

COLFAX

Fluid Handling

INSTRUCTION MANUAL

AND

PARTS LIST

FOR

(A)E3LB(C)(K)-187, -200, and -250 SERIES PUMPS



WARNING

This Manual and GENERAL INSTRUCTIONS MANUAL, SRM00046, should be read thoroughly prior to pump installation, operation or maintenance.

Manual No. SRM00056

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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 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 fail equipment.			

*Non compliance of safety instructions identified by 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 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

Instructions found herein cover disassembly, assembly and parts identification of Series (A)E3LB(C)(K) 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, SRM00046, 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 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
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 (A)E3LB(C)(K)-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.

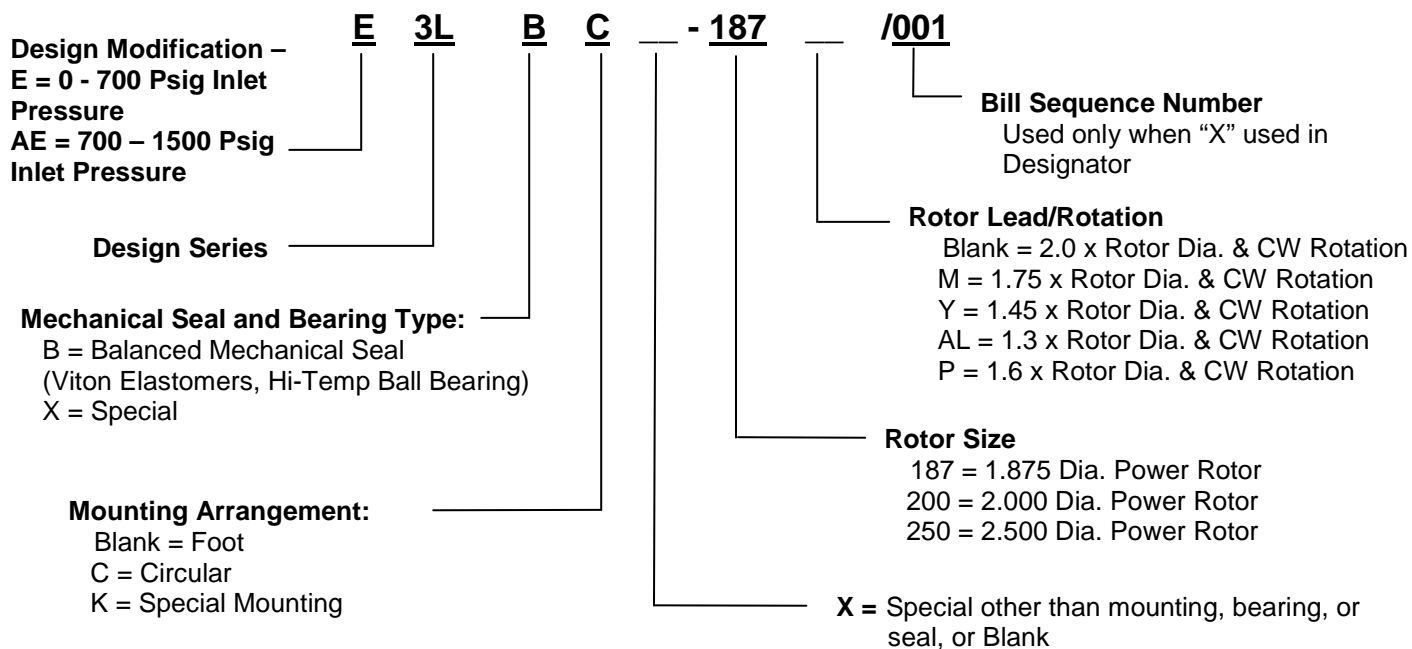
C. DESCRIPTION OF EQUIPMENT

The (A)E3LB(C)(K) 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 (A)E3LB(C)(K) 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 (A)E3LB(C)(K) 187, -200, and -250 pumps, refer to pump nameplate, this instruction manual, and assembly drawings 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 the IDP number(s) and names for replacement part(s).
5. Give above information to your Imo service representative.

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
<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 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)
E3L ALLOWABLE INLET PRESSURE RANGE.....	300 - 700 psig
AE3L ALLOWABLE INLET PRESSURE RANGE.....	700 - 1500 PSIG
NOTE: Series E3LB pumps are designed for positive inlet pressures. Unit should not be operated for extended periods of time with inlet pressure less than atmospheric.	
MAXIMUM DIFFERENTIAL PRESSURE.....	500 psi
FILTRATION.....	(See General Instruction Manual, SRM00046)
MOUNTING.....	Foot or Flange mounted in any attitude. (A)E3LBK mounted in vertical direction only

G. PARTS LIST

Table 2 – Pump Parts List

IDP	QTY	DESCRIPTION	KIT	IDP	QTY	DESCRIPTION	KIT
1	1	Pump Case		19	2	Cap Screws (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 Screws		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 Screws (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	150± 10 lb. ft.	203 ± 12 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.	27 ± 3 Nm
19	187- 250	Cap Screw(s)	3/8 – 16	30 ± 2 lb. ft.	41 ± 3 Nm

H. PUMP MAINTENANCE

H.1



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 equipment is disconnected and locked-out.

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- Use proper assembly drawing, Figures 4, 5 and 6 for applicable pump type and size.

SPECIAL NOTE: To service mechanical seal and ball bearings ONLY perform H.3, Steps 1 thru 10 and H.4, Steps 5-12 ONLY.



CAUTION

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

1. Remove external tubing (30) from pump by loosening tube fittings (29).
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.

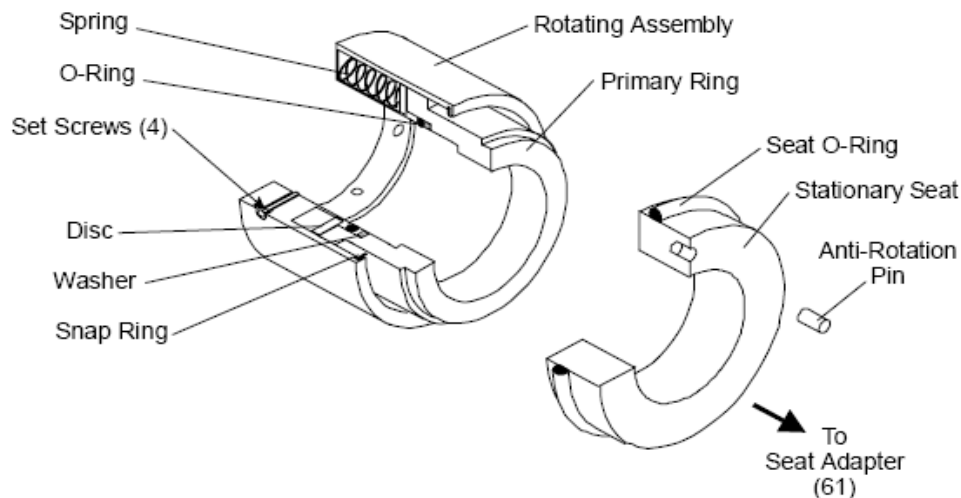


Figure 2 – Mechanical Seal (12) Details

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 - Use proper assembly drawing, Figures 4, 5 and 6 for applicable pump type and size.

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 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 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 an AE3D-250__, this O-ring comes with the seal. On any other pump, this O-ring is separate from the seal). 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. Wipe mechanical seal rotating and stationary faces with a clean, lint free cloth before assembling faces together.

- d. Install assembled seal seat adapter (61), with stationary seat, to power rotor shaft in contact with to mechanical seal rotating face.
- e. 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

- f. 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).
 - g. 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 3.
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. Install rear seal from instructions below:

A. Find proper shim (23) thickness to be installed on outboard portion of Power Rotor (10) to achieve proper seal working length behind seal by performing following measurements. See figure 3 on page 12 for further description of instructions.

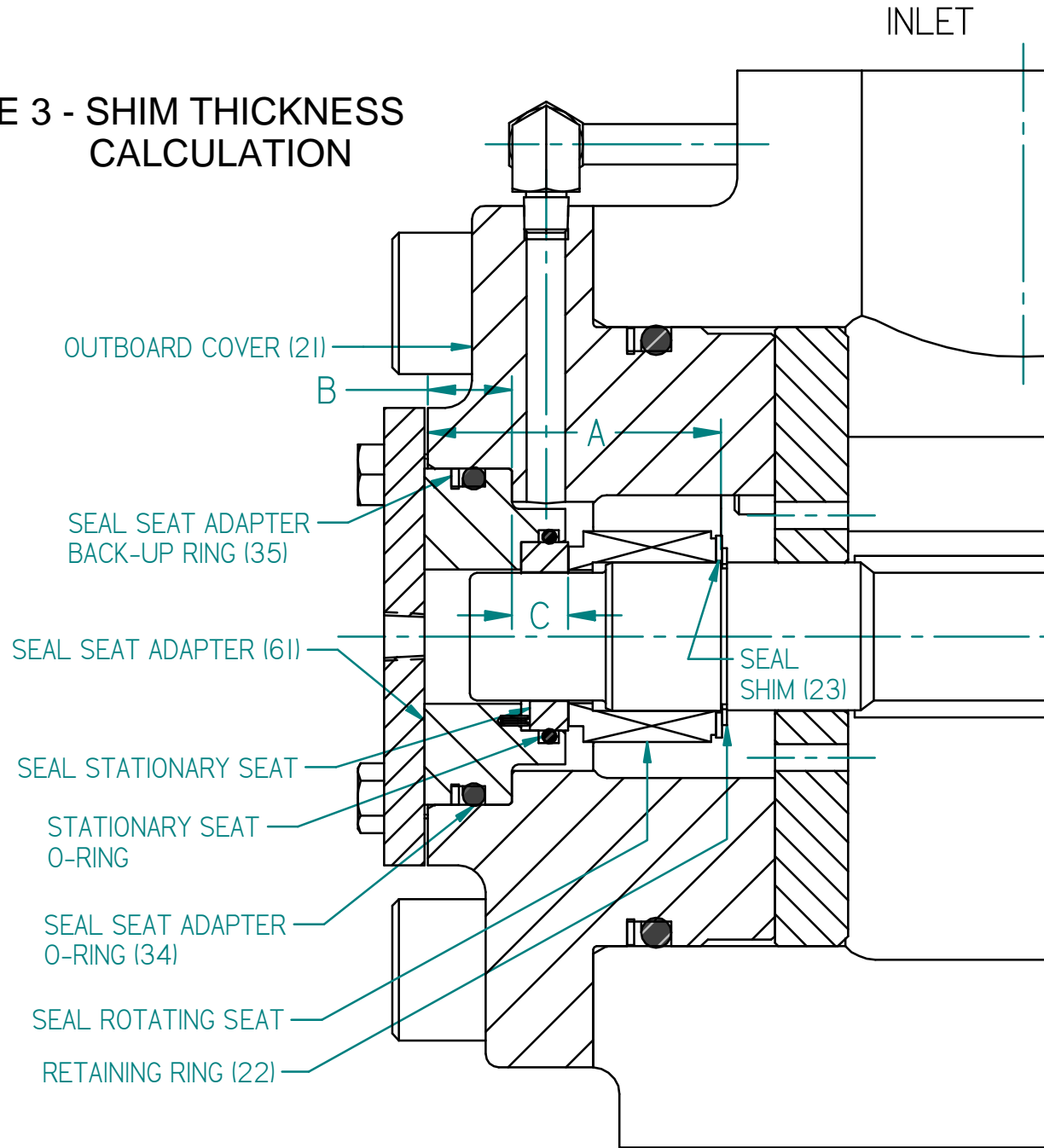
- 1) Take measurement "A" from outermost portion of end cover (21) to retaining ring (22) using a depth micrometer.
- 2) Prior to installing seal seat adaptor (61) take measurement "B" from outermost portion on outboard cover (21) to first step in outboard cover (21) using a depth micrometer.
- 3) Install stationary seat in seal seat adapter (35) without its O-ring and then take measurement "C" from end of stationary seat to step in seal seat adapter (61).

CAUTION

Care must be taken when taking measurement "C" to prevent damaging or scoring on surface of Seal Stationary Seat. Any damage to this part will cause seal to leak.

- 4) After all three measurements have been taken and recorded, subtract dimension "A" minus "B" minus "C". Record results from this calculation. Then subtract this calculation from seal actual seal working length which is 1.375". This number is required shim thickness that must be installed against retaining ring (22) on power rotor (10). Laminated shims (23) are provided in kit and can be individually peeled away to achieve proper shim thickness. All calculations are in inches.
 - B) Install proper amount of shims per above calculation against snap ring (22)
 - C) Using a clean system fluid or a rubber lubricant emulsion such as P-80, lubricate internal O-ring on rotating portion of seal. Install seal rotating assembly on power rotor (10) against shims (23). Tighten set screws located in rotating portion of seal to lock it to power rotor (10) (set screws are to be tightened using good engineering practices). Clean mechanical seal rotating and stationary faces with alcohol using a clean, lint free cloth to remove any finger prints, contaminants, or dirt.
 - D) Remove stationary seal seat from seal seat adapter (61). Install O-ring in groove on ID of seal seat adapter (61) and reinstall stationary seat in seal seat adapter (61) being sure that anti-rotation pin in seal seat adapter aligns with groove in back of stationary seal seat.
 - E) Install O-ring (34) (on AE3L-250 pumps this O-ring comes with the seal) and backup ring (35) (if 250 size pump) in groove on OD of seal seat adapter (61).
 - F) Wipe mechanical seal rotating and stationary faces with a clean, lint free cloth to remove any finger prints or dirt.
 - G) Install seal seat adapter (61) into outboard cover (21) with installed stationary seal seat face up against face of rotating seat.
 - H) Install outboard retainer (69) with bolts (8). Tighten bolts (8) equally and evenly to prevent cocking of seal seat adapter (61). Evenly tightening bolts (8) prevents damaging seal faces during installation process. After seal seat adapter is fully engaged in end cover, torque bolts (8) to appropriate value on torque table, Table 3. Allowing seal seat adapter (61) to cock during installation may damage mechanical seal faces.
13. Install tubing (30) using tube and other fittings (29) on inboard and outboard covers (4 and 21).
 14. 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.
 15. Perform alignment of pump and driver as specified in General Instruction Manual, SRM00046.

FIGURE 3 - SHIM THICKNESS CALCULATION



$$\text{SHIM THICKNESS} = A - B - C - 1.375$$

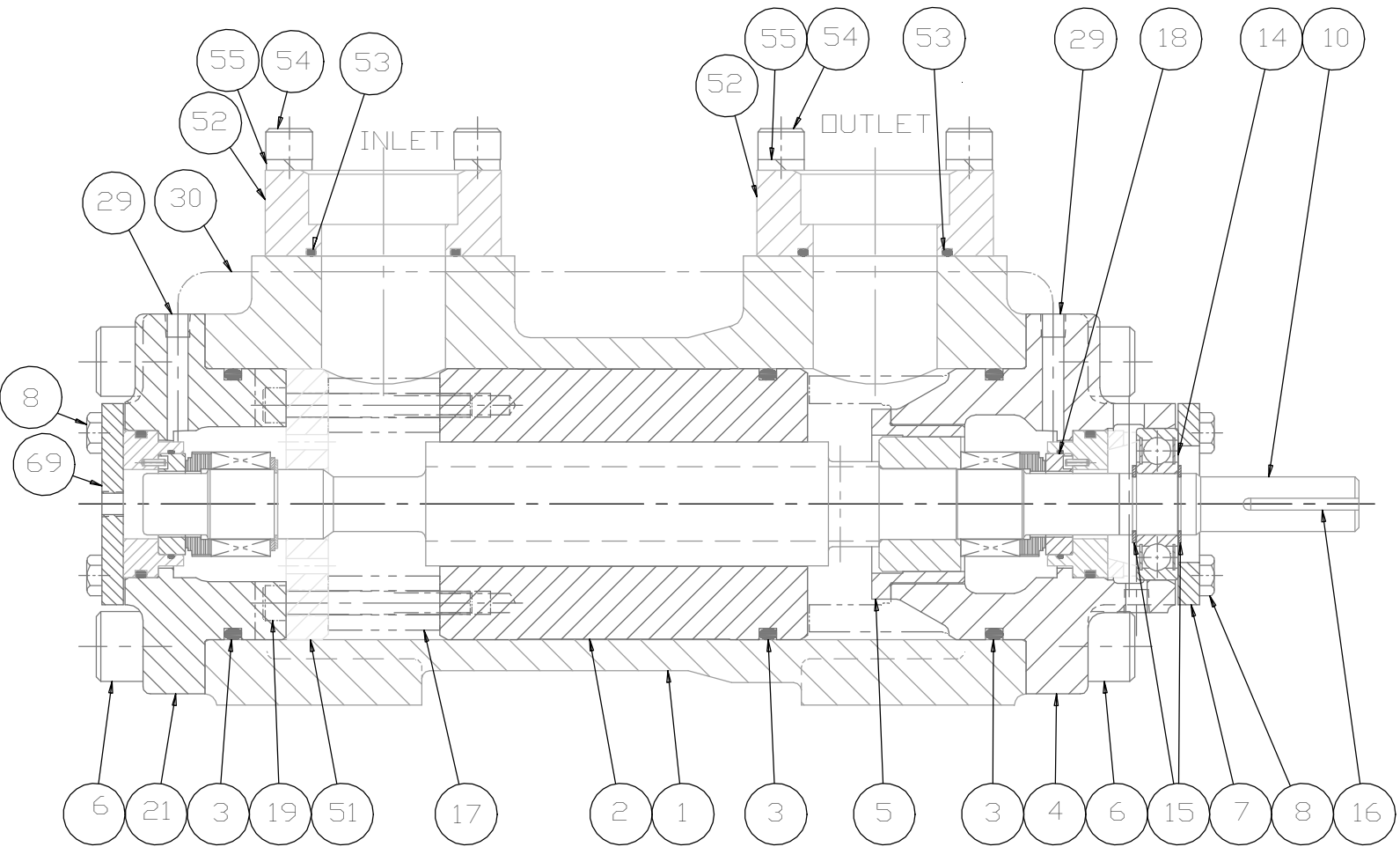
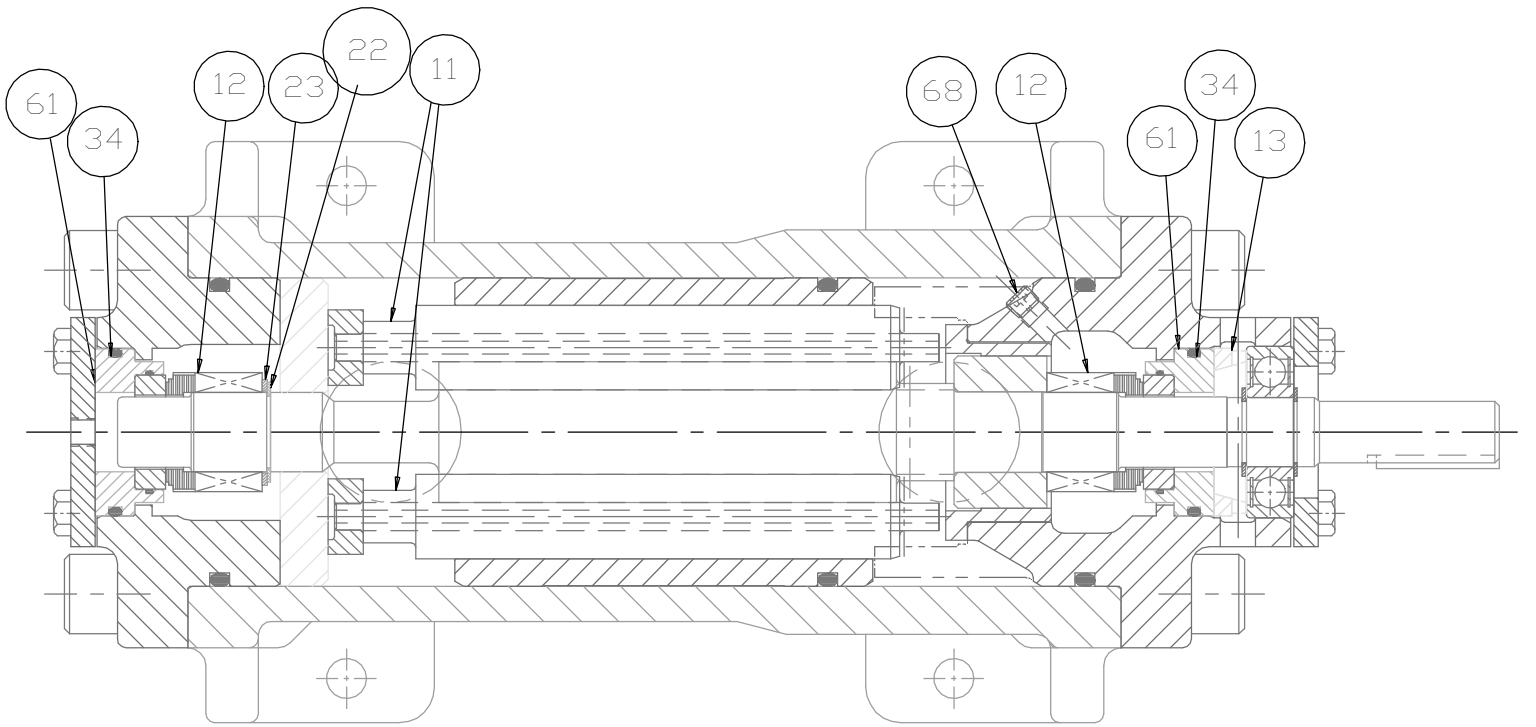


FIGURE 4 - (A)E3LB(K)-187_/200 ASSEMBLY

NOTES:

1. INSTALL S418EH DRIFICE PLUG WITH LOCTITE
2. ADJUST LAMINATED SHIM TO OBTAIN $1-3/16$ MECHANICAL SEAL WORKING LENGTH.

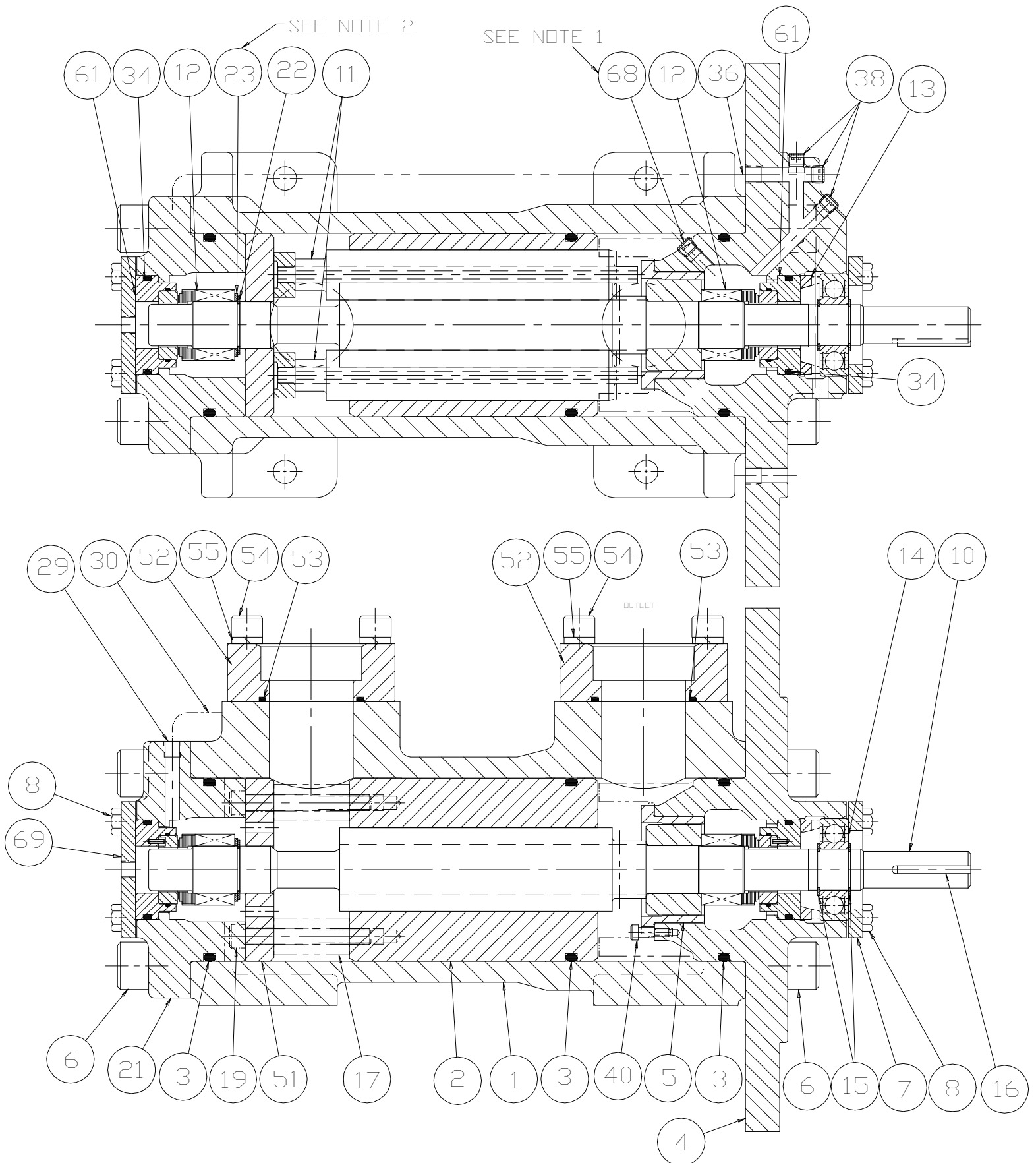


FIG 5 - (A/E3LBC-187_ / 200 ASSEMBLY

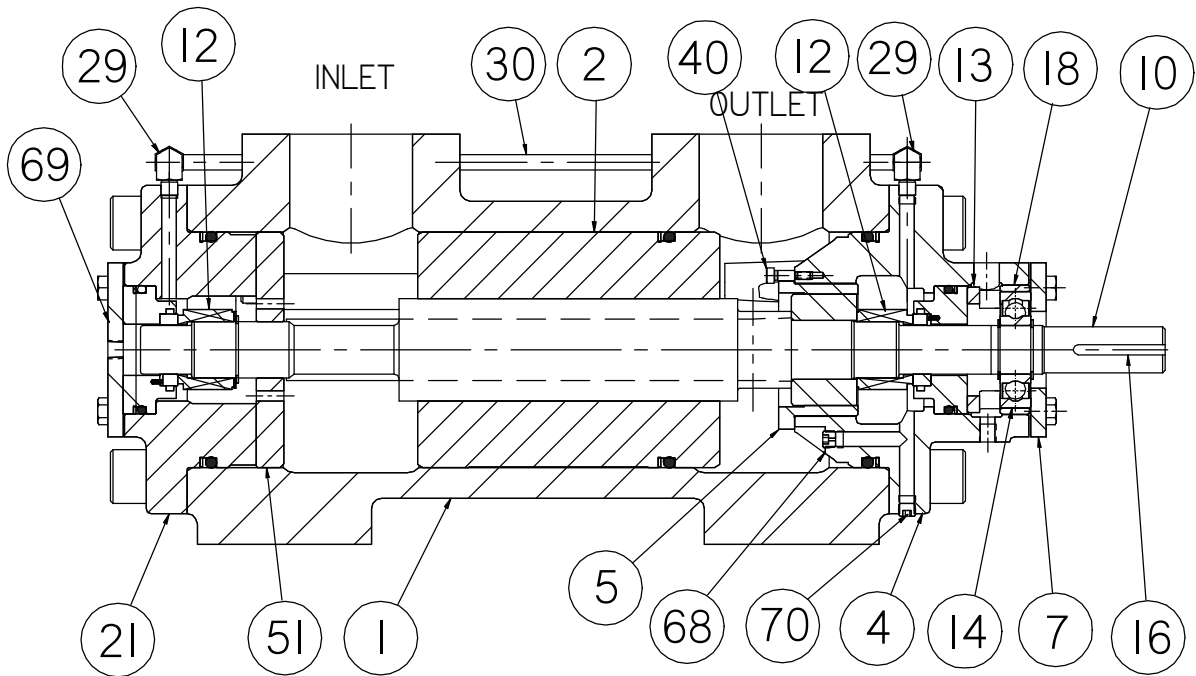
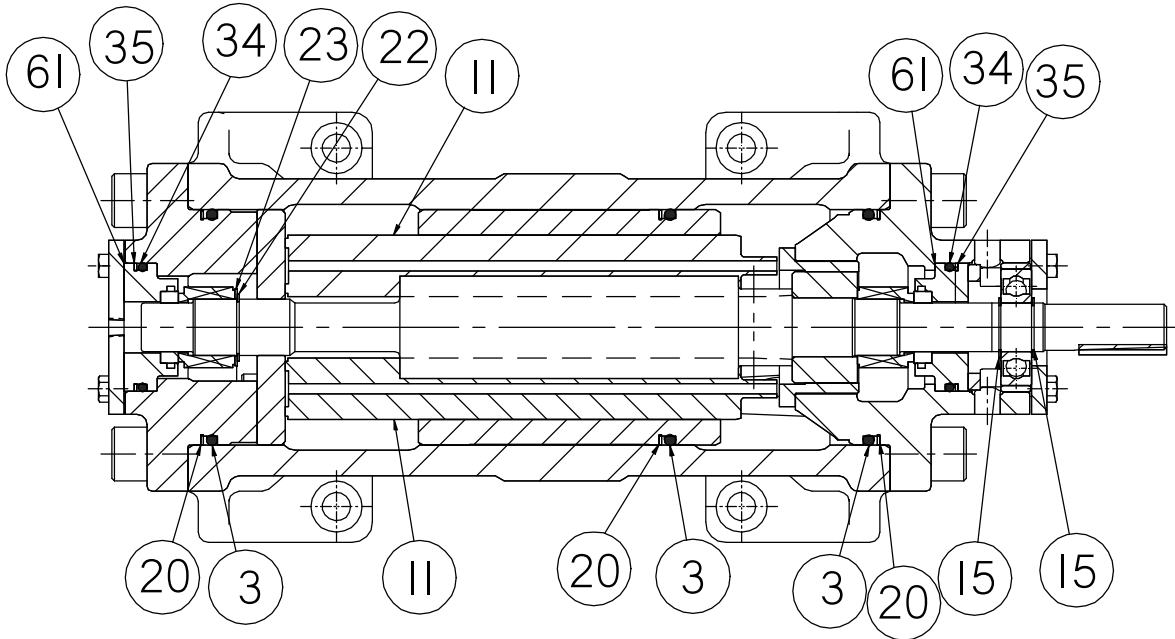
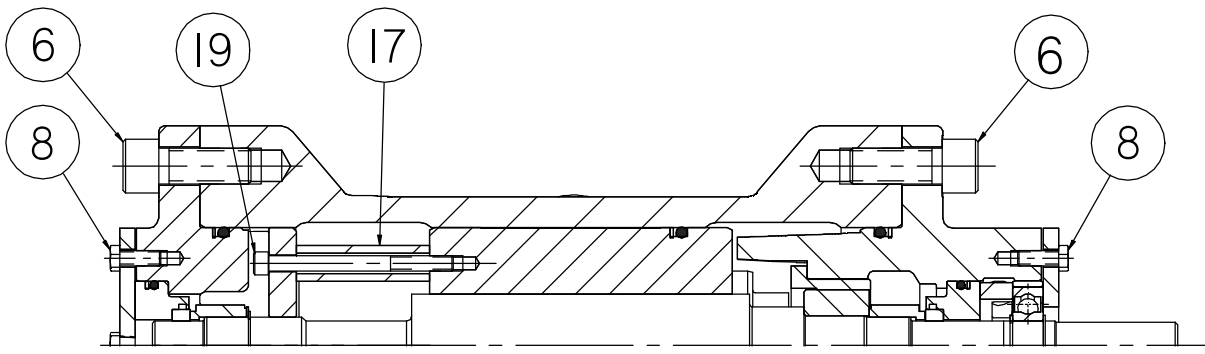
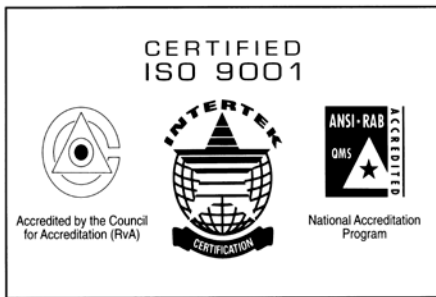


FIG 6 - (A)E3LB(K)-250_ ASSEMBLY



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