



**INSTRUCTION MANUAL
AND
PARTS LIST
FOR
E3LB-187 and -200 SERIES PUMPS
E3LBK-187 and -200 SERIES PUMPS**



WARNING

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

This manual now is
identified as part no.
SRM00056

The reliable pump people


Manual No. E3LB-187 – 200
Manual No. E3LBK-187 – 200


Rev. 1

October 2000



READ THIS ENTIRE PAGE BEFORE PROCEEDING

FOR THE SAFETY OF PERSONNEL AND TO PREVENT DAMAGE TO THE EQUIPMENT, THE FOLLOWING NOMENCLATURE HAS BEEN USED IN THIS 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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A. GENERAL INSTRUCTIONS

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

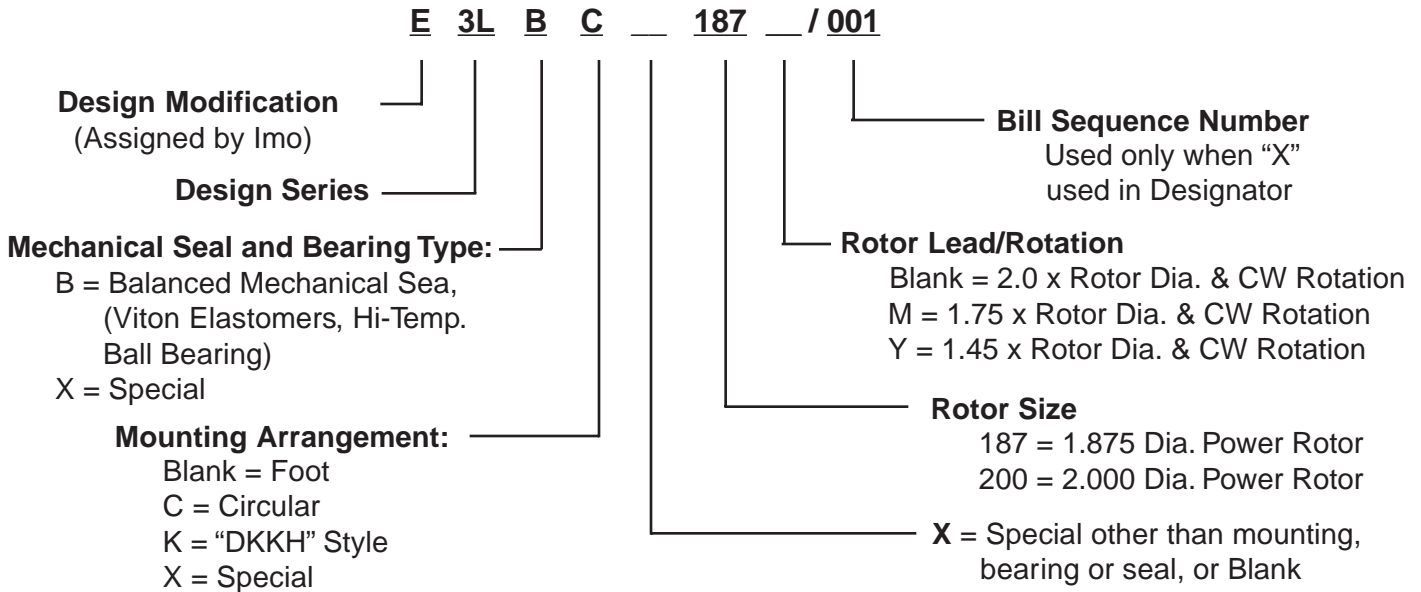
C. DESCRIPTION OF EQUIPMENT

The E3LB and E3LBK -187 and -200 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 and -200 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 and -200 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.

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. The pump is designed for liquids having the 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, the specific application limits may be different from that of the operational limitations. This equipment must not be operated without verifying system's operating requirements are within the 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

MAXIMUM SPEED	4400 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)
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.	
MAXIMUM PRESSURE DIFFERENTIAL	500 psi
FILTRATION	(See General Instruction Manual, CA-1)
MOUNTING	Foot or Flange mounted in any attitude

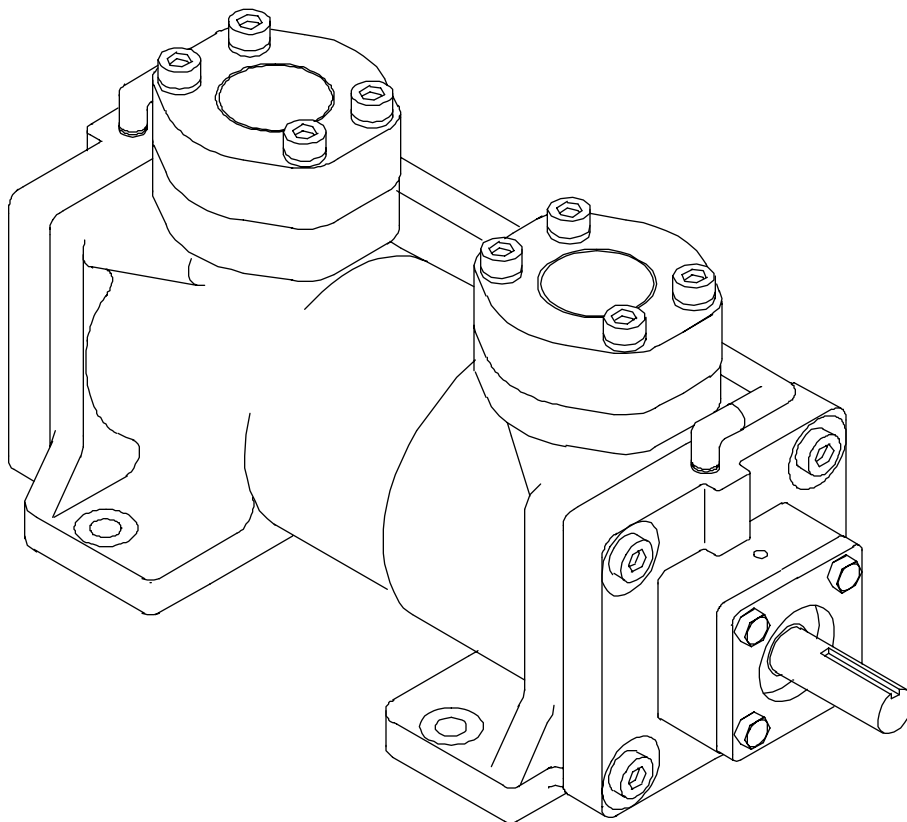


Figure 2 – E3LB-187 & -200 Pump

G. PARTS LIST

Table 2 – Pump Parts List

IDP	QTY	DESCRIPTION	KIT	IDP	QTY	DESCRIPTION	KIT	
1	1	Case		23	1	Laminated Shim	X	
2	1	Rotor Housing	XX	29	***	Fitting(s)		
3	3	O-Ring(s)	X	30	1	Tubing		
4	1	Inboard Cover		34	2	O-Ring(s)	X	
5	1	Bushing	XX	40	**	Cap Screw(s)		
6	*	Cap Screw(s)		51	1	Thrust Plate	XX	
7	1	Inbd. Brg. Retainer		52	2	Flange Fitting(s)		
8	8	Hex Bolt(s)		53	2	O-Ring(s)	X	
10	1	Power Rotor	XX	54	8	Cap Screw(s)		
11	2	Idler Rotor(s)	XX	55	8	Lock Washer(s)		
12	2	Mechanical Seal(s)	X	61	2	Seat Adapter(s)		
13	1	Spacer		63	*	Shoulder Screw(s)		
14	1	Bearing	X	63	4U	Cap Screw(s)		
15	2	Truarc Ring(s)	X	65	1U	Tee		
16	1	Key		66	1U	Pipe Nipple		
17	2	Spacer(s)		67	1U	Hydraulic Fitting		
19	2	Cap Screw(s)		68	1	Pipe Plug/Orifice		
21	1	Outboard Cover		69	1	Outbd. Brg. Retainer		
22	1	Retaining Ring	X					
	X	= Minor Repair Kit Items.						
	XX	= Major Repair Kit Items. (Items marked (X) are included in Major Repair Kit).						
	U	= Used on E3LBK pumps only.						
	*	IDP 63 Not in all Pumps. Total QTY of 8 between IDPs 6 and 63.						
	**	Used Only on Pumps with Circular Flanges.						
	***	Some Pumps have Numerous Fittings in Seal Return Line.						

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 NUMBER	QTY	DESCRIPTION	SIZE (Inch)	TORQUE VALUE (English)	TORQUE VALUE (Metric)
6 or 63	8	Cap Screw(s)	3/4 - 10	90 ± 5 lb. ft.	122 ± 6 Nm
8	8	Hex Bolt(s)	3/8 - 16	95 ± 5 lb. in.	11 ± 1 Nm
19	2	Cap Screw(s)	3/8 - 16	30 ± 2 lb. ft.	40 ± 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 5, Tables 2 and 3.

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 pumping 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.2 MECHANICAL SEAL ORIFICE

Depending on specific operating conditions, E3LB pumps may require an orifice to provide cooling flow to the pump's mechanical seals. The decision to install an orifice, is made during pump selection and is based on operating conditions provided by the customer. The orifice, (68), is located within the inboard cover (4). It provides additional flow from the discharge port to the inboard mechanical seal chamber. Each pump has the capability to have an orifice installed by means of an 1/8" NPT tapped opening provided in inboard cover (4). When an orifice is not required, a solid plug is installed in the tapped opening. If an orifice is installed, the pump nameplate is stamped accordingly. Part number (68) is utilized in all pumps and is identified as either the orifice or solid pipe plug.

Nameplate Example: Model No. E3LB-187, 0.063-inch Orifice Installed.

H.3 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.

H.4 PUMP DISASSEMBLY



CAUTION

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

NOTE: The E3LB -187 and -200 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.

STEP 1 Remove Outboard Cover and Mechanical Seal (Suction Side) – See Figure 5 and 3

Remove external tubing (30) from pump by loosening tube fittings (29) or other fittings that may be installed.

Remove four hex bolts (8) and outboard bearing retainer (69) from outboard cover (21).

Remove the outboard cover (21) by removing four cap screws (6) from cover.

Disassemble O-ring (3), seat adapter (61), and O-ring (34) from cover (21).

Remove stationary seat and O-ring from seat adapter (61).

Loosen the four set-screws holding the mechanical seal (12) on to the power rotor (10). See Figure 3. Slide mechanical seal off the power rotor. Remove shim (23) and retaining ring (22) from power rotor (10) shaft.

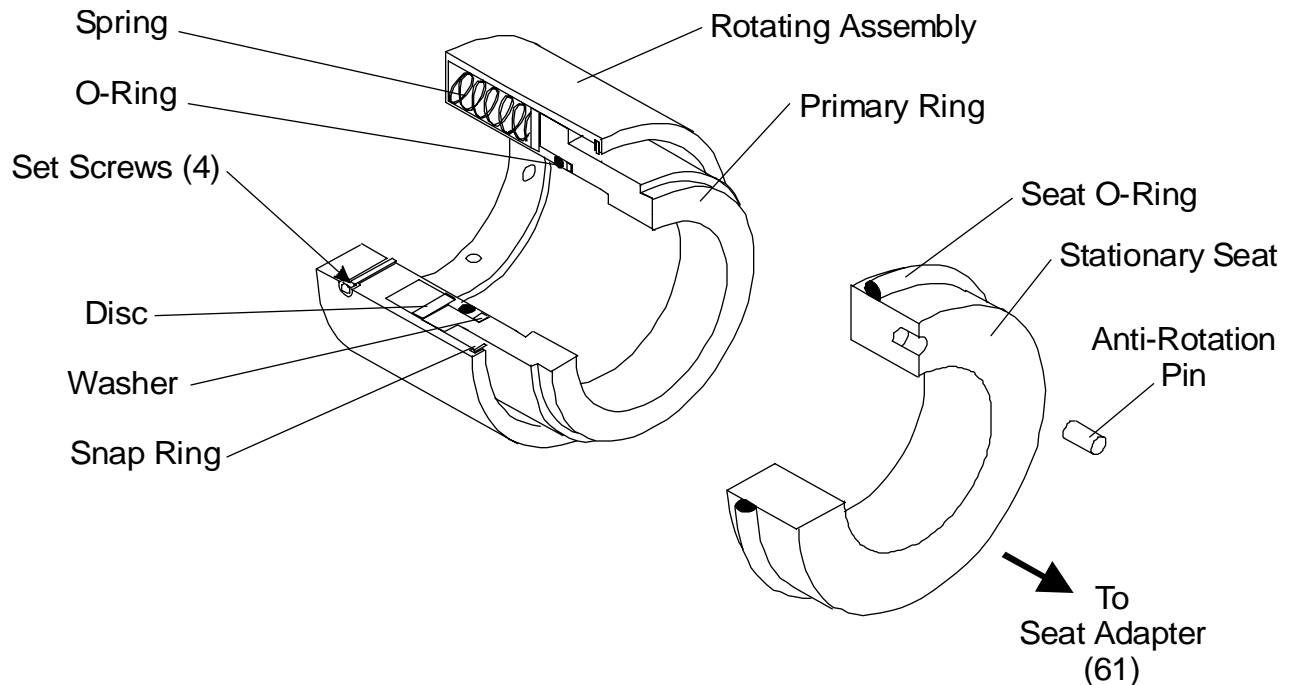


Figure 3 – Mechanical Seal (12) Details

STEP 2 Remove Bearing Retainer and Power Rotor Assembly (Discharge Side)

Remove four hex bolts (8) and inboard bearing retainer (7) from inboard cover (4).

Pull and twist power rotor shaft (10) to remove the power rotor from the rotor housing (2) and inboard cover (4).

STEP 3 Disassemble Power Rotor

The power rotor assembly (10) consists of two Truarc retaining ring sets (15), a ball bearing (14), spacer (13), seat adapter (61), inboard mechanical seal (12), and O-ring (34).

With a flat blade screwdriver, carefully remove outer and inner Truarc retaining ring sets (15) from grooves of power rotor (10).

Using an arbor press or bearing puller, remove the ball bearing (14) from power rotor (10).

Remove spacer (13), seat adapter (61) and inboard mechanical seal stationary seat from the power rotor (10).

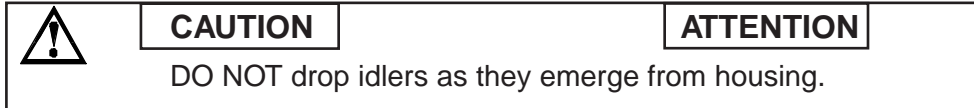
Remove stationary seat and O-ring from seat adapter (61).

Remove O-ring (34) from seat adapter (61).

Loosen the four set-screws on the mechanical seal (12). See Figure 3. Rotate seal and slide off shaft of power rotor (10).

STEP 4 Remove Inboard Cover and Idler Rotors (Discharge Side)

- Remove four cap screws (6 or 63).
- Remove inboard cover (4) from case (1).
- Remove O-ring (3) from inboard cover (4).
- Remove bushing (5) from inboard cover (4).
- Remove two idler rotors (11) from housing (2).



STEP 6 Remove Housing (Suction Side)

- From outboard end (suction side) pull thrust plate (51) and housing (2) from case (1).
- Disassemble two cap screws (19), thrust plate (51), two spacers (17) and O-ring (3) from housing (2).

H.5 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: If an orifice is installed check to see that the orifice opening is not clogged.

H.5.1 NYLOK Fastener Torque Procedure

Required torque stated on the assembly drawing and the supplemental torque table does not include the additional torque required to install fasteners containing Nylok inserts (pellet, strip, patch, ring, collar). The torque required for the first application is much higher than it is for subsequent applications. To insure that the required pre-load on a Nylok fastener is achieved, the following is the correct required procedure.

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

****This procedure must be repeated each time a Nylok fastener is reused.***

STEP 1 Assemble and Install Housing and Install Idler Rotors

- Assemble two cap screws (19), thrust plate (51) and two spacers (17) onto the housing (2). Tighten cap screws (19) finger-tight to allow thrust plate to align with case bore (1) when inserted into case.
- Install O-ring (3) in groove of housing (2).
- Fully insert assembled housing (2), O-ring end first, into outboard end (suction side) of case (1).
- Torque thrust plate cap screws (19) to values specified in Table 3.
- From the inboard end (discharge side) install two idler rotors (11) in idler bores of housing (2) with small diameter of idlers facing the inboard end of housing (2).

STEP 2 Install Inboard Cover (Discharge Side)

Install bushing (5) to inboard cover (4).

Install O-ring (3) in groove of inboard cover (4).

Install assembled inboard cover (4) on pump case (1) using four cap screws (6 or 63).

Torque screw (6 or 63) to values specified in Table 3.

STEP 3 Assemble Power Rotor

Slide inboard mechanical seal (12) rotating assembly on power rotor (10) shaft (see Figure 3) until it contacts rotor balance piston.

Tighten the four set-screws on the mechanical seal (12).

Install O-ring to the inner groove of seat adapter (61) and install mechanical seal (12) stationary seat in seat adapter (61) ensuring that anti-rotation pin is properly engaged.

Install O-ring (34) on seat adapter (61) and slide seat adapter on power rotor shaft.

Install spacer (13) on power rotor (10) shaft.

Install inner Truarc retaining ring set (15) in groove of power rotor (10).

Using an arbor press, install ball bearing (14) on power rotor shaft (10). Press **ONLY** on inner race ring of bearing.

CAUTION

Bearing service life could be significantly reduced if the bearing is pushed on by its outer race ring.

Install outer Truarc retaining ring set (15) in groove of power rotor, next to bearing.

STEP 4 Install Power Rotor (Discharge Side)

Install power rotor (10) into inboard cover (4) and pump case (1). When inserting power rotor (10) into pump, rotate power rotor in normal pump rotation direction (CW or CCW) to align and mesh threads of power rotor with threads of idlers (11).

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

Install inboard retainer (7) to inboard cover (4) using four bolts (8). Torque bolts (8) to values specified in Table 3.

STEP 5 Install Outboard Shim and Mechanical Seal (Suction Side)

Install retaining ring (22) in groove of outboard end of power rotor (10).

Install O-ring (3) 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.

To find the proper shim thickness perform the following. See Figure 4.

- To determine dimension "A", (Figure 4). Measure distance from counter-bore of outboard cover (21) to installed retaining ring (22).
- To determine dimension "B", (Figure 4). Install seal stationary seat (insuring 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.
- 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).

Remove layers of laminated shims (23) to achieve proper thickness as determined above.

Remove cap screws (6) and outboard cover (21) from case (1).

Install proper thickness of shim (23) on power rotor shaft (10) next to retaining ring (22).

Install mechanical seal rotating assembly (12) on power rotor (10) shaft and tighten four set-screws.

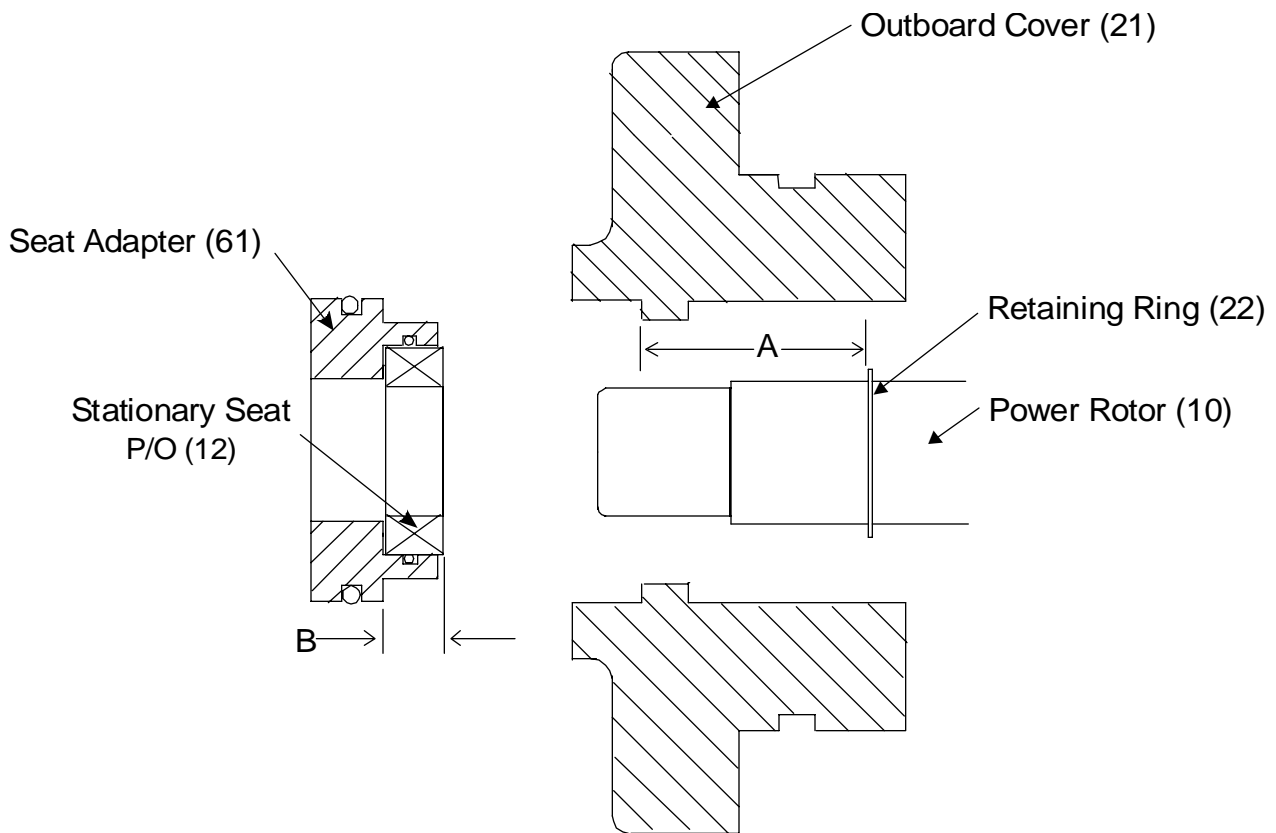


Figure 4 – Shim Thickness Measuring

STEP 6 Install Outboard Cover (Suction Side)

Install outboard cover (21) on case (1) using four cap screws (6) or (63). Torque screws to values specified in Table 3.

Install O-ring (34) on seat adapter (61).

Install seat adapter (61) in cover (21) insuring that the anti-rotation pin is properly seated.

Install outboard bearing retainer (69) on cover (21) using four hex bolts (8). Torque hex bolts to values specified in Table 3.

Install tubing (30) using tube fittings (29) (or other fittings) on inboard and outboard covers (4 and 21).

STEP 7 Install Pump to Pump-Driver Mount

Install pump to mounting. Install coupling hub and key (16) on power rotor shaft (10).

Assemble two O-rings (53), eight cap screws (54) and eight lock washers (55) into inlet and outlet flange fittings (52). Install flanges to suction and discharge ports. Ensure flanges are flat and are parallel to pump body ports. Tighten eight cap screws (54) evenly, to compress both O-rings (53).

STEP 8 Align Pump and Driver

Perform alignment of pump and driver as specified in General Instruction Manual, CA-1.

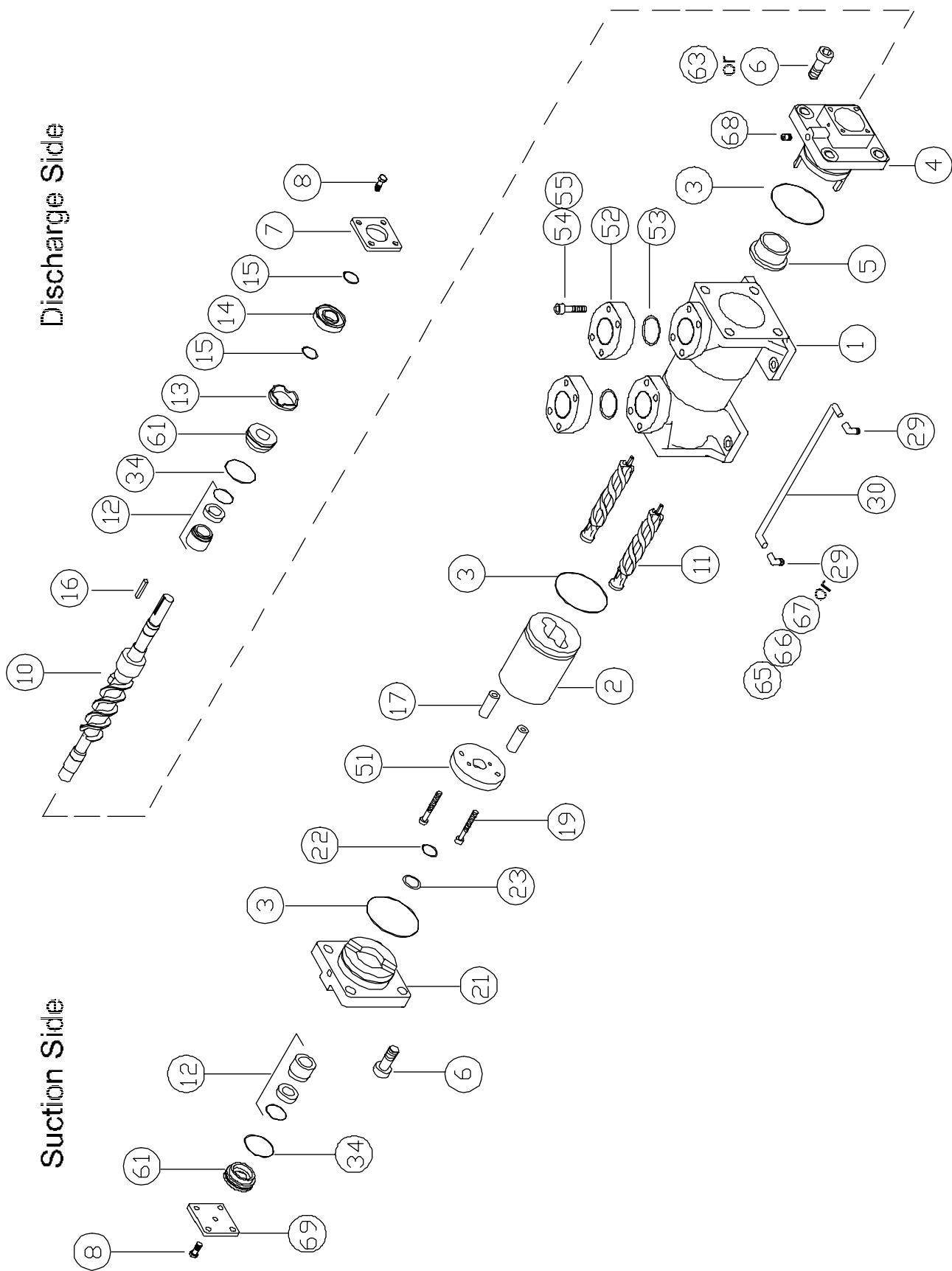


Figure 5 – E3LB and E3LBK-187 and -200 Assembly

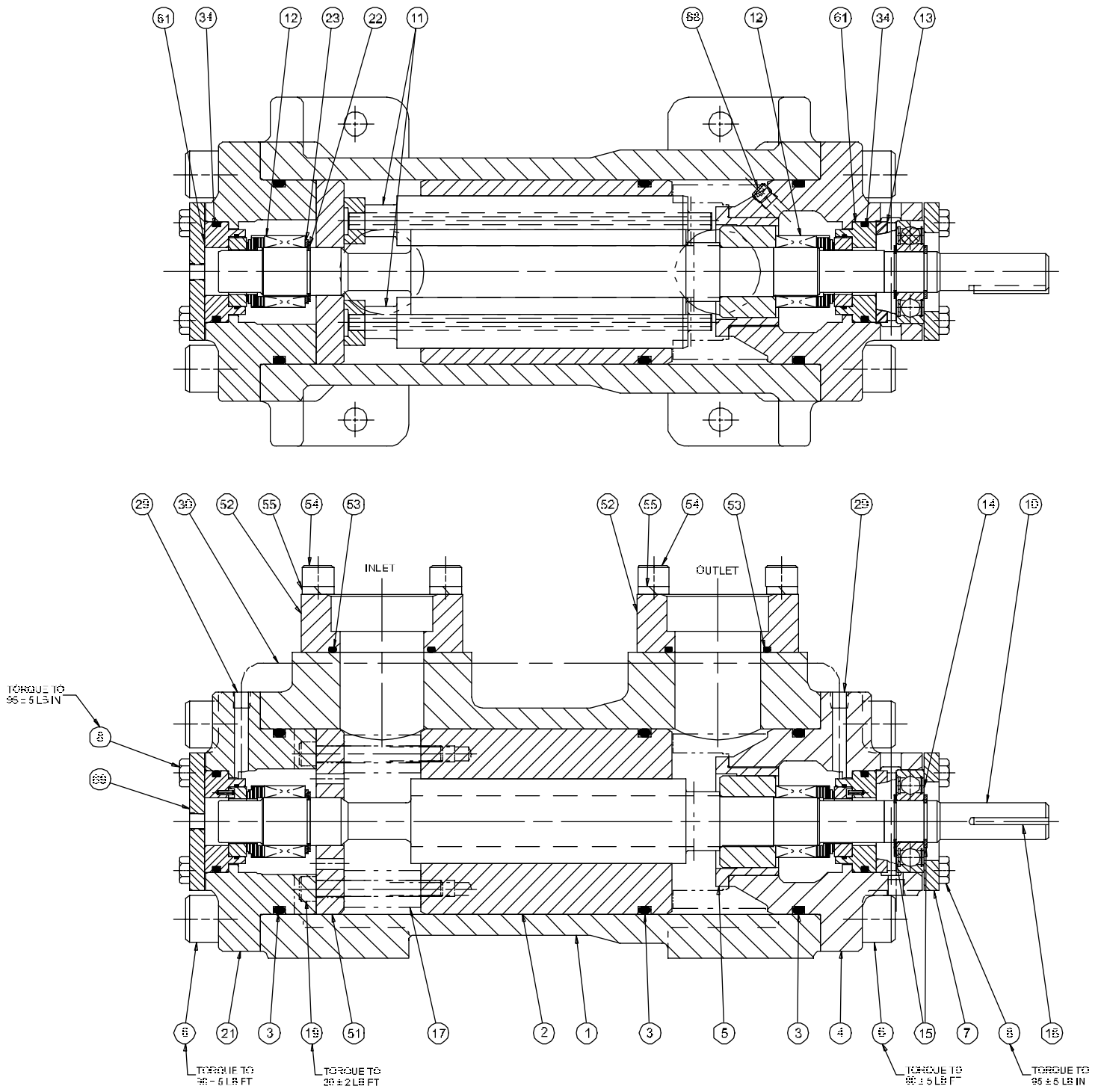


Figure 6
Assembly E3LB-187, -200

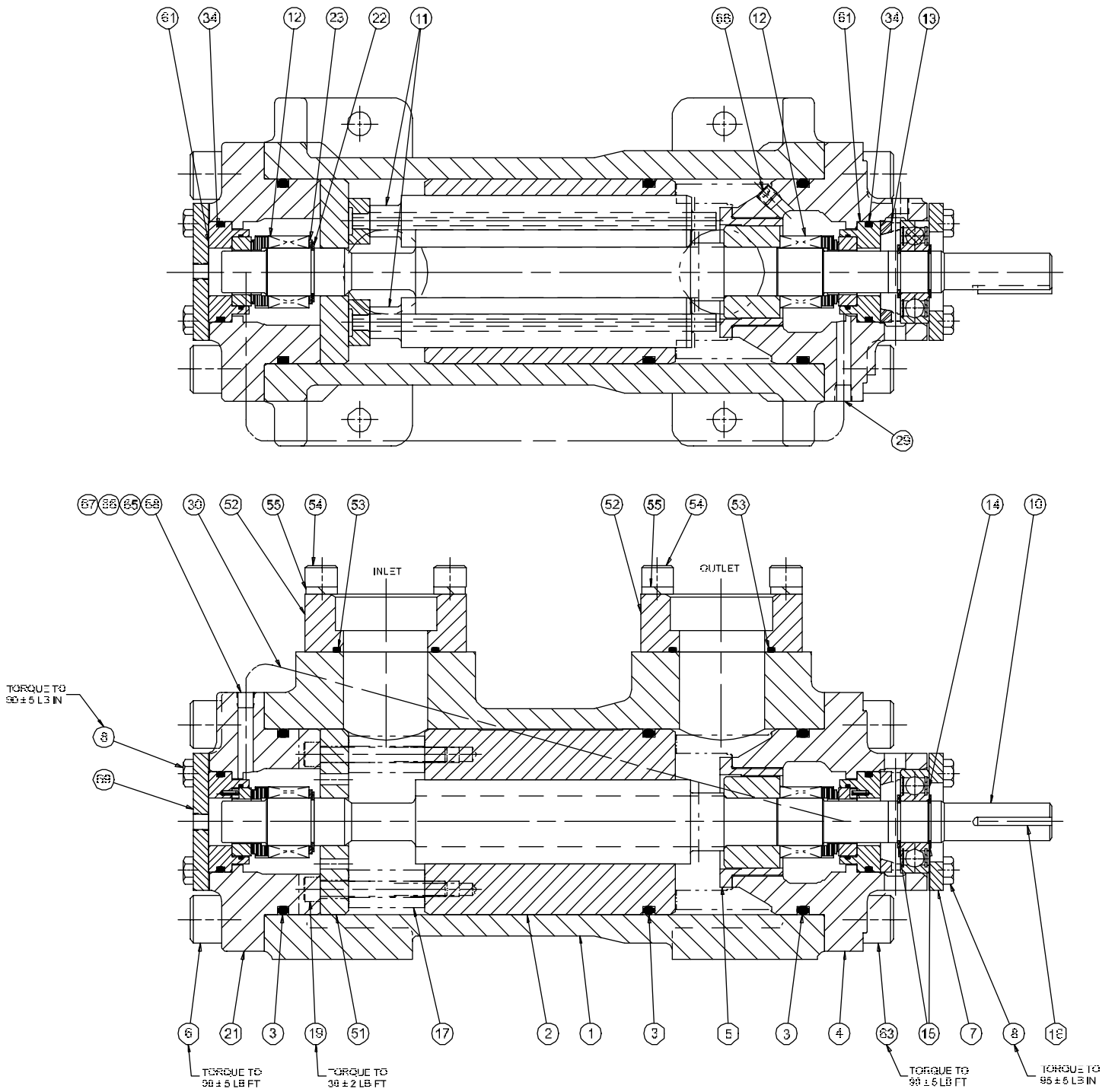


Figure 7
Assembly E3LBK-187, -200

