O-Ring	X	21	1	Outboard Cover		
4	1	Inboard Cover		22	1	Retaining Ring	X	
5	1	BP Bushing	XX	23	1	Shim	X	
6	8*	Cap Screw s		29	2	Tube Fitting(s) (1 on 187/200 C-face)		
7	1	Bearing Retainer		30	1	Tubing		
8	8	End Cover Hex Bolts		34	2	Seal Seat Adapter O-Rings	X	
10	1	Power Rotor	XX	35	2	Seal Back-Up Rings (250 Size Only)	X	
11	2	Idler Rotors	XX	36	1	Tubing Fitting (187/200 C-Face Only)		
12	2	Seal	X	40	1	Shoulder Bolt (187 and 200 C-Face and 250 Size Only)		
13	1	Bearing Spacer		51	1	Thrust Plate	XX	
14	1	Bearing	X	61	2	Seal Seat Adapter		
15	2	Bearing Retaining Rings	X	63	4	Cap Screw s (187 and 200 Size K-Mount Only)		
16	1	Key		68	1	Orifice		
17	2	Thrust Plate Spacers		69	1	Outboard Bearing Retainer		
18	1	Brg OD Spacer (250 Size Only)						
	X =	Minor Repair Kit Items						
	XX =	Major Repair Kit Items (Items marked (X) are included in Major Repair Kit)						
	*	Total qty of 8 between IDP 6 and 63						

NOTE: If Nylok cap screws are assembled/disassembled more than 5 times, IMO suggests replacing with new Nylok cap screws.

Table 3 – Fastener Size and Tightening Torque Value

IDP	PUMP SIZE	DESCRIPTION	SIZE (in)	TORQUE VALUE (English)	TORQUE VALUE (Metric)
6 or 63	187/200	Cap Screw(s)	3/4 – 10	90 ± 5 lb. ft.	122 ± 6 Nm
6	250	Cap Screw(s)	7/8 – 9	300 ± 15 lb. ft.	407 ± 20 Nm
8	187/200	Hex Bolt(s)	3/8 – 16	95 ± 5 lb. in.	11 ± 1 Nm
8	250	Hex Bolt(s)	3/8 – 16	20 ± 2 lb. ft.	21 ± 3 Nm
19	187- 250	Cap Screw(s)	3/8 – 16	30 ± 2 lb. ft.	41 ± 3 Nm

H. PUMP MAINTENANCE



WARNING

Failure to observe precautions while installing, inspecting, and maintaining the 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.



DANGER

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

H.1 GENERAL COMMENTS

NOTE: Part number identifiers (IDPs) contained within parenthesis such as (10) refer to the circled numbers shown on the assembly drawing. See Figure 4, 5, and 6, and Tables 2 and 3.

H.2 TOOLS REQUIRED

The procedures described in this manual require common mechanics hand tools, a torque wrench, dial indicator and suitable lifting device (such as) slings, straps, etc

The following steps are required before starting any maintenance action:

1. De-energize driver.
2. Close all inlet and outlet valves.
3. Vent pressure from pump and drain pumped liquid.
4. Remove eight cap screws (54) and lock washers (55) from inlet and outlet flange fittings.
5. Remove two O-rings (53) from inlet and outlet (52) flange grooves.
6. Remove coupling hub and key (16) from power rotor (10) shaft.
7. Remove pump from its mounting and locate on a suitable work bench.

H.3 PUMP DISASSEMBLY

SPECIAL NOTE: To service mechanical seal and ball bearings **ONLY** perform H.3, Steps 1 thru 10 and H.4, Steps 5-25 **ONLY**.



CAUTION

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

NOTE: The E3LB -187, -200, and -250 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.

1. Remove external tubing (30) from pump by loosening tube fittings (29) or other fittings that may be installed.
2. Remove outboard bearing retainer bolts (8) and outboard bearing retainer (69) from outboard cover (21).
3. Remove outboard cover (21) by removing cap screws (6). Seal seat adapter (61) with seal stationary seal will come out with outboard cover (21).
4. Remove seal seat adapter (61) from outboard cover (21). Remove back up ring (35), if pump is 250 size, and O-ring (34) from seal seat adapter. Remove O-ring in ID of seal seat adapter. Remove back up ring (20), if pump is 250 size, and O-ring (3) from outboard cover (21).
5. Loosen set-screws holding the mechanical seal (12) on power rotor (10). See Figure 2 below. Slide mechanical seal (12) off power rotor. Remove shim (23) and retaining ring (22) from power rotor (10) shaft.

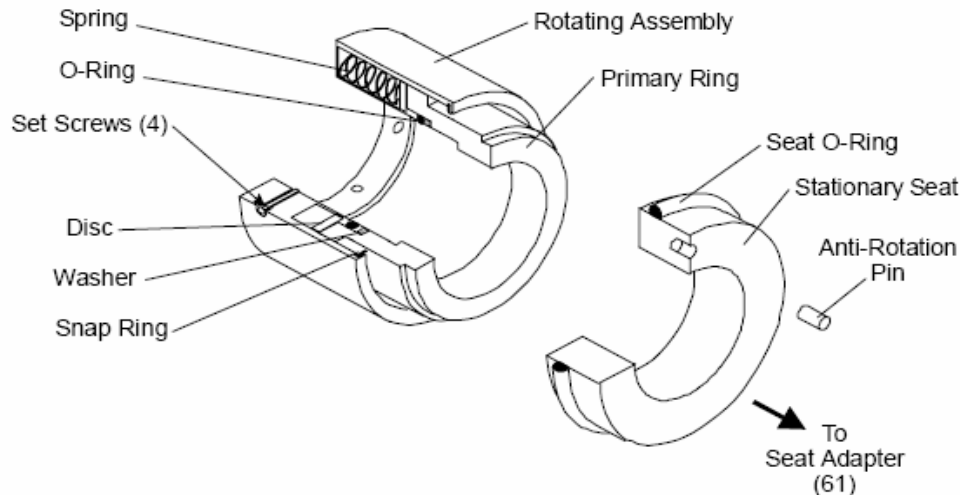


Figure 2 – Mechanical Seal (12) Details

6. Remove thrust plate (51) by removing bolts (19) and thrust spacers (17).
7. Remove idlers (11) by screwing them out of housing (2).

CAUTION

Do not permit idlers (21, 35) to drop as they emerge from housings (73, 24).

8. Remove inboard bearing cover retainer hex bolts (8) and inboard cover bearing retainer (7) from inboard cover (4).
9. Remove power rotor (10) assembly from inboard cover (4). Power rotor assembly consists of power rotor (10), bearing (14), truarc rings (15), seal (12), seal spacer (13) and seal seat adapter (61) with O-rings (34) and back-up ring (35), if pump is 250 size.

Note: On 250 Size pump bearing OD spacer (18) may come out with power rotor assembly.

10. Disassemble power rotor as below see Figure 2 for mechanical seal details:
 - a. With a flat blade screwdriver, carefully remove outer and inner Truarc retaining rings (15) located on both sides of bearing (14) from grooves of power rotor (10)
 - b. Sealed ball bearing (14) is assembled to power rotor (10) with a light press fit. Ball bearing (14) may be removed by using a bearing puller or a vertical arbor press. When using press, two pieces of key stock are to be placed through openings of spacer (13) underneath ball bearing (49) on both sides of power rotor shaft. Key stock should be long enough to support power rotor (10) as it is placed in press. Press ram is to be positioned against power rotor (10) coupling end face. Gently press power rotor (10) through ball bearing (14). Ensure power rotor (10) does not fall to floor once ball bearing (14) is off of its diameter.
 - c. Remove spacer (13) and seat adapter (61) with mechanical seal stationary seat from power rotor (10), Remove stationary seal seat and O-ring from inside of seal seat adapter and remove O-ring (34) and back-up ring (35), if pump is 250 size, from stationary seat (61) OD.
 - d. Loosen the set-screws on mechanical seal (12). See Figure 2. Rotate seal and slide off shaft of power rotor (10).
11. Remove inboard cover (4) from case (1) by removing cap screws (6) or (63) if pump is a 187 or 200 size "K" mount type.
12. Remove O-ring (3) from inboard cover (4) and back up ring (20) if pump is 250 size.
13. If pump is a 250 size or a 187 or 200 size with a C –face mounting, remove shoulder bolt (40) from inboard cover (4).
14. Remove bushing (5) from inboard cover (4).
15. Remove housing (2) from case (1) through suction end and remove O-ring (3) and back up ring (2), if size 250.

H.4 PUMP ASSEMBLY AND LUBRICATION

NOTE: Prior to assembly, all parts should be cleaned and inspected for nicks and burrs. Replace all worn or damaged parts. Imo pump recommends automatic replacement of O-rings and ball bearings when these parts have been disturbed from their previously installed positions. Prior to assembly, wipe all parts including fasteners with light lubrication fluid that is compatible with the process liquid.

NOTE: Check to see that the orifice (68) opening is not clogged.

NOTE: Bolts (19) have nylok threads. Torque stated in torque table does not include additional torque required to install fasteners containing Nylok inserts (pellet, strip, patch, ring, and collar). Torque required for first application is much higher than it is for subsequent applications. To insure that required preload on a Nylok fastener is achieved, following is correct required procedure.

- a) Using a suitable torque wrench, install fastener in threaded hole until Nylok insert is completely engaged. Record torque value.
- b) Add torque value recorded in Step 1 to value called out in torque table.
- c) Tighten fastener to torque value determined in Step 2.

NOTE: This procedure must be repeated each time Nylok fastener is reused.

1. Install O-ring (3) in groove in inboard cover (4). If pump is 250 size, install back-up ring (20) in onboard cover (4).
2. Install bushing (5) in inboard cover (4). If pump is 250 size or 187/200 C-face version, be sure to line up groove in bushing (5) with hole in inboard cover (4) and install shoulder bolt (40) in inboard cover (4). Snug up shoulder bolt.
3. Assemble inboard cover (4) into case (1) using bolts (6) or (63) if pump is 187/200 size K-mount type. Be sure that seal return drain (29) is facing vertically up. Torque bolts to value in torque table 3.
4. Install housing (2), O-ring end first, into suction side of case (1) until it butts up against stops on inboard cover (4). Idler bores in housing (2) must be installed approximately horizontal with respect to the centerline of the pump.
5. Assemble Power rotor (10) and mechanical seal (12) as follows. See Figure 2 mechanical seal detail:
 - a. Install mechanical seal (12) rotating assembly on power rotor (10) shaft until it contacts rotor balance piston. Tighten set screws.
 - b. Install O-ring (this O-ring comes with the seal) in groove on the ID of seal seat adapter (61) and install O-ring (34) in groove on OD of seal seat adapter (61). If pump is 250 size, install back up ring (20) in groove on OD of seal seat adapter (61)
 - c. Install mechanical seal (12) stationary seat in seat adapter (61) ensuring that anti-rotation pin is properly engaged.

- d. Wipe mechanical seal rotating and stationary faces with a clean, lint free cloth before assembling faces together.
- e. Install assembled seal seat adapter (61), with stationary seat, to power rotor shaft in contact with to mechanical seal rotating face.
- f. Install spacer (13) on power rotor (10) shaft behind seal seat adapter (61) and then install inner truarc ring (15) in groove in power rotor (10).

CAUTION

In next step, where bearing (14) is installed, only inner race of bearing can be pressed on or bearing will be damaged. Sleeve should be used which goes over shaft and presses only inner bearing diameter

- g. Install power rotor (10) on press with thread end of power rotor (10) on base of press. Press bearing (14) on power rotor (10), pressing only on inner race of bearing (14) until bearing seats against inner truarc ring (15).
 - h. Install outer Truarc retaining ring set (15) in groove of power rotor, next to bearing
6. Install assembled power rotor (10) in pump, centering all parts as they enter inboard cover (4). Align one of openings in spacer (13) over drain in inboard cover (4).

NOTE: Insure that all parts are centered and properly positioned as they enter inboard cover.

7. Install bearing retainer (7) on inboard cover (4) using bolts (8). Torque bolts (8) to proper value for pump size in torque table 2.
8. Install idlers (11) into housing (2) by meshing threads with power rotor thread and screwing them into housing idler bores.
9. Assemble bolts (19) through thrust plate (51) and spacers (17) on bolts (19) and then attach thrust assembly to housing (2). Torque bolts (19) to proper value for pump size in torque table 3.
10. Install retaining ring (22) in groove of outboard end of power rotor (10).
11. Install O-ring (3) and, if 250 size, back-up ring (20) to outboard cover (21) and install outboard cover (21) to case (1) using cap screws (6). Torque cap screws (6) to values specified in Table 3. Be sure heads of bolts (19) fit into anti-rotation slots in outboard cover (21). If they do not, turn thrust plate (51) and housing (2) until idler bores are horizontal and bolt heads fit.
12. To find proper shim thickness, perform the following. See Figure 3.
- a. Determine dimension "A", (Figure 3) by measuring distance from counter-bore of outboard cover (21) to installed retaining ring (22)
 - b. Determine dimension "B", (Figure 3) by installing seal stationary seat (ensuring that the anti-rotation pin is properly seated) and O-ring in seat adapter (61). Measure distance from shoulder of seat adapter (61) to face of seal stationary seat.

- c. Subtract measurement “B” from measurement “A” and add 0.010 inch. From this dimension, subtract the working length of the mechanical seal (1 3/8 (1/64 inch). The resulting dimension will be the proper thickness of shim (23).

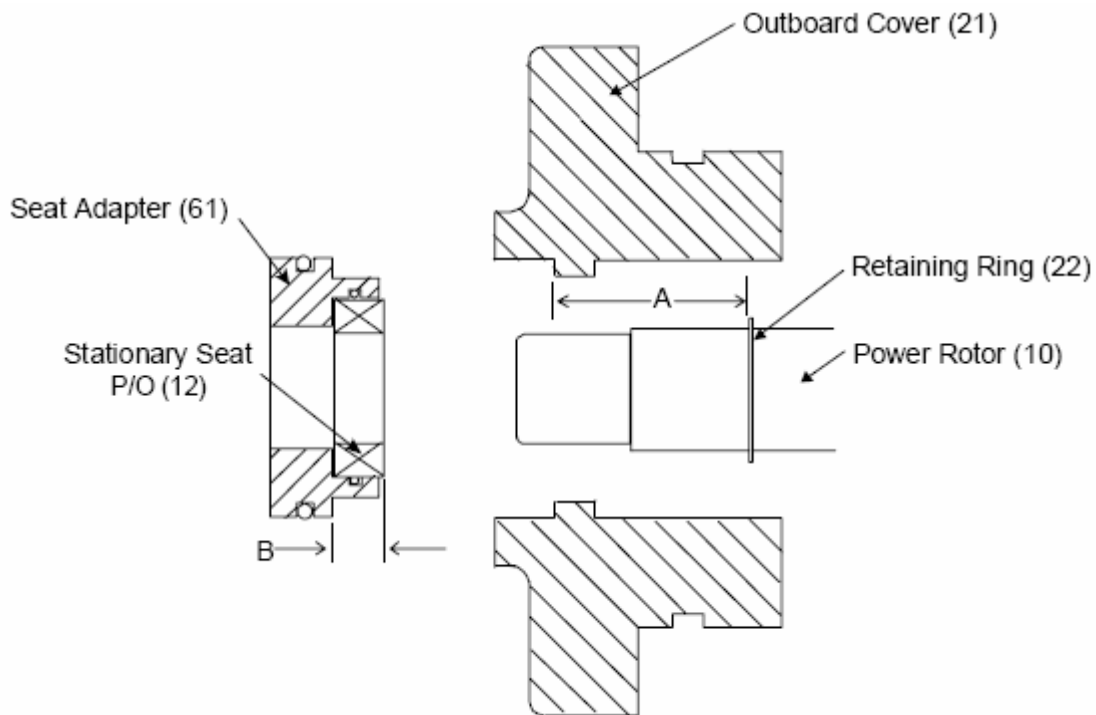


Figure 3 – Shim Thickness Measuring

13. Remove layers of laminated shims (23) to achieve proper thickness as determined above.
14. Remove cap screws (6) and outboard cover (21) from case (1).
15. Install proper thickness of shim (23) on power rotor shaft (10) next to retaining ring (22).
16. Install mechanical seal rotating assembly (12) on power rotor (10) shaft and tighten four set-screws.
17. Install outboard cover (21) on case (1) using four cap screws (6) or (63). Torque screws to values specified in Table 3.
18. Install O-ring (this O-ring comes with the seal) in groove on the ID of seal seat adapter (61) and install O-ring (34) in groove on OD of seal seat adapter (61). If pump is 250 size, install back up ring (20) in groove on OD of seal seat adapter (61).
19. Install mechanical seal (12) stationary seat in seat adapter (61) ensuring that anti-rotation pin is properly engaged.
20. Wipe mechanical seal rotating and stationary faces with a clean, lint free cloth before assembling faces together.
21. Install assembled seal seat adapter (61), with stationary seat in outboard cover (21).

22. Install outboard bearing retainer (69) on cover (21) using four hex bolts (8). Torque hex bolts to values specified in Table 3.
23. Install tubing (30) using tube fittings (29) (or other fittings) on inboard and outboard covers (4 and 21).
24. Ensure flanges are flat and are parallel to pump body ports. Tighten eight cap screws evenly, to compress both O-rings. Assemble two O-rings, eight cap screws and eight lock washers (into inlet and outlet flange fittings. Install flanges to suction and discharge ports. Tighten eight cap screws evenly, to compress both O-rings.
25. Perform alignment of pump and driver as specified in General Instruction Manual, CA-1.

NOTES:

3. ADJUST LAMINATED SHIM TO OBTAIN $1-3/8 \pm 1/64$ MECHANICAL SEAL WORKING LENGTH.

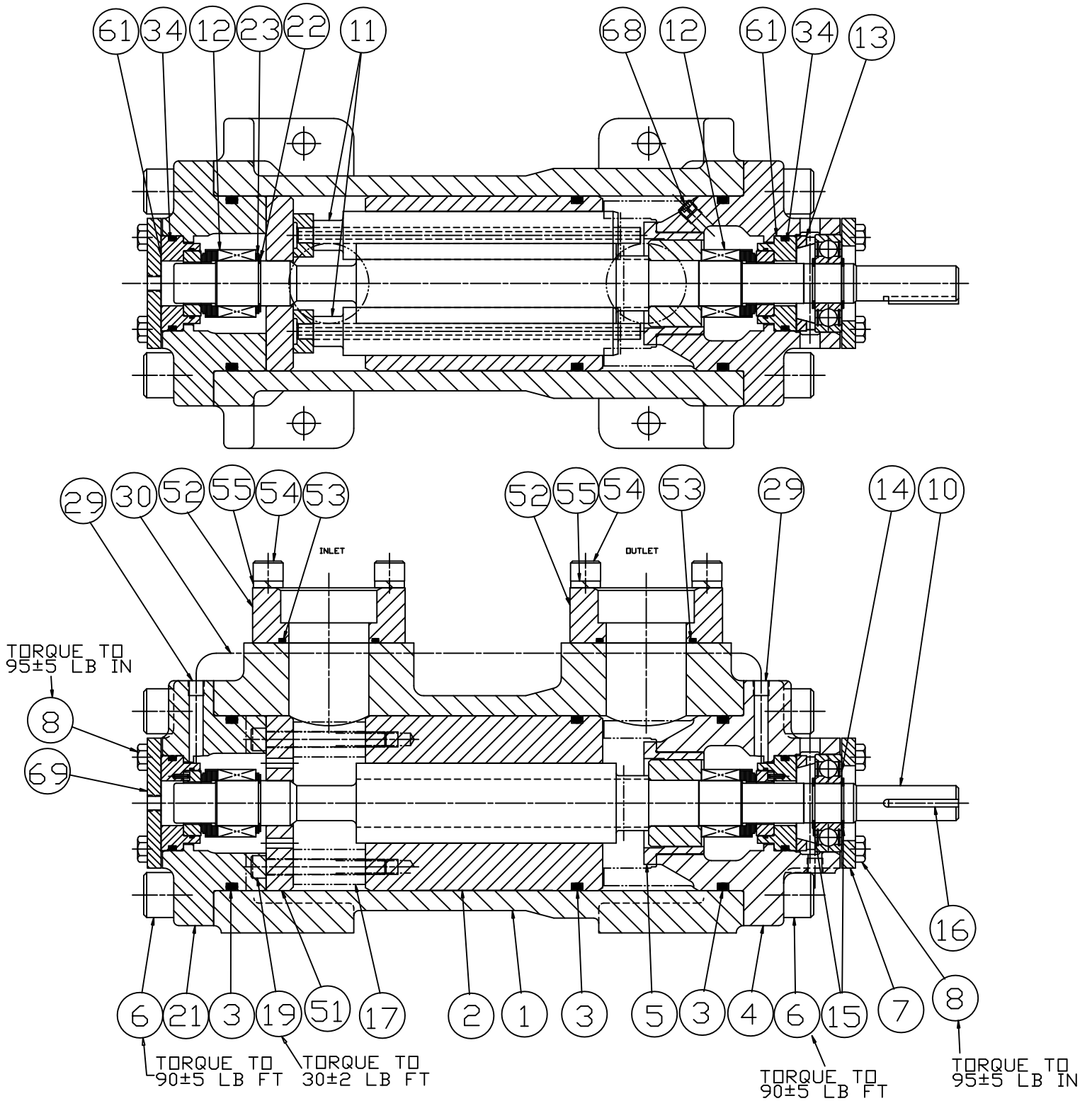
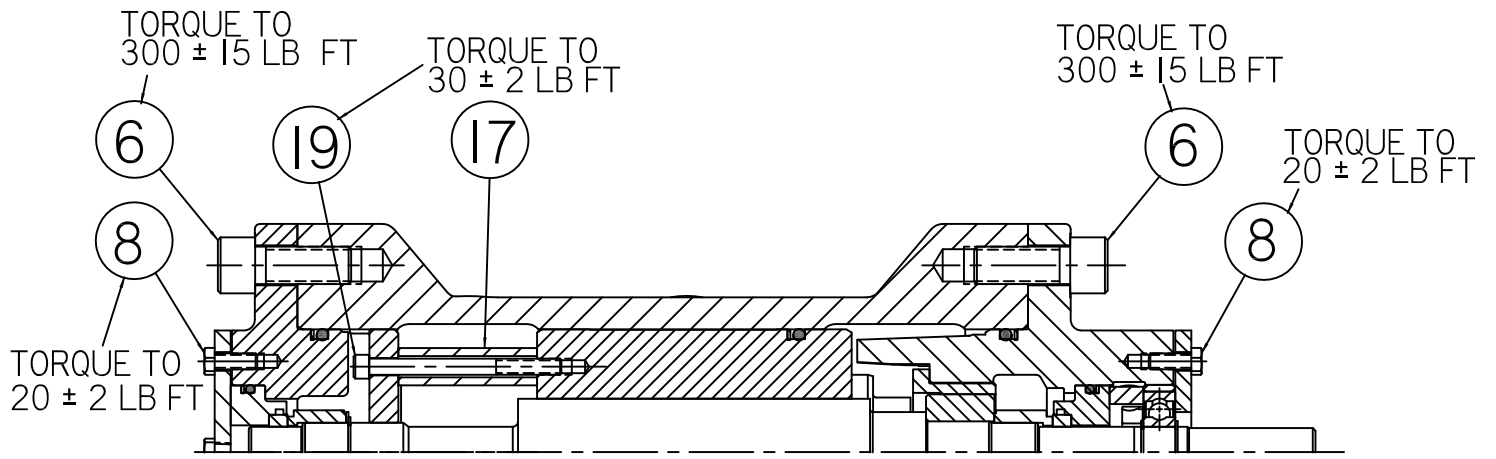
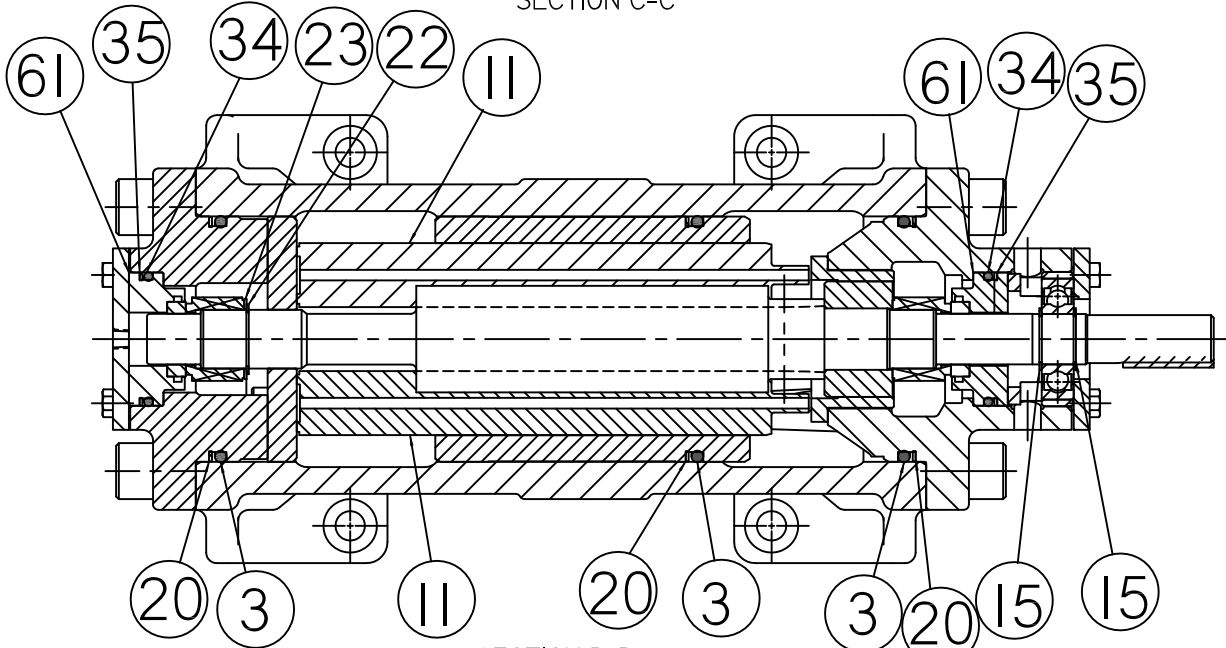


Figure 4

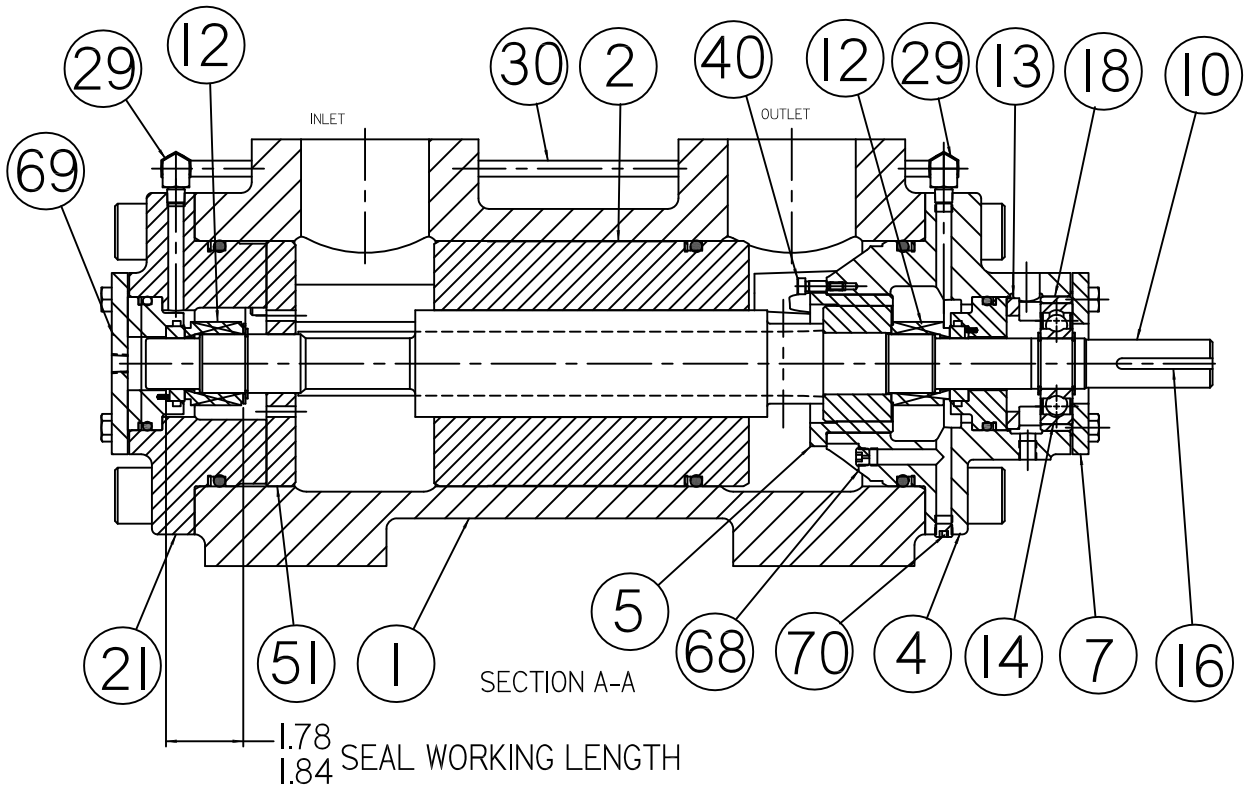
E3LB(K)-187/200



SECTION C-C



SECTION B-B



SECTION A-A

Figure 5
E3LB(K)-250

NOTES:

1. INSTALL S418EH DRIFICE PLUG WITH LOCTITE
2. ADJUST LAMINATED SHIM TO OBTAIN $1\text{-}3/8 \pm 1/64$ MECHANICAL SEAL WORKING LENGTH.

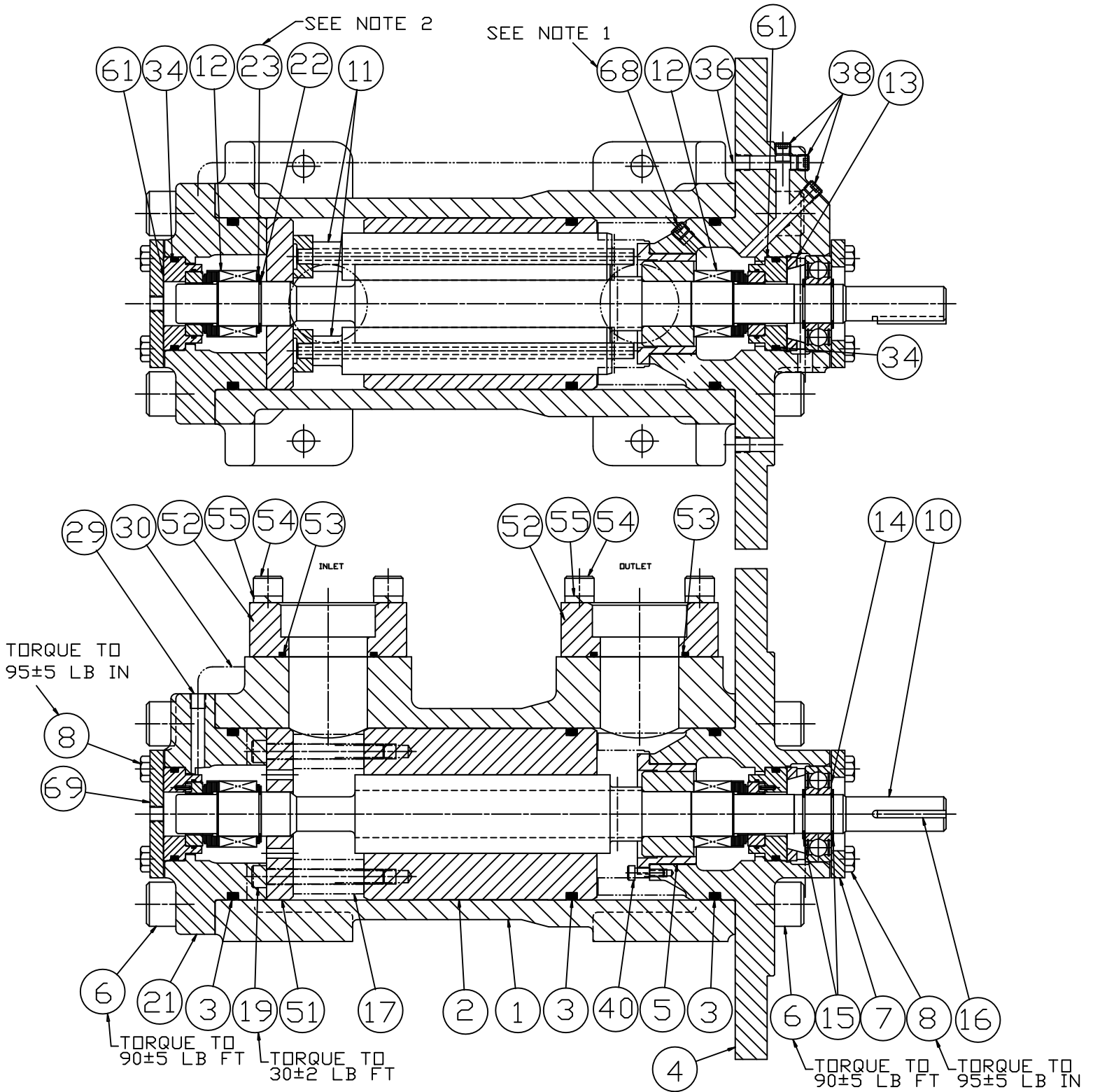


Figure 6

E3LB(K)C-187/200



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