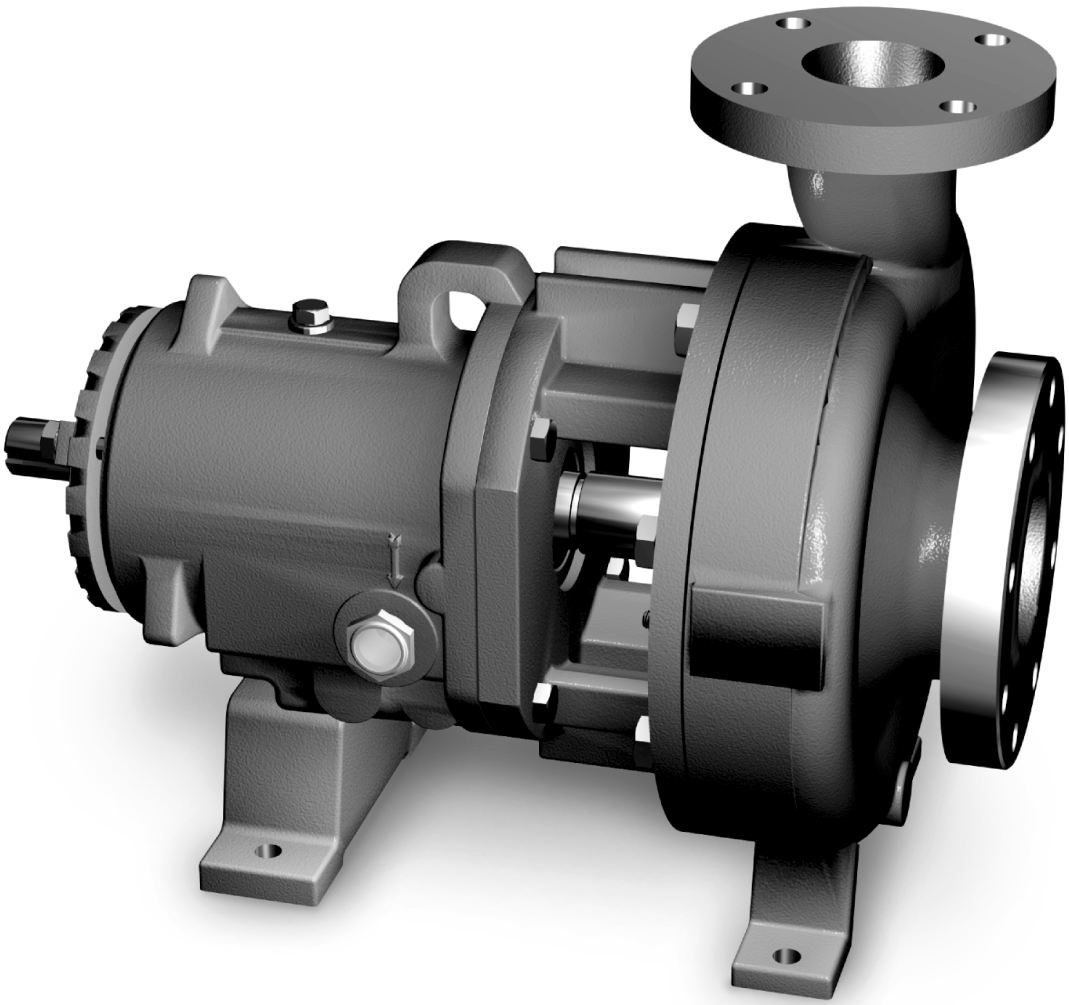
SUMMIT PUMP

Model Clark 3
ANSI Standard Process Pump

Installation, Operation, and Maintenance Manual



SUMMIT™
PUMP
Green Bay, WI

WARRANTY

Pumping units assembled by Specialty Components, Inc., Green Bay, WI are guaranteed to be free from defects in material and workmanship for one year from date of shipment from factory in Green Bay, WI. The obligation under this Warranty, statutory or otherwise, is limited to replacement or repair at Green Bay, WI., of such part as shall appear to us upon inspection at such point, to have been defective in material or workmanship.

This Warranty does not obligate Specialty Components, Inc. to bear the cost of labor or transportation charges in connection with replacement or repair of defective parts; nor shall it apply to a pump upon which repairs or alterations have been made unless authorized by Specialty Components, Inc.

No warranty is made in respect to engines, motors, or trade accessories, such being subject to warranties of their respective manufacturers.

No express implied or statutory warranty, other than herein set forth is made or authorized to be made by Specialty Components, Inc.

In no event shall Specialty Components, Inc. be liable for consequential damages or contingent liabilities arising out of the failure of any Specialty Components, Inc. pump or parts thereof to operate properly.

SPECIALTY COMPONENTS, INC.
Green Bay, WI

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Contents

1. INTRODUCTION

This installation, operation, and maintenance manual is designed to help you achieve the best performance and longest life from your Summit Clark 3 Pump.

This pump is a semi or open impeller, centrifugal model with an end suction / top discharge. The pump is designed for handling mild industrial corrosives.

Please contact your Summit Clark 3 Pump distributor to answer any questions regarding the pump or its application, which are not covered in this manual or in other literature accompanying this unit.

For information or technical assistance on the power source, contact the power source manufacturer's local dealer or representative.

The following message types are used in this manual to alert maintenance personnel to procedures that require special attention for the protection and safety of both equipment and personnel:

CAUTION!

Hazards or unsafe practices could result in minor personal injury or product damage. These instructions describe the procedure required and the possible damage that could result from failure to follow the procedure.

DANGER!

Immediate hazards exist, which will result in severe personal injury or death. These instructions describe the procedure required and the possible injury that will result from failure to follow the procedure.

WARNING!

Hazards or unsafe practices could result in severe personal injury or death. These instructions describe the procedure required and the possible injury that could result from failure to follow the procedure.

2. RECEIPT AND STORAGE

RECEIVING THE PUMP

Immediately upon arrival, carefully inspect the pump for evidence of damage during transit. Immediately report any damage to your Summit Pump Distributor.

STORING THE PUMP

Store the pump in a clean dry place. **Do not remove piping connection covers**. Rotate the pump shaft by hand **at least once per week** to maintain a protective film of oil or grease on the bearings.

3. INSTALLATION

LOCATION

When choosing a location for the pump, select an area that provides easy access for inspection and maintenance. Locate the pump as close as possible to the source which will provide Net Positive Suction Head (NPSH) equal to or greater than that required by the pump at any capacity over its expected operating range.

FOUNDATION

Use a foundation that is sufficient enough to support all points of the pump base-plate. Level and grout the base-plate per standard construction practices.
(See ANSI/HI 1.2.4-1997.)

PIPING CONNECTION – SUCTION/DISCHARGE

All piping must be independently supported and accurately aligned to the pump suction and discharge flanges. Ideally, you should place a short length of flexible or bellows type spool piece in the connections directly next to the pump flange.

CAUTION!
Never use force to align piping to the pump flanges.

At a minimum, use suction pipe that is one size larger than the flange. Use an eccentric reducer to meet the suction pipe with the pump. Mount the reducer flat side up. Elbows must be a minimum of six diameters from the pump according to its long radius. A spool piece that incorporates the eccentric reducer is most helpful in inspecting the impeller and casing.

The discharge piping should include isolation and check valves. The check valve prevents excessive backpressure and keeps the pump from rotating backward. Place the check valve between the pump and isolation valve. The isolation valve is used for priming, starting, and shutting down the system. If you use pipe diameter increasers, place them between the pump and the check valve.

ALIGNMENT

The alignment at the pump and drive shaft is one of the most important considerations in the pump installation.

■ TO ALIGN THE PUMP

1. Use flexible spacer couplings to achieve proper alignment.
2. Check and adjust the parallel and angular alignment to within .005 inches prior to connecting the coupling halves.
3. Jog the motor to check rotation before connecting the shaft coupling. Its arrow should match up with the arrow on the pump.

4. Install a coupling guard when the pump is aligned.

Perform an alignment check on pumps in hot service at operating temperatures.

WARNING!
Open the discharge valve after starting the pump. Not doing so could cause dangerous heat build up.

WARNING!
Be sure the pump's motor is locked out at the starter.

ROTATION

■ TO ROTATE THE PUMP

1. Lock out power to the pump driver.
2. Remove the coupling guard and coupling.
3. Momentarily restore power and energize the motor to determine rotation.
4. Confirm that the motor rotation coincides with proper pump rotation. The proper pump rotation is counterclockwise when facing the pump's suction.

WARNING!
Operating the pump in the opposite rotation may dislodge the impeller causing severe damage to the impeller and/or casing.

5. Reinstall the coupling and coupling guard.

STUFFING BOX

Braided packing is supplied as standard equipment on all pumps. Install gland bolt nuts (353) finger tight only. Adjust the gland bolt nuts during start-up to achieve 40-65 drops of leakage per minute.

Clean and cool pumpage may be used to lubricate the packing. If the pumpage is not suitable, you must supply an external source of lubrication.

CAUTION!

Do not allow packing to run dry. It must be lubricated.

See ANSI/ASME B73.1 M-1984 for proper seal flush plans.

4. OPERATION

LUBRICATION

CAUTION!
Pumps are not shipped with oil in the bearing frame.

Ball bearings are very sensitive to over lubrication and under lubrication, both being detrimental to bearing performance. In either case, excessive heating and reduced life will result. Use a thermometer to determine overheating. Do not use the sense of touch to determine whether the pump is overheating, as it is a very poor guide.

The relationship between temperature and lubrication is an indication of performance. The tabulation shown in *Table 1* is intended to serve as an approximate guide for determining operation for standard pumps.

Table 1

	Degrees Fahrenheit		
Pumping liquid temperature	60°	200°	300°
Approximate normal line bearing temperature	115°	140°	160°

The information shown in *Table 1* is based on a room temperature of 70°F. Maximum bearing temperature is 175°F. The temperatures shown above have a tolerance of plus 15°F. It is necessary to flush water on the shaft through a flushing gland or the stuffing box seal cage when liquid temperatures are above 250°F. This can be done either through a flushing gland or the stuffing box seal cage.

Oil Lubrication

The oil in the housing reaches the bearings by means of oil slingers, which splash oil onto the bearings. Only use premium quality hydraulic oil containing anti-foam, anti-oxidation, and anti-rust additives. Do not use detergent oils. *Table 2* lists the recommended viscosity oils.

Use a 300 SSU viscosity at 100° F for applications where pumping temperatures are below 200° F. At pumping temperatures above 200° F, use 470 SSU at 100° F with optional cooler.

Table 2

Bearing Temperature	**ISO Grade**	**Oil Viscosity at 100 Degrees F**
Up to 150° F	46	215 SSU
150° F to 200° F	68	300 SSU
Above 200° F	100	470 SSU

Clark 3 pumps are equipped with sight glass (144). Over time, oil will become contaminated and lose its lubricating qualities. An oil change is recommended after the first month of operation and every six months thereafter.

Grease Lubrication

Regrease grease lubricated bearings with NLG1 No. 2 consistency grease for pumpage temperatures below 350° F and use NLG1 No. 3 for temperatures over 350° F. Regrease bearings every three months.

■ TO REGREASE LUBRICATED BEARINGS

1. Wipe dirt and foreign matter from the fittings.
2. Remove grease relief plugs from the bottom of the frame.
3. Fill grease through fittings until it comes out through the relief holes.
4. Reinstall grease relief plugs.

CAUTION!
Do not fill through the air vent opening in the top of the housing.

IMPELLER CLEARANCE

Impeller clearance is the measurement between the back of the reverse vane impeller and the stuffing box cover and the measurement between the impeller vanes and the surface of the casing. This clearance is set at .015 inches during assembly, but may need adjustment prior to initial startup. (See APPENDIX A for additional clearances and procedures for setting the clearance.)

PRIMING

Prior to starting a centrifugal pump, it is imperative that you prime the pump by flooding the suction piping and casing with fluid. You can do this by opening the suction isolation valve and the packing sealing liquid valve.

CAUTION!
Do not operate the pump without liquid in the casing.

START UP

■ TO START UP THE PUMP

1. Rotate the pump by hand, making sure that the rotating element is spinning freely.
2. Make sure the suction valve is open.

3. Partially close the discharge valve.

CAUTION!
Do not operate the pump with a closed discharge valve for an extended period of time.

4. Unlock power to the pump driver.
5. Slowly open the discharge valve as soon as the motor reaches operating speed.
6. On packed pumps, adjust the stuffing box nuts (353) to achieve leakage of 40-65 drops per minute.
   On mechanical seal pumps, follow manufacturer's instructions.
7. Adjust the discharge valve as needed while checking piping for leaks.
8. Check mechanical operation of the pump and motor.

DANGER!
Do not operate the pump without the proper guard. See ANSI/ASME B15.1-1996.

SHUT DOWN

■ TO SHUT DOWN THE PUMP

1. Gradually close the discharge valve and turn off power to the motor.
2. Lock out power to the pump driver.

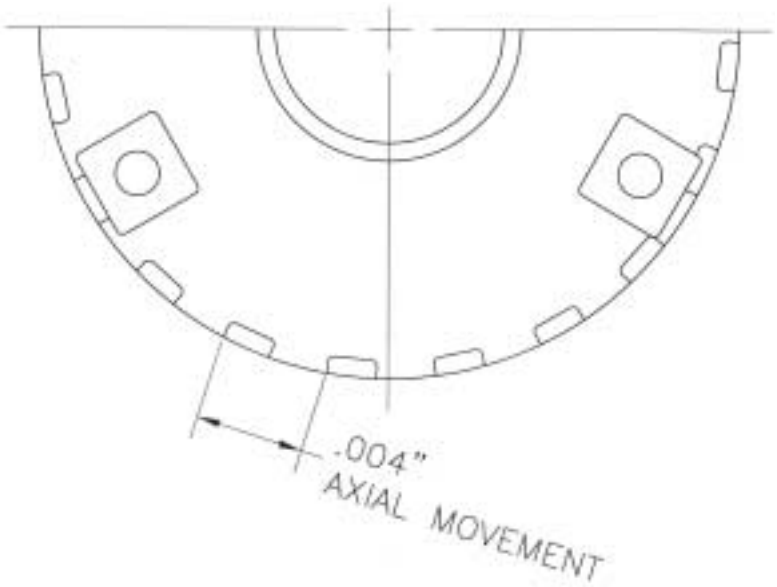
APPENDIX A - IMPELLER CLEARANCE SETTING

A gradual loss in head and/or capacity can occur. You can restore performance by adjusting the impeller clearance; which is the measurement between the back of the reverse vane impeller and the stuffing box cover and the measurement between the impeller vanes and the surface of the casing.

Table 3

Temperature		Impeller Clearance
200° F	(93° C)	.015” (.38mm)
250° F	(121° C)	.017” (.43mm)
300° F	(144° C)	.019” (.48mm)
350° F	(177° C)	.021” (.53mm)
400° F	(204° C)	.023” (.58mm)
Over 400° F	(204°+ C)	.025” (.64 mm)

Figure 1



REVERSE VANE IMPELLER CLEARANCE SETTING

■ TO SET THE REVERSE VANE IMPELLER CLEARANCE

1. Install the entire rotating assembly (including the adapter stuffing box cover and impeller) into the casing.
2. For Group 1, secure the assembly’s frame (228) to the casing using the casing studs (370) and nuts (370K). For Groups 2 and 3, secure the adapter frames (108) to the casing using the casing studs (370) and nuts (370K).

3. Loosen set screws (134A).
4. Using a wrench on one of three lugs on the face of the bearing housing (134), turn the housing counter clockwise until the impeller comes into light rubbing contact with the surface of the stuffing box cover. Rotating the shaft (122) at the same time accurately determines the zero setting.
5. Rotate the bearing housing (134) clockwise to set proper clearance. (See *Table 3* for proper settings for pumping conditions.) Rotating the housing the width of one of the indicator patterns on the bearing housing (See *Figure 1*.) moves the impeller axially 0.004 inches (0.1mm). To determine how much rotation is required, divide the desired clearance by .004.
6. Rotate the bearing housing (134) to get the desired setting. Tightening the set screws (134A) causes the impeller to move 0.002 inches (0.05mm) closer to the box cover. This must be considered when setting the clearance.
7. When you obtain the desired setting, tighten the set screws (134A) to lock the housing in place.

OPEN VANE IMPELLER CLEARANCE SETTING

■ TO SET THE OPEN VANE IMPELLER CLEARANCE

1. Install the entire rotating assembly (including the adapter stuffing box cover and impeller) into the casing.
2. For Group 1, secure the assembly's frame (228) to the casing using the casing studs (370) and nuts (370K). For Groups 2 and 3, secure the adapter frames (108) to the casing using the casing studs (370) and nuts (370K).
3. Loosen the set screws (134A).
4. Turn the bearing housing (134) clockwise until the impeller comes into light rubbing contact with the casing. Rotating the shaft (122) at the same time accurately determines the zero settings.
5. Rotate the bearing housing (134) counter clockwise to set the proper clearance. (See *Table 3* for proper settings for pumping conditions.) Rotating the housing the width of one of the indicator patterns on the bearing housing (*See Figure 1*.) moves the impeller axially 0.004 inches (0.1mm). Divide the desired clearance by 0.004 to determine how much rotation is required.
6. Rotate the bearing housing (134) the required amount to get the desired setting. Tightening the set screws (134A) causes the impeller to move 0.002 inches (0.05mm) away from the casing. This must be considered when setting the clearances. Rotate the housing (134) counter clockwise to achieve the desired clearance.
7. When you obtain the desired setting, tighten the set screws (134A) to lock the housing in place.

APPENDIX B – CENTRIFUGAL PUMP TROUBLE-SHOOTING

The following table provides possible solutions for symptoms that you could experience with your centrifugal pump.

WARNING!

Before attempting to service the pump:

1. Follow the shut down procedures.
2. Lock out the power source.
3. Allow the pump to cool.
4. Close the suction and discharge valves.
5. Drain the pump.

Table 4

CENTRIFUGAL PUMP TROUBLESHOOTING		
Symptom	**Cause**	**Solution**
Pump not delivering liquid	• Pump not primed.	• Re-prime pump.
	• Suction lift too high.	• Install shorter suction pipe.
	• Wrong direction of rotation.	• Change motor wiring.
	• Impeller clogged.	• Back-flush pump.
	• Suction line plugged.	• Remove debris.
Low flow and low head	• Air leak in stuffing box.	• Replace or adjust packing.
	• Worn suction side plate.	• Replace defective part.
	• Impeller worn or damaged.	• Inspect and replace impeller, if needed.
	• Air lead in suction line.	• Replace gasket.
	• Impeller clogged.	• Back-flush pump.
	• Wrong direction of rotation.	• Change motor wiring.

Table 4 (continued)

CENTRIFUGAL PUMP TROUBLESHOOTING		
Symptom	**Cause**	**Solution**
Pump loses prime	• Pump not primed correctly.	• Re-prime pump.
	• Air leak in suction line.	• Replace gasket or pipe plug.
	• Lantern ring in wrong location.	• Repack, moving lantern ring to correctly align with flush hole.
Bearings are running hot	• Misalignment.	• Realign drive coupling.
	• Low or insufficient lubricant.	• Check oil level and or grease.
Motor requires excessive amperage	• Stuffing box gland is too tight.	• Readjust or replace packing.
	• Total dynamic head is too low.	• Install throttle or reduce impeller diameter.
	• Rotary part rubbing stationary part.	• Adjust part or replace parts.
	• Liquid is heavier than specified.	• Check specific gravity of liquid.
Stuffing box is leaking excessively	• Stuffing box is incorrectly packed.	• Repack stuffing box.
	• Shaft sleeve is scored or worn.	• Replace shaft sleeve as required.
	• Wrong type of packing.	• Install the correct packing.
	• Shaft is bent.	• Replace shaft.
	• Worn mechanical seal parts.	• Rebuild seal; replace parts.

APPENDIX C – MAINTENANCE AND REPAIR

DISASSEMBLY PROCEDURES

(See APPENDIX D for cross-section of corresponding model.)

■ TO DISASSEMBLE YOUR PUMP

1. Lock out the power supply at the motor starter.
2. Close off valves on discharge, suction, sealing fluid, and cooling fluid.
3. Drain the casing and flush, as needed.
4. Disconnect sealing and cooling fluid lines.
5. Place lifting sling through frame to ensure safe handling during disassembly and assembly.
6. Remove coupling guard and coupling spacer.
7. Remove hexnut (370K) holding the frame adapter (108) to the casing (100).
8. Remove bolt (529) from bearing housing foot (241), saving the shims (370F).
9. Pull the frame adapter back from the casing.
10. Discard the casing cover gasket (351).
11. Take the frame assembly to bench and secure for further work.
12. Scribe the location of the coupling on the shaft (122) and remove the coupling.
13. Remove the impeller (101) from the shaft (122) while holding the shaft with a strap wrench or suitable tool that will not mark the shaft.

    Note: Threads are *right*-handed.

14. Discard the impeller gasket (412A).

    For a packed pump:

    a. Remove the packing gland nuts (353).
    b. Slide the gland toward frame (228).
    c. Remove the stuffing box cover bolts (370H).
    d. Remove the stuffing box cover (106).
    e. Remove the packing gland (107).
    f. Remove the packing (106) and lantern ring (105).

    For a mechanical seal:

    a. Remove the seal gland nuts (353).
    b. Remove the stuffing box cover bolts (370H).
    c. Remove the stuffing box cover (106).

d. Remove the mechanical seal rotating element (383) from the pump shaft sleeve by loosening the set screws and sliding off assembly.

e. Slide off shaft sleeve (126).

f. Slide off seal gland with stationary seat and o-ring gasket.

15. If the pump is oil lubricated, remove the drain plug (408A) and drain the oil from the housing (228).

16. Remove the bearing frame adapter (108) by removing the adapter bolts (370B) and separate the adapter (108) from the bearing frame (228).

Note: This step does not apply to Group 1.

17. Loosen the set screws (134A) on the outboard bearing housing (134) and unscrew the outboard bearing housing (134) from the bearing frame (228).

18. Turn the bearing housing by using a wrench on one of the three square lugs on the housing.

19. Unscrew until the assembly is free from the frame (228).

20. Discard the o-ring (360D).

21. On Group 1 and Group 2 pumps, remove the snap ring (361A). On Group 3 pumps, remove the bearing cover screws (370G), the retainer (109C), and then the bearing housing (134) by tapping with a rubber hammer.

22. Remove the bearing lock nut (136) and bearing lock washer (382).

23. Remove the inboard bearing (168A) and outboard bearing (112). Use an arbor press or bearing puller to facilitate.

Note: **Do not** use a hammer, which may cause damage to the shaft.

24. Complete the disassembly of bearing frame (228) by removing the oil plug (408A), oil, sight glass (144), vent plug (113A), and foot (241).

25. Inspect all parts for cracks, erosion, pitting, rusting, damaged threads, corrosion, or a worn shaft or sleeve.

26. Remove and replace oil seals, outboard (332A) from bearing housing (134), and inboard seal (333A), from bearing frame adapter (108).

ASSEMBLY PROCEDURES

(See APPENDIX D for cross-section of corresponding model.)

■ TO ASSEMBLE YOUR PUMP

1. Clean the bearing frame and inspect all tapped holes. Chase as needed.
2. Install oil plug (408A), oil sight glass (144), and vent plug (113A).
3. Attach foot (241) and foot shim (370F) with a foot bolt (529).
4. On oil lubricated models, install a new oil slinger (284A) on the shaft (122) if

removed during disassembly.

5. On the Group 3 model, install the bearing cover (109C) on the shaft (122).
6. Install the outboard bearing (112) on the shaft (122).

   If grease lubricated, install with shields toward the impeller end.

   If oil lubricated, there are no seals or shields.

   Press bearings onto the shaft with an arbor press or heat with an induction heater. (The induction heater method is preferred).
7. Install the lock nut (136) and lock washer (382).
   a. Place the tang of the lock washer in the shaft keyway.
   b. Tighten the lock nut with a spanner wrench until snug.
   c. Bend any of the lock washer tangs into the lock nut slots.
8. Install the inboard bearing (168A) on the shaft (122).

   If grease lubricated, install with the shield away from the impeller end.

   If oil lubricated, there should be no seals or shields.
9. Install a new outboard seal (332A) (if equipped) in the outboard bearing cover (134), in addition to a new inboard seal (333A) (if equipped) in the bearing frame (228) for Group 1 model, or in the adapter frame (108) for Groups 2 and 3 models. (See APPENDIX F for impro bearing isolator maintenance instructions.)
10. Apply a thin coating of lubricant inside the outboard bearing area of the bearing frame.
11. Install two new O-rings (496) in the outboard bearing housing (134).
12. Slide the bearing housing (134) over the outboard bearing (112).
13. On Group 1 and 2 pumps, slide the snap ring (361A) in place with the slat side toward the bearing, and snap it into its groove in the bearing housing (134).
14. On Group 3 pumps, slide the bearing retainer (109C) against the bearing, and install and tighten the retainer bolts (370G).
15. Install the shaft assembly in the bearing frame (228).
    a. Be sure to oil lubricate the O-rings and threads on the bearing housing (134) before installing the housing in the bearing frame (228).
    b. Thread the bearing housing (134) into the bearing frame (228).
    c. Turn the housing clockwise to start the threads and continue turning until the bearing housing flange is approximately 1/8 inch (3mm) from the housing.
    d. Loosely install the set screws (134A).
16. On Group 2 and 3 pumps:
    a. Assemble the bearing frame adapter (108) to the bearing frame (228).

b. Install a new O-ring (360D).

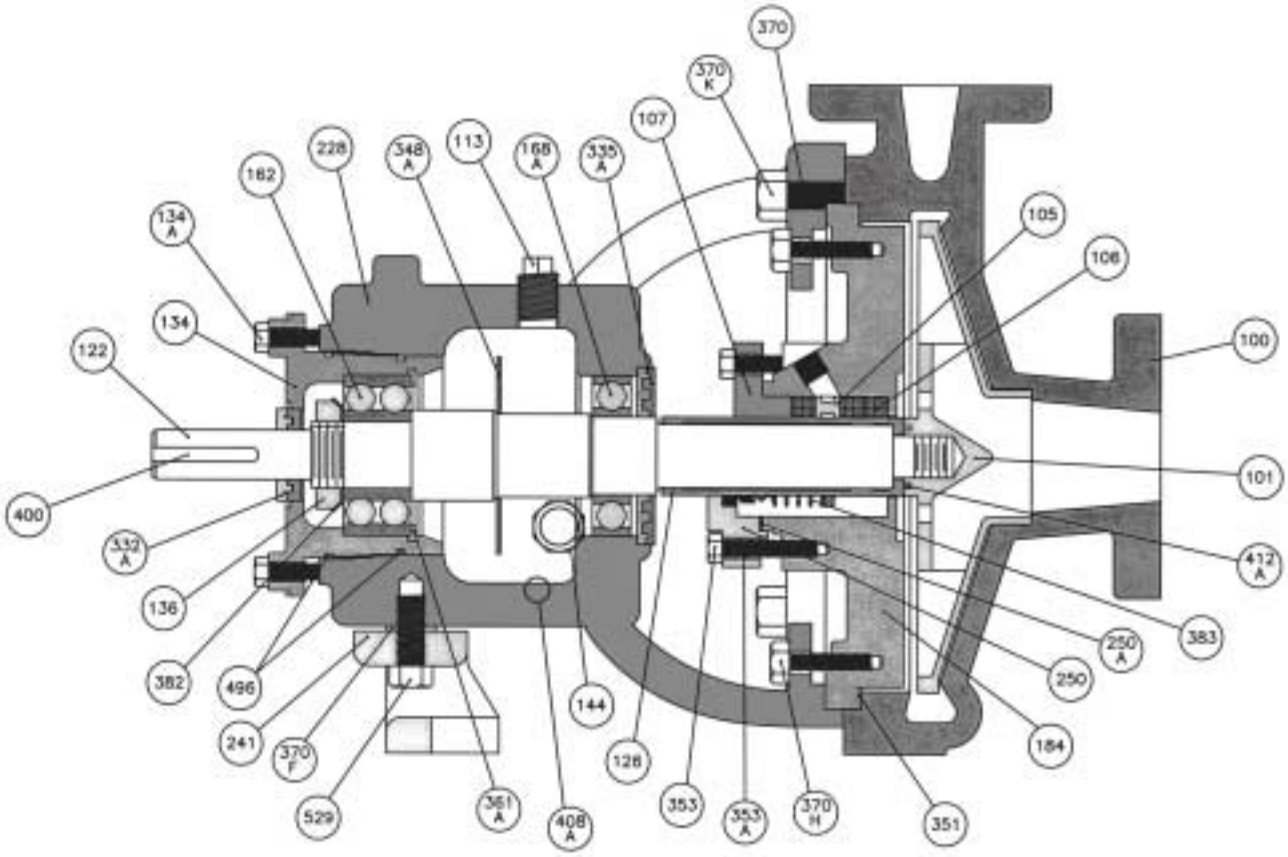
c. Insert the bearing adapter bolts (370B) through the adapter, into the bearing frame (228).

17. If the pump shaft is equipped with a sleeve (126), slide it into place on the impeller end of the shaft (122).

18. Pump assembly is ready for wet end assembly. (See APPENDIX E for instructions.)

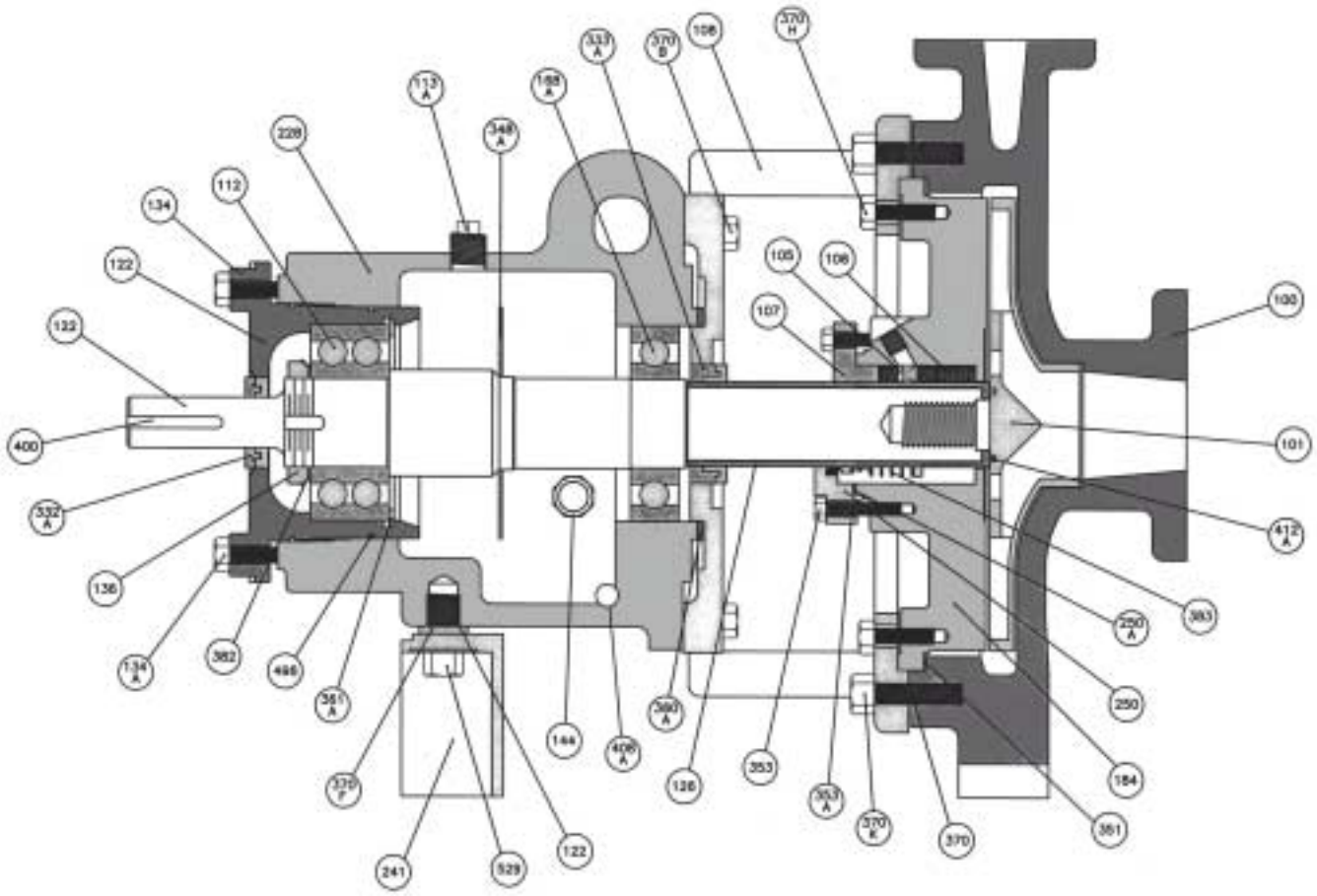
APPENDIX D – PUMP CROSS SECTIONS AND PARTS LISTS

SUMMIT CLARK 3 PUMP - GROUP 1 CROSS SECTION



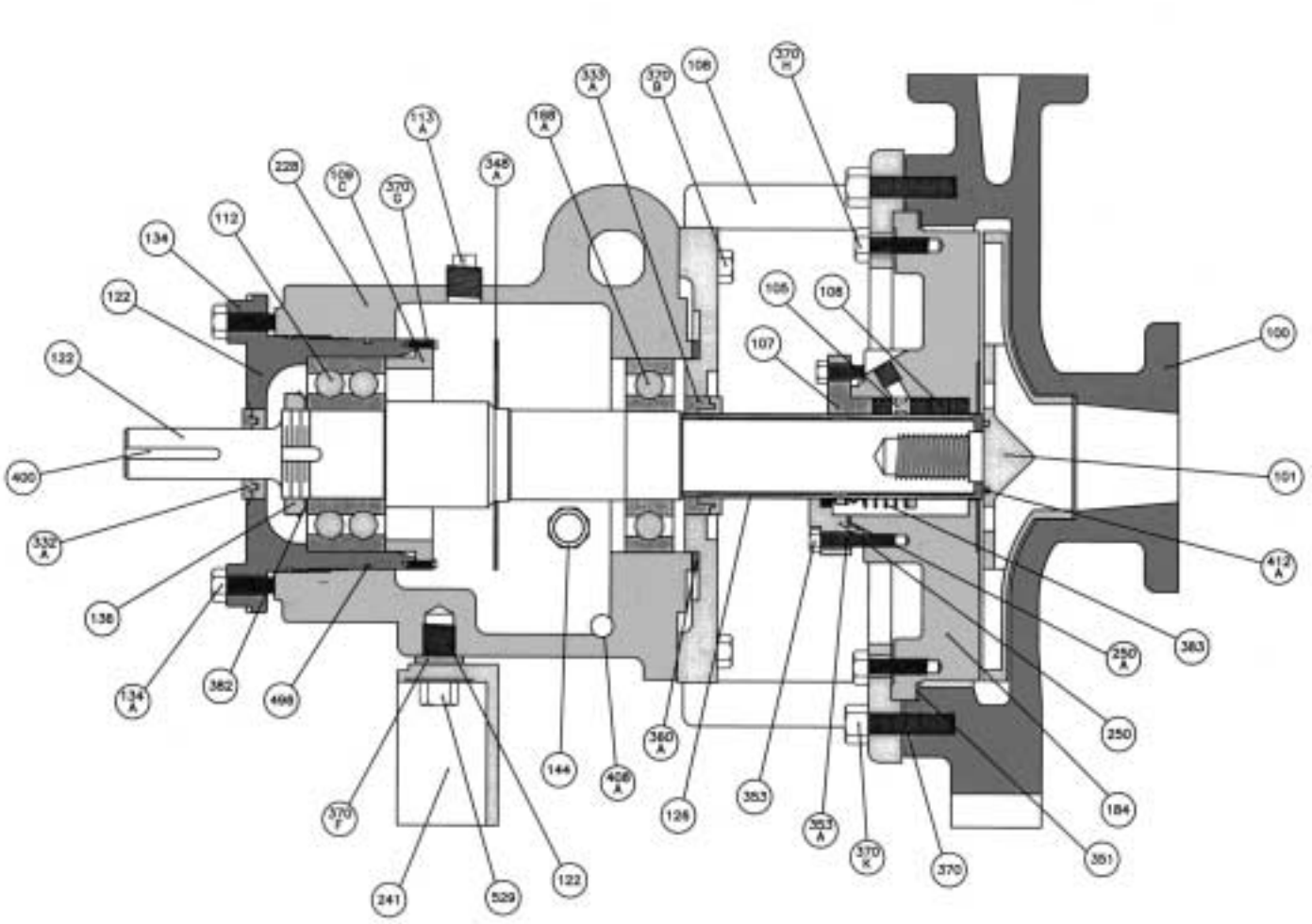
SUMMIT Clark 3 Group 1 Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
100	Casing	228	Bearing Housing	382	Lockwasher - Bearing
101	Impeller	241	Bearing Housing Foot	383	Mechanical Seal
105	Packing Seal Cage Halves	250	Gland - Mechanical Seal	400	Key - Shaft/Coupling
106	Packing	250A	Gland Gasket	408A	Bearing Housing Drain Plug
107	Gland - Packing	332A	Big Isolator - Outboard	412A	Impeller Gasket
113	Bearing Housing Vent Plug	335A	Big Isolator - Inboard	496	O-Ring - Bearing Carrier
122	Shaft	348A	Oil Slinger (optional)	529	Capscrew - Foot
126	Hook Sleeve (optional)	351	Rear Cover Gasket		
134	Bearing Carrier	353	Hexnut - Gland		
134A	Set Screw - Bearing Carrier	353A	Stud - Gland		
136	Locknut - Bearing	361A	Bearing Carrier Retainer		
144	Sight Cage - Bearing Housing	370	Stud - Casing		
162	Bearing Outboard	370F	Shim		
168A	Bearing Inboard	370H	Capscrew - Cover/Adapter		
184	Rear Cover Plate	370K	Hexnut - Casing		

SUMMIT CLARK 3 PUMP - GROUP 2 CROSS SECTION



SUMMIT Clark 3 Group 2 Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
100	Casing	184	Rear Cover Plate	370F	Shim
101	Impeller	228	Bearing Housing	370H	Capscrew - Cover/Adapter
105	Packing Seal Cage Halves	241	Bearing Housing Foot	370K	Hexnut - Casing
106	Packing	250	Gland - Mechanical Seal	382	Lockwasher - Bearing
107	Gland - Packing	250A	Gland Gasket	383	Mechanical Seal
108	Bearing Housing Adapter	332A	Big Isolator - Outboard	400	Key - Shaft/Coupling
112	Bearing Outboard	333A	Big Isolator - Inboard	408A	Bearing Housing Drain Plug
113A	Bearing Housing Vent Plug	348A	Oil Slinger (optional)	412A	Impeller Gasket
122	Shaft	351	Rear Cover Gasket	496	O-Ring - Bearing Carrier
126	Hook Sleeve (optional)	353	Hexnut - Gland	529	Capscrew - Foot
134	Bearing Carrier	353A	Stud - Gland		
134A	Set Screw - Bearing Carrier	360D	O-Ring – Adapter/Frame		
136	Locknut - Bearing	361A	Bearing Carrier Retainer		
144	Sight Cage - Bearing Housing	370	Stud - Casing		
168A	Bearing Inboard	370B	Capscrew - Bearing Housing		

SUMMIT CLARK 3 PUMP - GROUP 3 CROSS SECTION



SUMMIT Clark 3 Group 3 Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
100	Casing	168A	Bearing Inboard	370B	Capscrew - Bearing Housing
101	Impeller	184	Rear Cover Plate	370F	Shim
105	Packing Seal Cage Halves	228	Bearing Housing	370G	SOC-Capscrew Clamp
106	Packing	241	Bearing Housing Foot	370H	Capscrew - Cover/Adapter
107	Gland - Packing	250	Gland - Mechanical Seal	370K	Hexnut - Casing
108	Bearing Housing Adapter	250A	Gland Gasket	382	Lockwasher - Bearing
109C	Clamp Ring Bearing Housing	332A	Big Isolator - Outboard	383	Mechanical Seal
112	Bearing Outboard	333A	Big Isolator - Inboard	400	Key - Shaft/Coupling
113A	Bearing Housing Vent Plug	348A	Oil Slinger (optional)	408A	Bearing Housing Drain Plug
122	Shaft	351	Rear Cover Gasket	412A	Impeller Gasket
126	Hook Sleeve (optional)	353	Hexnut - Gland	496	O-Ring - Bearing Carrier
134	Bearing Carrier	353A	Stud - Gland	529	Capscrew - Foot
134A	Set Screw - Bearing Carrier	360D	O-Ring – Adapter/Frame		
136	Locknut - Bearing	361A	Bearing Carrier Retainer		
144	Sight Cage - Bearing Housing	370	Stud - Casing		

APPENDIX E – PACKING / MECHANICAL SEAL

PACKED TYPE PUMPS

1. Install the stuffing box cover plate (184) into the bearing frame housing (228) on Group 1 models. On Group 2 or 3 models, install the stuffing box cover plate (184) into the bearing adapter frame (108) using frame and adapter bolts (370B).
2. Install the impeller (101) with a new gasket O-ring (412A). (See *Impeller Clearance Setting Instructions* on page 9.)
3. Using an impeller wrench or strap wrench on the coupling end of the shaft, tighten the impeller by rotating it clockwise, making certain it is tight.
4. Install the appropriate packing (106) in the stuffing box as determined by the fluid being pumped.
   a. First, insert two rings of packing into the bottom of the box.
   b. Next, insert the lantern ring (105) while staggering the packing joints and lantern ring joint by 90 degrees. Make sure that the lantern ring lines up with the flushing connection.
   c. Install the remaining two rings of packing.
   d. Slide the gland (107) into the stuffing box and screw on the gland nuts (353). Lightly snug up the nuts. Final adjustments can be made after the pump is in operation.

MECHANICAL SEAL PUMPS

Steps 1 through *5* are the same as above. The seal assembly on the shaft or shaft sleeve is per each seal manufacturer's instructions for the specific model of seal.

Note: The seal assembly instructions differ for each manufacturer's model or type. Please follow their instructions for installation. After installation, follow *Steps 1* through *3* above. Be sure all flush or seal cooling lines are installed and working. Remember that the impeller clearance is set in *Step 2* and cannot be changed without resetting the seal.

INSTALLING PULL BACK ASSEMBLY (ALL MODELS)

1. Inspect the casing, clean the gasket surface, and install the new gasket (351).
2. Slide the assembly into the casing (100).
3. Install the casing bolts (370). Use anti-seize compound on the stuffing box cover. Then bolt into place.
4. Set the impeller clearance and rotate the shaft. (See APPENDIX A.) If rubbing occurs, determine the cause and correct it.
5. Install the flushing lines, pans, piping, and seal pieces.

6. Lubricate the pump (per instructions on pages 6 and 7).
7. Install the drive coupling and align the pump and motor shafts.
8. Connect the coupling halves.

Follow normal plant start-up procedures for locked out equipment.

APPENDIX F – MAINTENANCE INSTRUCTIONS FOR IMPRO/SEAL® "VBX" BEARING ISOLATORS

DETAILS OF OPERATIONS

The Impro Bearing Isolator is a Labyrinth type seal, which performs two functions:

1. Maintains the clean oil in the bearing housing.
2. Keeps contaminates from entering the bearing housing.

The unit is comprised of three major components: the **rotor**, the **stator**, and the "**VBX**" ® **ring**.

The **rotor** fits over the shaft and is held in place by an elastometric drive ring. The drive ring causes the rotor to turn with the shaft and also provides a positive static seal on the shaft. There is no metal to metal contact between the shaft and rotor, thus no wear and friction concerns.

The **stator** is held in the housing by a nominal .002" interference fit. An o-ring gasket on the outside diameter of the stator secures a positive seal between the stator and the housing bore. The designed Labyrinth grooves and lube return trough on the stator inside diameter retains the lubricant inside the bearing housing.

The rotor and stator act together to keep contamination out of the bearing housing.

The "VBX" ® ring, stator, and rotor are a unit and must not be pulled apart. If the unit is pulled apart or comes apart, it must be replaced with a new unit. The "VBX" ® is intended to be an inseparable design.

Repairs or replacement of seals are only necessary if excessive oil leakage is visible. If or when the bearing housing is disassembled, it is recommended that the rotor o-rings be replaced.

DISASSEMBLY PROCEDURES

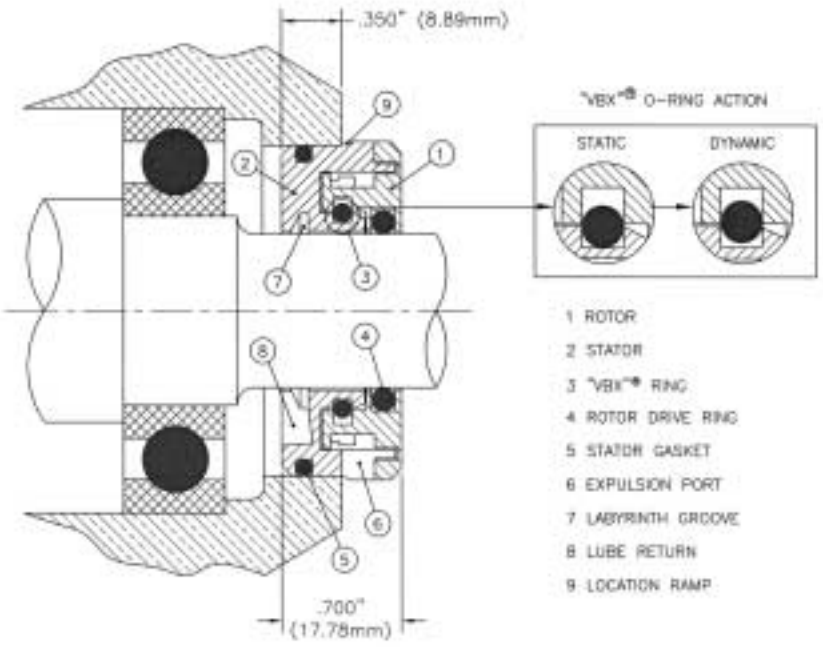
1. Remove shaft assembly (122) per instructions for pump disassembly. (See page 13.)
2. Group 1 removal. Insert a bar (wood or plastic) through the outboard bearing housing end of the bearing frame (228). Contact the inboard bearing isolator (333A). Remove by tapping the bar or pushing with an arbor press.

   Groups 2 and 3 removal. Disassemble the bearing frame adapter (108) per pump disassembly instructions. Remove the inboard bearing isolator (333A) with a bar (wood or plastic) by tapping or by pushing with an arbor press.
3. Groups 1, 2, and 3 Outboard Bearing Isolator (332A) removal. Block up the outboard bearing housing (134) on the bench, coupling the end toward the bench top. Tap the isolator out of the housing or use an arbor press.
4. Inspect the bearing isolators. If the unit pulls apart, a new isolator is needed for reassembly.
5. Replace the rotor 0-rings and stator 0-rings each time the units are removed from the pump assembly.

INSTALLATION PROCEDURES

1. Group 1, 2, and 3 Inboard Isolator. Position the bearing frame (228) or adapter (108) inboard bearing side up. Place the isolator seal (333A) stator side in the bore. THE EXPULSION PORT MUST BE IN THE 6 O'CLOCK POSITION. While using a block large enough to cover the entire flange of the isolator, use an arbor press to press the stator into the bore. Press into place until the location ramp begins. (See *Figure 2*.)

Figure 2

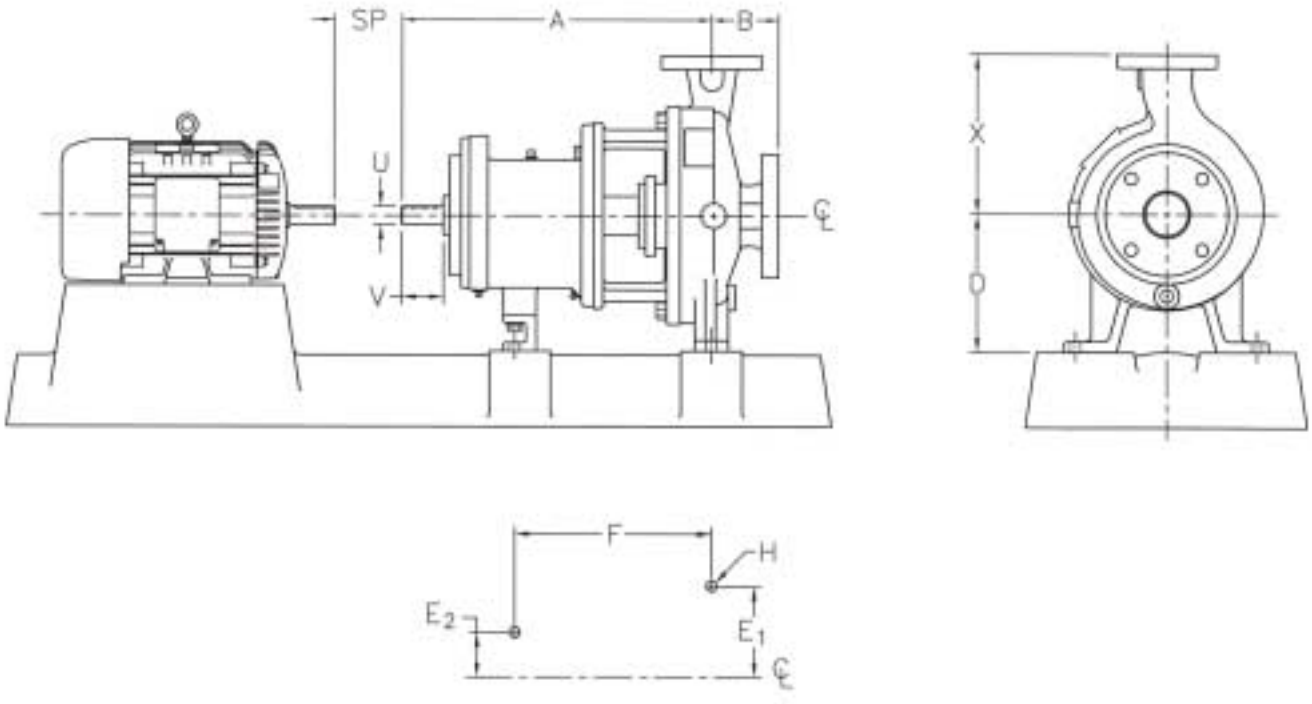


2. Outboard Isolator (332A). Position the bearing housing (134) outside flange up. Place the isolator in the bore and press into place using the same technique as in *Step 1* above.
3. Lightly lube the sleeve end of the shaft and rotor drive ring. Slide the bearing frame (228) or adapter (108) over the shaft per assembly instructions.
4. To assemble the outboard end, tape the shaft (122) keyway with black tape. Lube the tape and rotor drive ring. Slide the bearing housing (134) over the shaft (122) end and continue per assembly instructions.

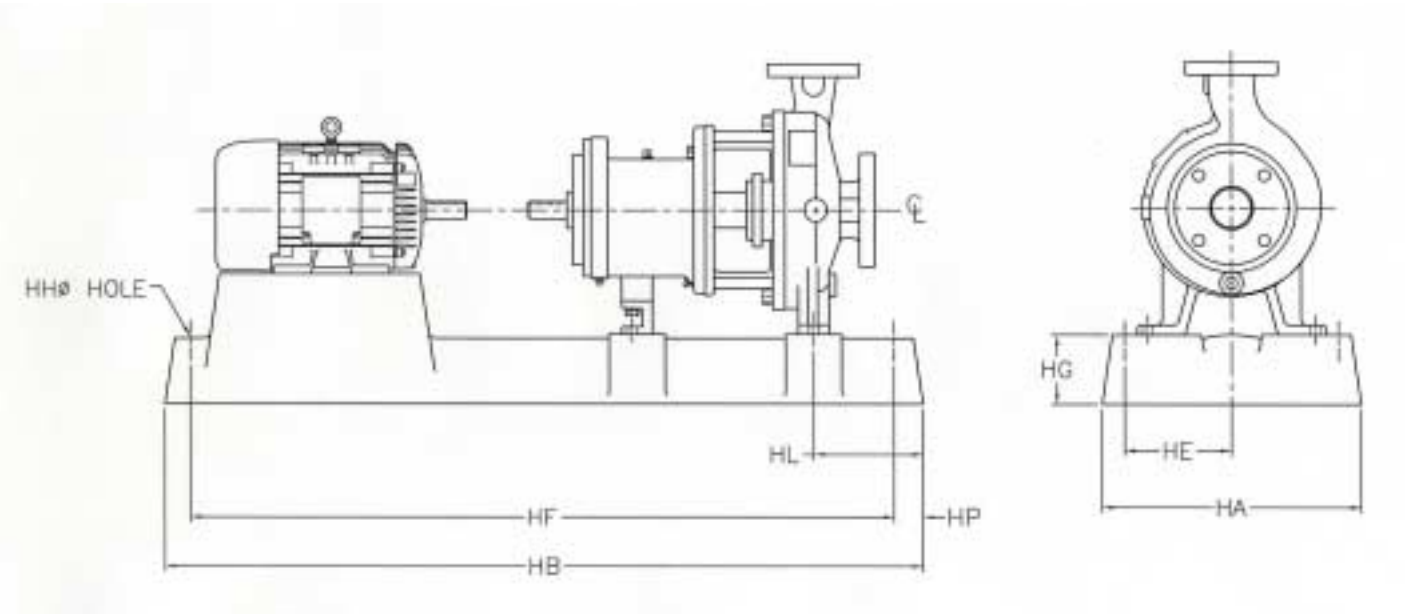
MAKE SURE EXPULSION PORT AND LUBE RETURN ARE IN THE 6 O'CLOCK POSITION IN FINAL ASSEMBLY.

APPENDIX G – DIMENSIONAL DATA

MODEL CLARK 3 DIMENSIONAL DATA



DIMENSIONS																
PUMP FRAME	ANSI	SIZE			X	D	B	A	SP	FOOT PATTERN				SHAFT		
		DIS	SUC	IMP						E1	E2	F	H	U	KEYWAY	V
GROUP 1	AA	1	1.5	6	6 1/2	5 1/4	4	13 1/2	3 3/4	3	0	7 1/4	5/8	.875	3/16 X 3/32	2
	AB	1.5	3	6												
		2	3	6												
	AA	1	1.5	8												
	AB	1.5	3	8												
GROUP 2	A60	2	3	8	9 1/2	8 1/4	4	19 1/2	3 3/4	4 7/8	3 5/8	12 1/2	5/8	1.125	1/4X1/8	2 5/8
	A70	3	4	8	11											
	A70	3	4	8G	11											
	A05	1	2	10	8 1/2											
	A50	1.5	3	10	8 1/2											
	A60	2	3	10	9 1/2											
	A70	3	4	10	11											
	A40	3	4	10H	12 1/2											
	A80	4	6	10	13 1/2											
	A80	4	6	10H	13 1/2											
	A20	1.5	3	13	10 1/2											
	A30	2	3	13	11 1/2											
	A40	3	4	13	12 1/2											
	A80	4	6	13	13 1/2											
GROUP 3	A90	6	8	13	16	14 1/2	6	27 7/8	5 1/4	8	4 1/2	18 3/4	7/8	2.375	5/8 X 5/16	4
	A100	8	10	13	18											
	A110	6	8	15	18											
	A120	8	10	15	19											
	A120	8	10	15G	19											



BASEPLATE RELATED DIMENSIONS										
PUMP FRAME	**BASEPLATE NUMBER**	**MAX MOTOR FRAME**	**HA**	**HB**	**HE**	**HF**	**HP**	**HG**	**HH**	**HL**
GROUP 1	1	145	10	35	4	32 1/2	1 1/4	3	3/4	4 1/2
	2	215	12	39	4 1/2	36 1/2	1 1/4	3 1/4	3/4	4 1/2
	3	286	15	46	6	43 1/2	1 1/4	4 1/8	3/4	4 1/2
GROUP 2	4	215	12	45	4 1/2	42 1/2	1 1/4	3 3/4	3/4	4 1/2
	5	286	15	52	6	49 1/2	1 1/4	4 1/8	3/4	4 1/2
	6	365	18	58	7 1/2	55 1/2	1 1/4	4 3/4	1	4 1/2
	7	444	18	60	7 1/2	57 1/2	1 1/4	4 3/4	1	4 1/2
GROUP 3	8	286	26	62	9 1/2	59 1/2	1 1/4	4 3/4	1	6 1/2
	9	365	22	68	9 1/2	65 1/2	1 1/4	4 3/4	1	6 1/2
	10	447	22	80	9 1/2	77 1/2	1 1/4	4 3/4	1	6 1/2