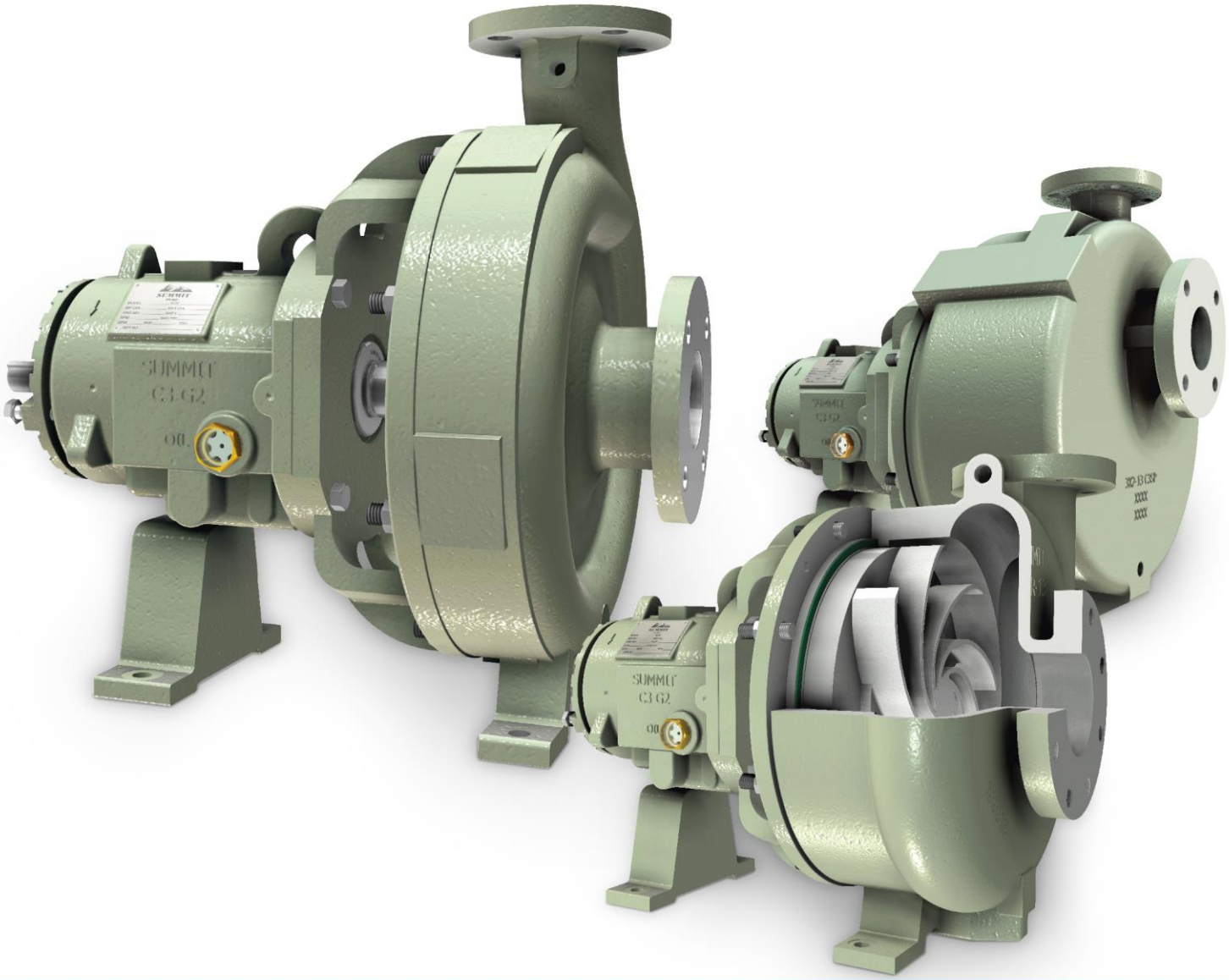
SUMMIT™ CLARK 3

Installation, Operation, and Maintenance Manual



ANSI Standard Process Pump

SUMMIT™ PUMP, Inc

www.SUMMITPUMP.com

1. GENERAL INFORMATION

1.1 WARRANTY

Pumping units assembled by Summit Pump, 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 Summit Pump, 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 Summit Pump, 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 Summit Pump, Inc.

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

1.2 LIABILITY

Summit Pump, Inc. shall not be liable for personal physical injury, damage or delays caused by failure to follow the instructions and procedures for installation, operation and maintenance contained in this manual.

The equipment is not for use in or with any nuclear facility or fire sprinkler system. Buyer accepts the responsibility for insuring that the equipment is not used in violation and Buyer shall indemnify and hold Seller harmless from any and all liability (including such liability resulting from seller's negligence) arising out of said improper use.

1.3 COPYRIGHT

The information contained herein is for informational use only and is subject to change without notice. Summit Pump assumes no responsibility or liability for any errors or inaccuracies that may appear in this manual.

2. CONTENTS

3. INTRODUCTION

This installation, operation, and maintenance manual is designed to help you achieve the best performance and longest life from your Summit C3 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 C3 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:

⚠ DANGER

Imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Includes Information on operation, maintenance, rules or directions. May indicate possible property damage.

4. RECEIPT AND STORAGE

4.1 RECEIVING THE PUMP

⚠ DANGER

Use proper lifting techniques to avoid serious personal injury or death

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

4.2 STORING THE PUMP

Store the pump in a clean dry place. **Do not remove flange covers**. Rotate the pump shaft by hand **at least once per week** to maintain a protective film of oil or grease on the bearings. If you anticipate long-term storage, special treatment is available for purchase from Summit Pump, Inc.

5. INSTALLATION

5.1 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.

5.2 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)

5.3 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.

⚠ DANGER

Lock out driver power before beginning work on pump

⚠ CAUTION

Never use force to align piping to pump flanges

⚠ WARNING

Never operate pump with suction valve closed

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.

⚠ WARNING

Never operate pump with closed discharge valve; unless starting pump

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.

5.4 ALIGNMENT

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

⚠ DANGER

Lock out driver power before beginning work on pump

5.4.1 Pump Alignment

1. Use flexible spacer couplings to achieve proper alignment.
2. Check and adjust the parallel and angular alignment to within coupling manufacturer's alignment recommendations prior to connecting the coupling halves.
3. Jog the motor to check rotation before connecting the shaft coupling. Rotation should be in a clockwise direction when looking from the drive end.
4. Install a coupling guard when the pump is aligned.

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

⚠ DANGER

Lock out driver power before beginning work on pump

⚠ WARNING

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

5.5 ROTATION

5.5.1 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 clockwise when viewed from the motor end.

⚠ CAUTION

Operation in reverse rotation may dislodge impeller causing severe damage to impeller and/or casing

5. Reinstall the coupling and coupling guard.
6. Unlock power to pump driver.

5.6 STUFFING BOX

This pump is shipped:

1. Empty box (No seal or packing).
2. Mechanical seal.
3. Packed with braided packing.

Clean and cool pumped liquid may be used to lubricate the packing. Before starting the pump be sure the mechanical seal or packing, is in place and lubricated. If the pumped liquid is not suitable, you must supply an external source of lubrication. If packed, adjust gland hexnuts (353) finger tight only. Adjust gland bolts during startup to achieve 40 to 65 drops per minute. If mechanical sealed, seal water flow should be to seal manufacturer's instructions.

NOTICE

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

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

6. OPERATION

6.1 LUBRICATION

⚠ CAUTION

Pumps are shipped from the manufacturer **WITHOUT** oil. Oil must be installed before operation

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.

The relationship between temperature and lubrication is an indication of performance. The tabulation shown in Table 6-1 is intended to serve as an approximate guide for determining operation for standard pumps.

Table 6-1: Liquid to Bearing temperature

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

The information shown in Table 6-1 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 rear cover plate seal cage when liquid temperatures are above 250°F. This can be done either through a flushing gland or the rear cover plate seal cage.

6.1.1 Oil Lubrication

The oil in the housing reaches the bearings by means of oil slingers (optional), which splash oil onto the bearings. Standard lubrication is oil bath. Only use premium quality hydraulic oil containing anti-foam, anti-oxidation, and anti-rust additives. Do not use detergent oils. Table 6-2 lists the recommended viscosity oils. See Appendix H for some acceptable lubricants.

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.

Fill bearing housing with oil until oil level reaches the center of the “bullseye” in the sight glass.

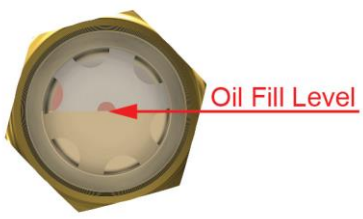


Figure 6-1: Oil Sight Glass

Table 6-2: Oil grade for Temperature

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

C3 pumps are equipped with sight gauge (319). Over time, oil will become contaminated and lose its lubricating qualities. An oil change is recommended after 200 hours or the first month of operation and every three months or 2000 hours whichever comes first.

6.1.2 Constant Level Oiler

Oilers are standard with the Clark 2 model pumps. The correct oil level is achieved using the constant level oiler connected to the NPT connection to the bearing frame. This sets the oil level at the top of the NPT port on the bearing frame.

To ensure oil is at the proper level, oil must always be visible in the bottle of the constant level oiler.

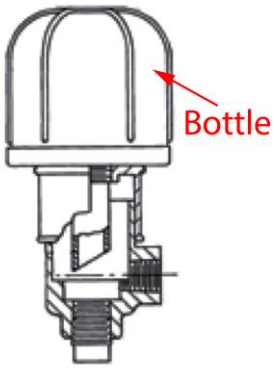


Figure 6-2: Constant Level Oiler

6.1.3 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.

6.1.4 Regrease 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.

NOTICE
Do not fill through the air vent opening located on top of the housing

6.2 IMPELLER CLEARANCE

⚠ CAUTION

Check impeller clearance prior to starting. Setting may have changed during transit.

⚠ DANGER

Lock out driver power before beginning work on pump

Impeller clearance is the measurement between the back of the reverse vane impeller and the rear cover plate or for open impellers the measurement between the impeller vanes and the casing. This clearance is set at 0.015 inches during assembly, but may need adjustment prior to initial startup. (See Section 7 APPENDIX A - IMPELLER CLEARANCE SETTING for additional clearances and procedures for setting the clearance.)

6.3 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 liquid flush valve.

⚠ CAUTION

Do not operate pump without liquid in casing

6.4 START UP

⚠ DANGER

Do not operate pump without proper guard.

See ANSI/ASME B15.1-1996

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.

⚠ WARNING

Never operate pump with closed discharge valve; unless starting pump

4. Unlock power to the pump driver

5. Following proper plant lockout procedures start the pump driver per manufacturer's start up procedure.
6. Slowly open the discharge valve as soon as the motor reaches operating speed.
7. On packed pumps, adjust the rear cover plate hexnuts (353) to achieve leakage of 40-65 drops per minute. On mechanical seal pumps, follow manufacturer's instructions.
8. Adjust the discharge valve as needed while checking piping for leaks.
9. Check mechanical operation of the pump and motor.

6.5 SHUT DOWN

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

7. 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 for reverse vane impellers is the measurement between the back of the impeller and the rear cover plate and the for open vane impellers is the measurement between the impeller vanes and the casing.

Table 7-1: Impeller Clearance Values

Temperature	Impeller Clearance
Below 200° F	0.018" ± 0.003 (0.46 mm ± 0.08)
200° F to ≤ 250° F	0.021" (0.53 mm)
251° F to ≤ 300° F	0.024" (0.61 mm)
301° F to ≤ 350° F	0.027" (0.69 mm)
351° F to ≤ 400° F	0.030" (0.76 mm)
401° F to ≤ 450°	0.033" (0.84 mm)
Over 450° F	0.036" (0.91 mm)

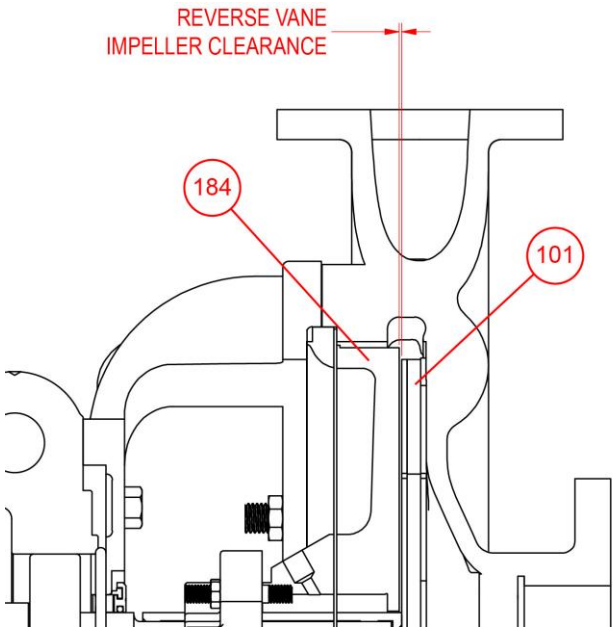


Figure 7-1: Reverse vane impeller clearance

7.1 REVERSE VANE IMPELLER CLEARANCE SETTING

1. Install the entire rotating assembly (including the adapter, rear cover plate, gasket and impeller) into the casing.
2. For Group 1, secure the assembly's bearing housing (228) to the casing using the casing studs (370J) and hexnuts (370K). For Groups 2 and 3, secure the bearing housing adaptor (108) to the casing using the casing studs (370J) and hexnuts (370K).
3. Loosen set screws (500).
4. Using a wrench on one of three lugs on the face of the bearing carrier (134), turn the bearing carrier (134) counter clockwise until the impeller comes into light rubbing contact with the surface of the rear cover plate. Rotating the shaft (122) at the same time accurately determines the zero setting.

5. Rotate the bearing carrier (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 A-2.*) moves the impeller axially 0.004 inches (0.1mm). To determine how much rotation is required, divide the desired clearance by .004.

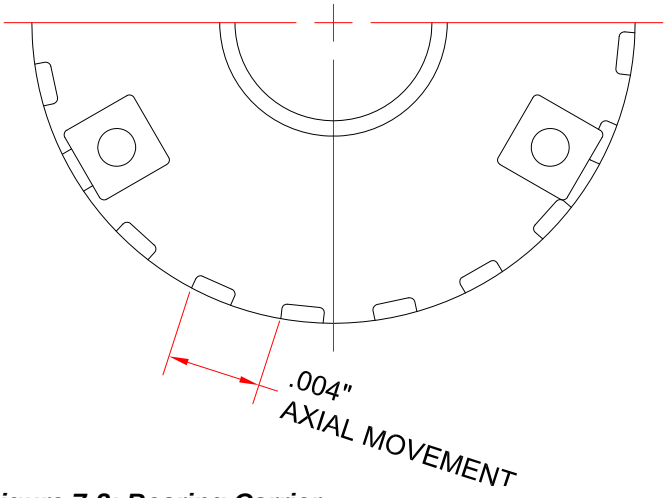


Figure 7-2: Bearing Carrier

6. Tightening the set screws (500) causes the impeller to move approximately 0.002 inches (0.05mm) closer to the rear cover plate. This must be considered when setting the clearance.
7. When you obtain the desired setting, tighten the set screws (500) to lock the housing in place.

7.2 OPEN VANE IMPELLER CLEARANCE SETTING

1. Install the entire rotating assembly (including the adapter rear cover plate and impeller) into the casing.
2. For Group 1, secure the assembly's bearing housing (228) to the casing using the casing studs (370J) and hexnuts (370K). For Groups 2 and 3, secure the bearing housing adaptor (108) to the casing using the casing studs (370J) and hexnuts (370K).
3. Loosen the set screws (500).
4. Turn the bearing carrier (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 carrier (134) counter clockwise to set the proper clearance. (See Table 7-1 for proper settings for pumping conditions.) Rotating the housing the width of one of the indicator patterns on the bearing housing (See Figure 7-2.) moves the impeller axially 0.004 inches (0.1mm). Divide the desired clearance by 0.004 to determine how much rotation is required.
6. Tightening the set screws (500) causes the impeller to move 0.002 inches (0.05mm) away from the casing. This must be considered when setting the clearances.
7. When you obtain the desired setting, tighten the set screws (500) to lock the housing in place.

8. APPENDIX B – CENTRIFUGAL PUMP TROUBLE-SHOOTING

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

⚠ WARNING

Before pump service:

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

Drain the pump

Table 8-1: Troubleshooting

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 rear cover plate.	• 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.

CENTRIFUGAL PUMP TROUBLESHOOTING (continued)		
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	• Rear cover plate gland is too tight.	• Readjust or replace packing.
	• Total dynamic head is too low.	• Reduce impeller diameter.
	• Rotary part rubbing stationary part.	• Adjust part or replace parts.
	• Liquid is heavier than specified.	• Check liquid viscosity. • Check Specific Gravity.
Rear cover plate is leaking excessively	• Rear cover plate is incorrectly packed.	• Repack rear cover plate.
	• 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.

9. APPENDIX C – MAINTENANCE AND REPAIR

⚠ WARNING

WEAR EYE PROTECTION. Failure to do so can result in serious injury

9.1 DISASSEMBLY PROCEDURES

See Section 10 APPENDIX D – PUMP CROSS SECTIONS AND PARTS LISTS for cross-section of corresponding model for pump disassembly reference.

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.

⚠ DANGER

Use proper lifting techniques to avoid serious personal injury or death

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).
8. Remove bolt (370) from bearing housing foot (109), saving the foot shims (370F).
9. Pull the bearing housing (228) back from the casing.
10. Discard the rear cover gasket (351).
11. Take the bearing housing assembly to bench and secure for further work.
12. Scribe the axial location of the coupling on the shaft (122) and remove the coupling.

⚠ WARNING

Never use heat to remove impeller.

Adding heat to a pressure vessel can cause an explosion resulting in personal injury or death

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.

NOTICE
Threads are right handed

14. Discard the impeller gasket (412A).

    For a packed pump:

    a. Remove the packing gland hex nuts (353).
    b. Slide the packing gland (107) toward bearing housing (228).
    c. Remove the cover to adaptor capscrew (370H).
    d. Remove the rear cover plate (184).
    e. Remove the packing (106) and lantern ring (105).
    f. Remove the packing gland (107).

    For a mechanical seal:

    a. Remove the seal gland hex nuts (353).
    b. Remove the cover to adaptor capscrew (370H).
    c. Remove the rear cover plate (184).
    d. Remove the mechanical seal rotating element 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 (408) and drain the oil from the bearing housing (228).
16. Remove the bearing housing adaptor (108) by removing the adapter to housing bolts (370B) and separate the bearing housing adapter (108) from the bearing housing (228).

NOTICE
This step does not apply to Group 1

17. Loosen the set screws (500) on the outboard bearing carrier (134) and unscrew the outboard bearing carrier (134) from the bearing housing (228). Turn the bearing housing by using a wrench on one of the three square lugs on the carrier. Unscrew until the assembly is free from the bearing housing (228).

18. Discard the o-rings (496).
19. On Group 1 and Group 2 pumps, remove the retainer (506). On Group 3 pumps, remove the bearing cover bolts (370G), the retainer (506), and then the bearing carrier (134) by tapping with a rubber hammer.
20. Remove the bearing locknut (136) and bearing lock washer (382).
21. Remove the inboard bearing (503) and outboard bearing (502). Use an arbor press or bearing puller to facilitate.

NOTICE
DO NOT use a hammer which may cause damage to the shaft and bearings

22. Complete the disassembly of bearing housing (228) by removing the drain plug (408), oil, sight gauge (319), filler plug (113), and bearing housing foot (109).
23. Inspect all parts for cracks, erosion, pitting, rusting, damaged threads, corrosion, or a worn shaft or sleeve.
24. Groups 1, 2, and 3. Remove and replace laby seals outboard (332A) from bearing carrier (134). Group 1 remove inboard laby seal (333A) from bearing housing (228). Groups 2 and 3 remove inboard laby seal (333A) from bearing housing adaptor (108).

9.2 ASSEMBLY PROCEDURES

See APPENDIX D for cross-section of corresponding model for pump disassembly reference.

15. Clean the bearing frame and inspect all tapped holes. Chase as needed.
16. Install drain plug (408), oil sight gauge (319), and filler plug (113).
17. Attach bearing housing foot (109) and foot shim (370F) with a foot bolt (370).
18. On oil lubricated models, install a new oil slinger (248A) on the shaft (122) if removed during disassembly.
19. Group 1 and 2 install retainer (506) on the shaft (122). On Group 3 install clamp ring (501), followed by the bearing retainer (506).
20. Install the outboard bearing (502) on the shaft (122).

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

    If oil lubricated, there are no seals or shields.
21. Press bearings onto the shaft with an arbor press or heat with an induction heater. (The induction heater method is preferred).

⚠ WARNING

WEAR INSULATED GLOVES when using heater. Bearings become extremely hot.

22. Install the locknut (136) and bearing lock washer (382).
    a. Place the tang of the lock washer in the shaft keyway.
    b. Tighten the locknut (136) with a spanner wrench, Group 1 torque 20 ftlb +5/-0, Group 2 torque 40 ftlb +5/-0, Group 3 torque 70 ftlb +5/-0.
    c. Bend any of the lock washer tangs into the lock nut slots.
23. Install the inboard bearing (503) 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.
24. Install a new laby seal (332A) (if equipped) in the outboard bearing carrier (134), in addition to a new inboard laby seal (333A) (if equipped) in the bearing housing (228) for Group 1 model, or in the bearing housing adaptor (108) for Groups 2 and 3 models. (See APPENDIX F for Labyrinth bearing isolator maintenance instructions.)
25. Apply a thin coating of lubricant inside the outboard bearing area of the bearing frame.
26. Install two new O-rings (496) in the outboard bearing carrier (134).
27. Slide the bearing carrier (134) over the outboard bearing (502).
28. On Group 1 and 2 pumps, slide the retainer (506) toward the outboard bearing (502) and bearing carrier (134). Be sure the retainer (506) is oriented correctly, Feet side facing away from inboard bearing (503).
29. On Group 3 pumps, slide the bearing retainer (501) against the bearing, and install and tighten the bolts (370G).
30. Install the shaft assembly in the bearing housing (228).
31. Be sure to oil lubricate the O-rings and threads on the bearing carrier (134) before installing the housing in the bearing housing (228).
32. Thread the bearing carrier (134) into the bearing housing (228).
33. 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.
34. Loosely install the set screws (500).
35. Slide the new O-ring-adaptor/frame (360Q) over shaft (122).
36. Assemble the bearing housing adapter (108) to the bearing housing (228).
37. Insert the bearing adapter to housing bolts (370B) through the adapter, into the bearing housing (228).

38. If the pump shaft is equipped with a sleeve (126), slide it into place on the impeller end of the shaft (122).
39. Pump assembly is ready for wet end assembly. (See Section 11 APPENDIX E – PACKING / MECHANICAL SEAL.)

10. APPENDIX D – PUMP CROSS SECTIONS AND PARTS LISTS

10.1 SUMMIT C3 PUMP - GROUP 1

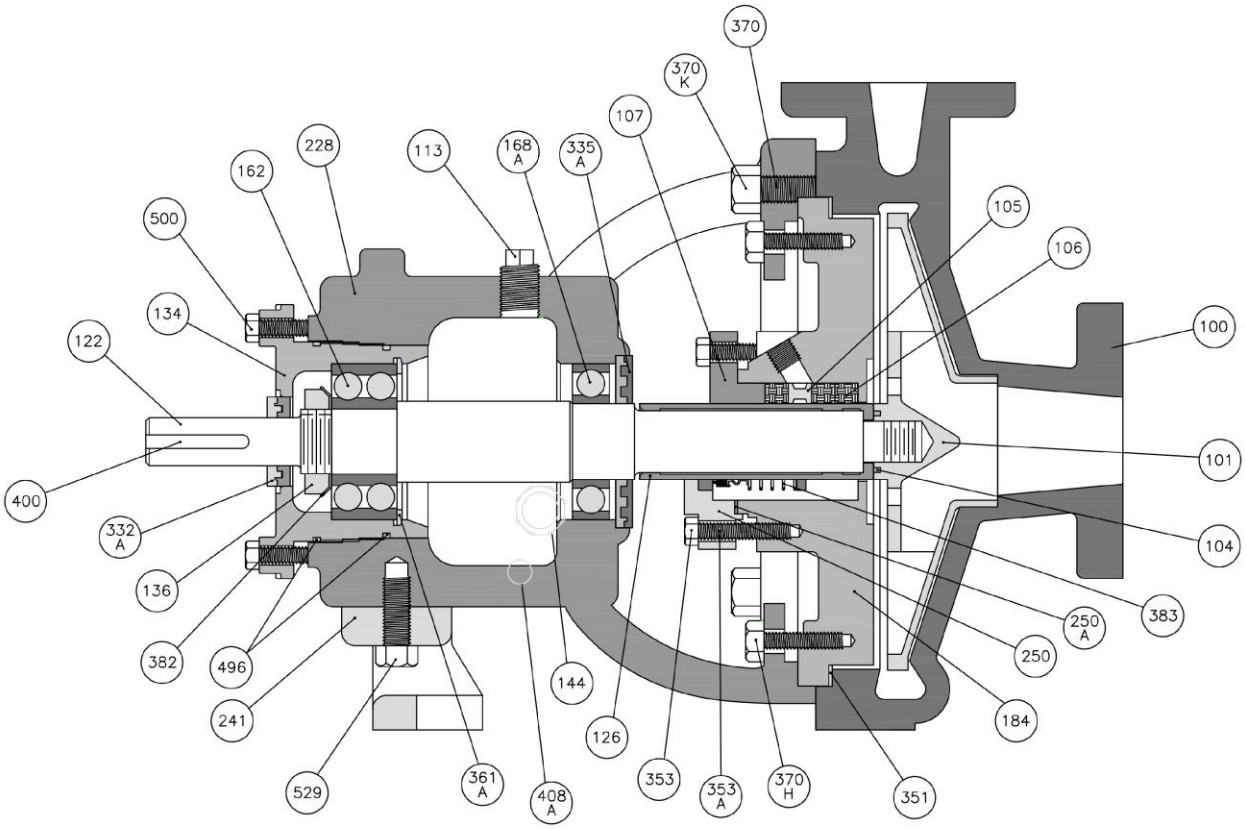


Figure 10-1: Group 1

Table 10-1: Group 1

SUMMIT C3 Group 1 Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
100	Casing	319	Sight Gauge	412A	Gasket (Impeller)
101	Impeller	332A	Laby seal (Outboard)	496	O-Ring (Bearing Carrier)
105	Lantern Ring	333A	Laby seal (Inboard)	500	Set Screw (Bearing Carrier)
106	Packing	348A	Oil Slinger (optional)	502	Bearing (Outboard)
107	Gland (Packing)	351	Gasket (Rear Cover)	503	Bearing (Inboard)
109	Foot (Bearing Housing)	353	Hexnut (Gland)	506	Retainer
113	Filler Plug	353A	Stud (Gland)		
122	Shaft	370	Bolt (Foot to Housing)		
126	Sleeve	370J	Stud (Casing)		
134	Bearing Carrier	370H	Capscrew (Cover/Adapter)		
136	Locknut (Bearing)	370K	Hexnut (Casing)		
184	Rear Cover Plate	382	Lockwasher (Bearing)		
228	Bearing Housing	383	Mechanical Seal		
250	Gland (Mechanical Seal)	400	Key (Shaft/Coupling)		
250A	Gasket (Gland)	408	Drain Plug		

10.2 SUMMIT C3 PUMP - GROUP 2

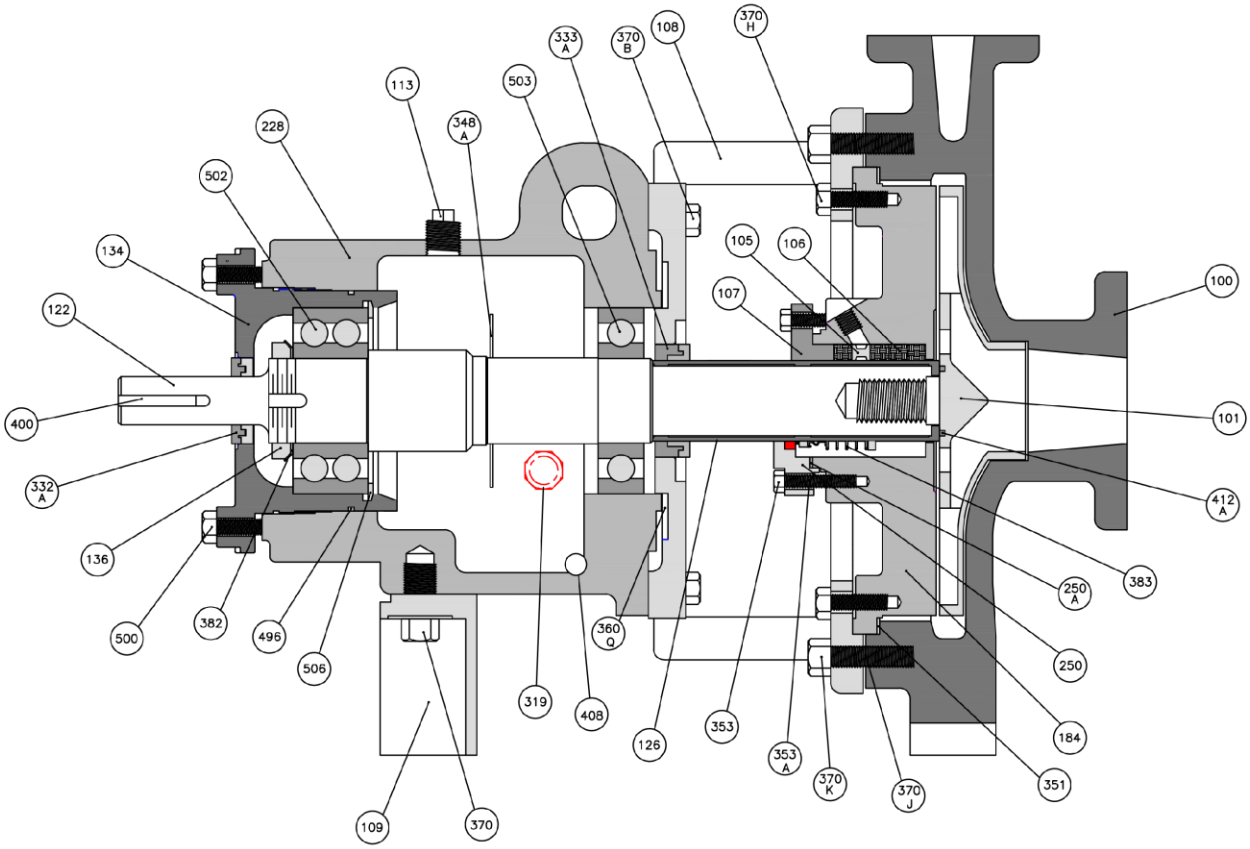


Figure 10-2: Group 2

Table 10-2: Group 2

SUMMIT C3 Group 2 Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
100	Casing	250A	Gasket (Gland)	383	Mechanical Seal
101	Impeller	319	Sight Gauge	400	Key (Shaft/Coupling)
105	Lantern Ring	332A	Laby seal (Outboard)	408	Drain Plug
106	Packing	333A	Laby seal (Inboard)	412A	Gasket (Impeller)
107	Gland (Packing)	348A	Oil Slinger (optional)	496	O-Ring (Bearing Carrier)
108	Adapter (Bearing Housing)	351	Gasket (Rear Cover)	500	Set Screw (Bearing Carrier)
109	Foot (Bearing Housing)	353	Hexnut (Gland)	502	Bearing (Outboard)
113	Filler Plug	353A	Stud (Gland)	503	Bearing (Inboard)
122	Shaft	360Q	O-Ring (Adapter)	506	Retainer
126	Sleeve	370	Bolt (Foot to Housing)		
134	Bearing Carrier	370B	Bolt (Adaptor to housing)		
136	Locknut (Bearing)	370H	Capscrew (Cover/Adapter)		
184	Rear Cover Plate	370J	Stud (Casing)		
228	Bearing Housing	370K	Hexnut (Casing)		
250	Gland (Mechanical Seal)	382	Lockwasher (Bearing)		

10.3 SUMMIT C3 PUMP - GROUP 3

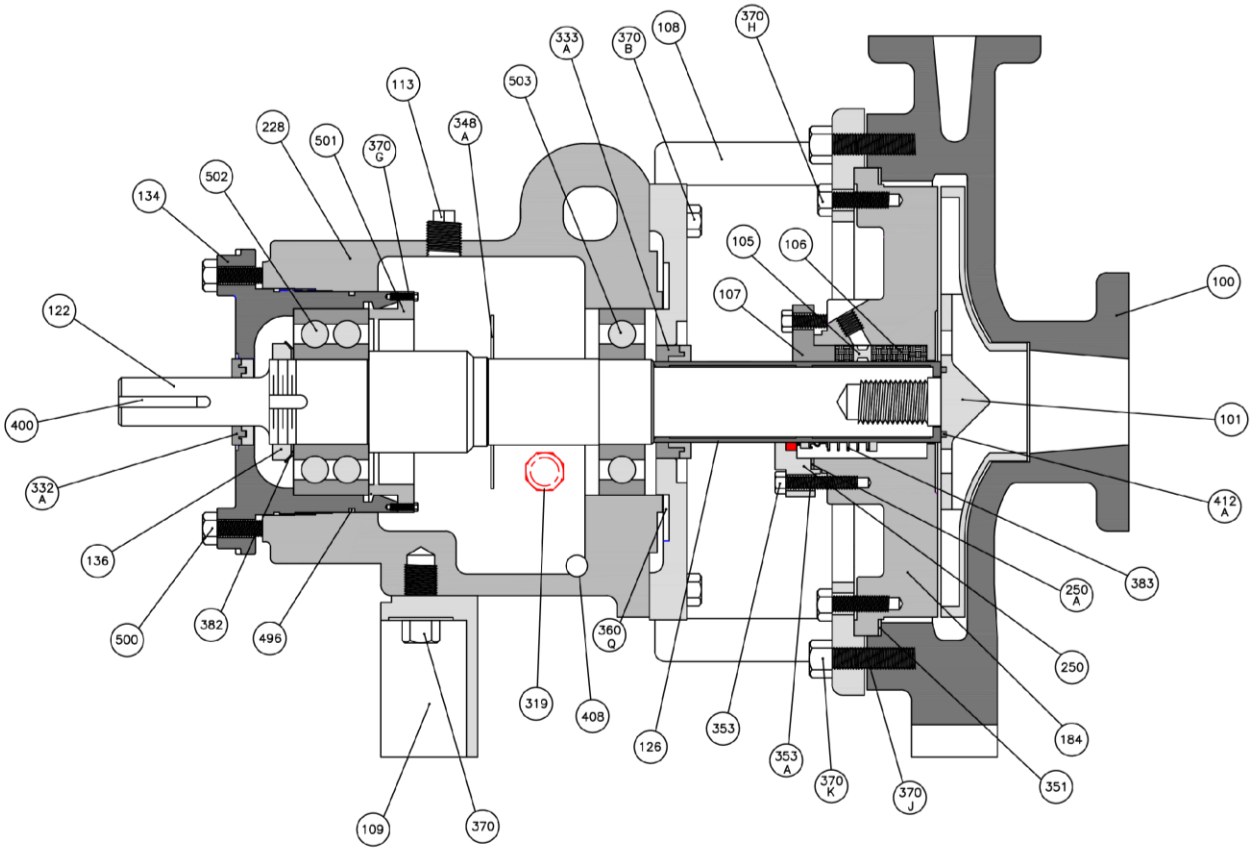


Figure 10-3: Group 3

Table 10-3: Group 3

SUMMIT C3 Group 3 Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
100	Casing	250A	Gasket (Gland)	382	Lockwasher (Bearing)
101	Impeller	319	Sight Gauge	383	Mechanical Seal
105	Lantern Ring	332A	Laby seal (Outboard)	400	Key (Shaft/Coupling)
106	Packing	333A	Laby seal (Inboard)	408	Drain Plug
107	Gland (Packing)	348A	Oil Slinger (optional)	412A	Gasket (Impeller)
108	Adapter (Bearing Housing)	351	Gasket (Rear Cover)	496	O-Ring (Bearing Carrier)
109	Foot (Bearing Housing)	353	Hexnut (Gland)	500	Set Screw (Bearing Carrier)
113	Filler Plug	353A	Stud (Gland)	501	Clamp Ring (Bearing Housing)
122	Shaft	360Q	O-Ring (Adapter)	502	Bearing (Outboard)
126	Sleeve	370	Bolt (Foot to Housing)	503	Bearing (Inboard)
134	Bearing Carrier	370B	Bolt (Adaptor to housing)		
136	Locknut (Bearing)	370G	Bolt		
184	Rear Cover Plate	370H	Capscrew (Cover/Adapter)		
228	Bearing Housing	370J	Stud (Casing)		
250	Gland (Mechanical Seal)	370K	Hexnut (Casing)		

10.4 RECOMMENDED SPARE PARTS

Please consult your local Summit Pump Distributor for ordering replacement parts. Reference the cross-section views in Section 10 APPENDIX D – PUMP CROSS SECTIONS AND PARTS LISTS and the price catalog when placing an order to Summit Pump. State the part number and description on the purchase order.

Note: Below are spare part recommendations. The spare parts needed are dependent on many factors such as acceptable downtime and the application of the pump.

Table 10-4: Group 1 Spare Parts

SUMMIT C3 Group 1 Spare Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
101	Impeller	184	Rear Cover Plate	408	Drain Plug
105	Lantern Ring	250	Gland (Mechanical Seal)	412A	Gasket (Impeller)
106	Packing	250A	Gasket (Gland)	496	O-Ring (Bearing Carrier)
107	Gland (Packing)	351	Gasket (Rear Cover)	502	Bearing (Outboard)
122	Shaft	382	Lockwasher (Bearing)	503	Bearing (Inboard)
126	Sleeve	383	Mechanical Seal	506	Retainer
136	Locknut (Bearing)	400	Key (Shaft/Coupling)		

Table 10-5: Group 2 Spare Parts

SUMMIT C3 Group 2 Spare Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
101	Impeller	184	Rear Cover Plate	383	Mechanical Seal
105	Lantern Ring	250	Gland (Mechanical Seal)	412A	Gasket (Impeller)
106	Packing	250A	Gasket (Gland)	496	O-Ring (Bearing Carrier)
107	Gland (Packing)	351	Gasket (Rear Cover)	502	Bearing (Outboard)
122	Shaft	360Q	O-Ring (Adapter)	503	Bearing (Inboard)
126	Sleeve	382	Lockwasher (Bearing)	506	Retainer
136	Locknut (Bearing)				

Table 10-6: Group 3 Spare Parts

SUMMIT C3 Group 3 Spare Parts List					
Item #	*Description*	*Item #*	*Description*	*Item #*	*Description*
101	Impeller	136	Locknut (Bearing)	382	Lockwasher (Bearing)
105	Lantern Ring	184	Rear Cover Plate	383	Mechanical Seal
106	Packing	250	Gland (Mechanical Seal)	412A	Gasket (Impeller)
107	Gland (Packing)	250A	Gasket (Gland)	496	O-Ring (Bearing Carrier)
122	Shaft	351	Gasket (Rear Cover)	502	Bearing (Outboard)
126	Sleeve	360Q	O-Ring (Adapter)	503	Bearing (Inboard)

11. APPENDIX E – PACKING / MECHANICAL SEAL

11.1 PACKED TYPE PUMPS

1. Slide gland, packing (107)/ gland – mechanical seal (250) onto shaft sleeve(106) towards bearing housing (228) away from impeller of shaft (122)
2. Install the rear cover plate (184) into the bearing housing (228) on Group 1 models. On Group 2 or 3 models, install the rear cover plate (184) into the bearing housing adaptor (108) using adaptor to housing bolts (370B).
3. Install the impeller (101) with a new impeller gasket (412A).
4. 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.
5. Install the appropriate packing (106) in the rear cover plate (184) 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 packing gland (107) into the rear cover plate and screw on the gland hexnuts (353). Lightly snug up the nuts. Final adjustments can be made after the pump is in operation.

11.2 MECHANICAL SEAL PUMPS

1. *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.

NOTICE
Seal assembly instructions differ with manufacture. Please follow their instructions for installation and maintenance. After installation, follow *Steps 1* and *2* 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.

11.3 INSTALLING PULL BACK ASSEMBLY (ALL MODELS)

1. Inspect the casing, clean the gasket surface, and install the new rear cover gasket (351).
2. Slide the assembly into the casing (100).
3. Install the casing studs (370J) and screw hex nuts (370K) into casing studs (370J) tighten in a crisscross pattern.
4. Set the impeller clearance and rotate the shaft. (See Section 7 APPENDIX A - IMPELLER CLEARANCE SETTING.) 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.

12. APPENDIX F – MAINTENANCE INSTRUCTIONS FOR LABYRINTH BEARING ISOLATORS

12.1 DETAILS OF OPERATIONS

The 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 O-ring

The **rotor** fits over the shaft and is held in place by an elastomeric 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 O-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. 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.

12.2 DISASSEMBLY PROCEDURES

1. Remove shaft assembly per instructions for pump disassembly. (See page 14.)
2. Group 1 removal. Insert a bar (wood or plastic) through the outboard bearing housing end of the bearing housing (228). Contact the inboard labyrinth seal (333A). Remove by tapping the bar or pushing with an arbor press.

   Groups 2 and 3 removal. Disassemble the bearing housing adaptor (108) per pump disassembly instructions. Remove the inboard labyrinth seal (333A) with a bar (wood or plastic) by tapping or by pushing with an arbor press.
3. Groups 1, 2, and 3 Outboard Labyrinth Seal (332A) removal. Block up the outboard bearing carrier (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 O-rings and stator O-rings each time the units are removed from the pump assembly.

12.3 INSTALLATION PROCEDURES

1. Group 1, 2, and 3 Inboard Isolator. Position the bearing housing (228) or bearing housing adapter (108) inboard bearing side up. Place the labyrinth 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.
2. Outboard Labyrinth Seal (332A). Position the bearing carrier (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 housing (228) or bearing housing 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 carrier (134) over the shaft (122) end and continue per assembly instructions.

NOTICE
Make sure expulsion port and lube return are in the 6 o'clock position in final assembly.

13. APPENDIX G – DIMENSIONAL DATA

13.1 MODEL C3 DIMENSIONAL DATA

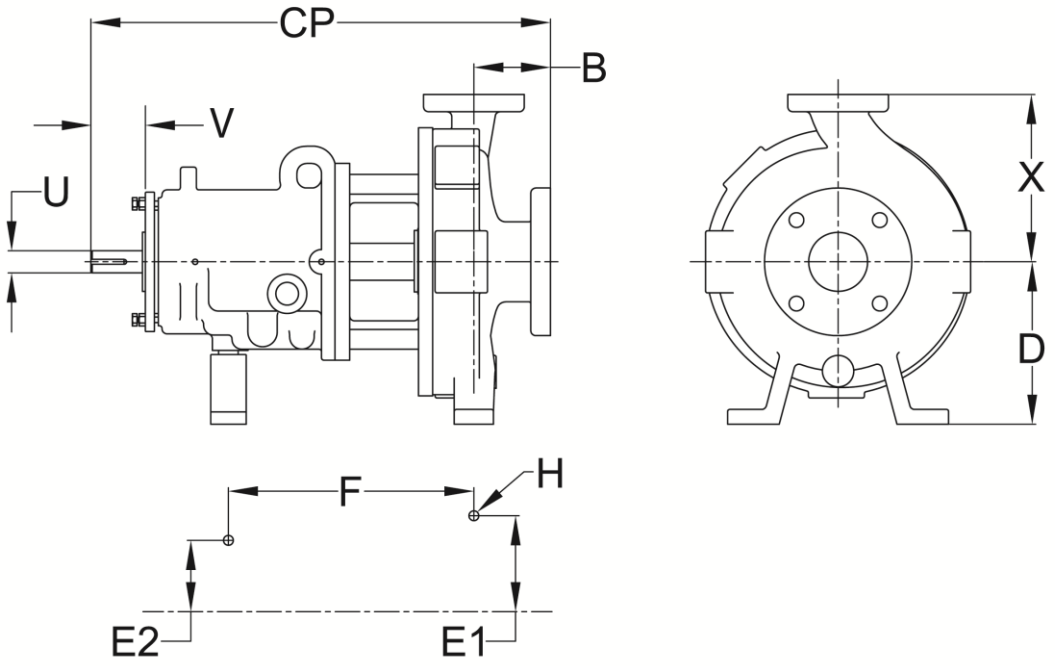


Figure 13-1: General Dimension Definition

Table 13-1: General Dimension Values

CLARK 3 PUMP DIMENSION CHART														
PUMP	SIZE	ANSI	X	D	B	CP	FOOT PATTERN				SHAFT			PUMP WEIGHT
							E1	E2	F	H	U	KWY	V	
Clark 3 Group 1	1.5X1-6	AA	6 1/2	5 1/4	4	17 1/2	3	0	7 1/4	5/8	7/8	3/16X3/32	2	100
	3X1.5-6	AB												110
	3X2-6	AC												115
	1.5X1-8	AA												100
	3X1.5-8		7 1/2	7										125
Clark 3 Group 2	3X2-8	A60	9 1/2	8 1/4	4	23 1/2	4 7/8	3 5/8	12 1/2	5/8	1 1/8	1/4X1/8	2 5/8	200
	4X3-8	A70	11											230
	2X1-10A	A05	8 1/2											210
	3X1.5-10A	A50	8 1/2											220
	3X2-10A	A60	9 1/2											225
	4X3-10	A70	11											225
	4X3-10H	A40	12 1/2											250
	6X4-10*	A80	13 1/2								1 1/2	3/8X3/16		290
	6X4-10H	A80	13 1/2	10										330
	3X1.5-13	A20	10 1/2								1 1/8	1/4X1/8		250
	3X2-13	A30	11 1/2											260
	4X3-13**	A40	12 1/2											280
	4X3-13HH	A40	12 1/2											280
	6X4-13A	A80	13 1/2											325
Clark 3 Group 3	8X6-14A	A90	16	14 1/2	6	33 7/8	8	4 1/2	18 3/4	7/8	2 3/8	5/8X5/16	4	680
	10X8-14	A100	18											900
	6X4-16		16											640
	8X6-16A	A110	18											830
	10X8-16	A120	19											920
	10X8-16H	A120	19											990

* Uses an oversized shaft on the coupling end

** Pump size 4x3-13 @ 1800RPM = 13.000" maximum diameter impeller
Pump size 4x3-13 @ 3600RPM = 11.000" maximum diameter impeller

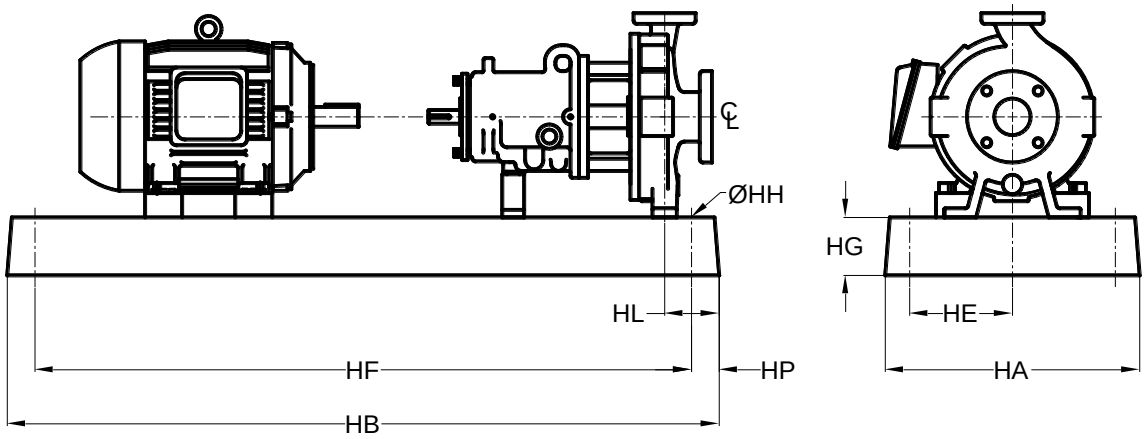


Figure 13-2: General Assembly Dimension Definitions

Table 13-2: General Assembly Dimension Values

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 3/8	3 3/16	3/4	4 5/8
	2	215	12	39	4 1/2	36 1/2	1 1/4	3 3/8	3/4	4 1/2
	3	286	15	46	6	43 1/2	1 1/4	6	3/4	4 1/2
GROUP 2	4	215	12	45	4 1/2	42 1/2	1 1/4	4	3/4	4 1/2
	5	286	15	52	6	49 1/2	1 1/4	4 3/8	3/4	4 1/2
	6	365	18	58	7 1/2	55 1/2	1 1/4	5	1	4 1/2
	7	444	18	60	7 1/2	57 1/2	1 1/4	5	1	4 1/2
GROUP 3	8	286	26	62	11 1/4	47	13	4	1	5 1/4
	9	365	26	68	11 1/4	47	13	4	1	5 3/16
	10	447	26	74	11 1/4	47	13	4 1/8	1	5 1/4

13.2 MODEL C3 STUFFING BOX RELATED DIMENSIONS

CBS Rear Cover

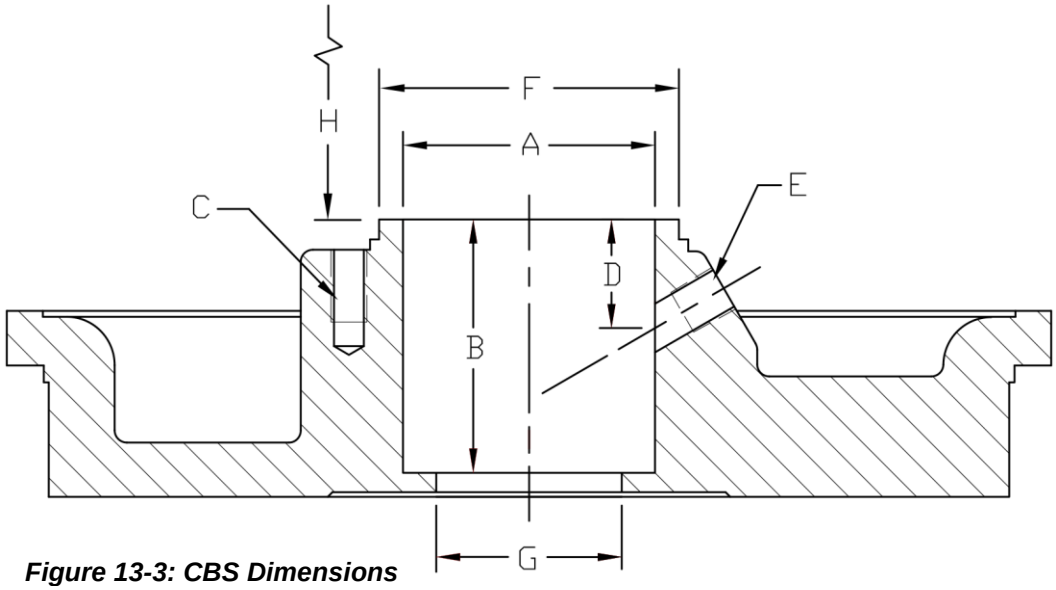


Figure 13-3: CBS Dimensions

Table 13-3: CBS & FMS Dimension Values

STUFFING BOX RELATED DIMENSIONS (Cylindrical Bore Standard, CBS)													
PUMP FRAME	SIZE	*A	B	*C		D	E	*F	G	*H	PACKING (CBS ONLY)		LANTERN RING WIDTH
				B.C.	TAP					OBSTRUCTION	SIZE	# OF RINGS	
CLK3 GP1	6"& 8" CBS	2.13	2.19	3.25	3/8-16 UNC	1.13	1/4-18 NPT	2.62	1.44	2.19	3/8	5	7/16
CLK3 GP2	8" CBS	2.63	2.63	3.75	3/8-16 UNC	1.13	1/4-18 NPT	3.12	1.93	3.00	3/8	5	5/8
	10" CBS	2.63	2.63	3.75	3/8-16 UNC	1.13	1/4-18 NPT	3.12	1.93	3.00	3/8	5	5/8
	13" CBS	2.63	2.63	3.75	3/8-16 UNC	1.13	1/4-18 NPT	3.12	1.93	3.00	3/8	5	5/8
CLK3 GP3	14" CBS	3.63	3.25	5.50	1/2-13 UNC	1.00	1/4-18 NPT	4.25	2.68	3.82	1/2	5	3/4
	16" CBS	3.63	3.25	5.50	1/2-13 UNC	1.00	1/4-18 NPT	4.25	2.68	3.82	1/2	5	3/4

* Flow Modifier Standard (FMS) dimensions are same for corresponding CBS dimensions

FMS Rear Cover

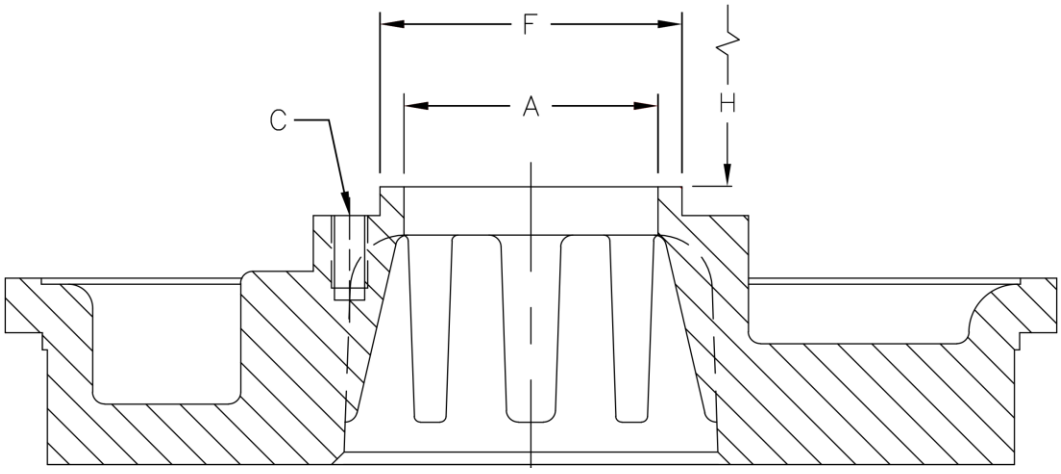


Figure 13-4: FMS Dimensions

CBL Rear Cover

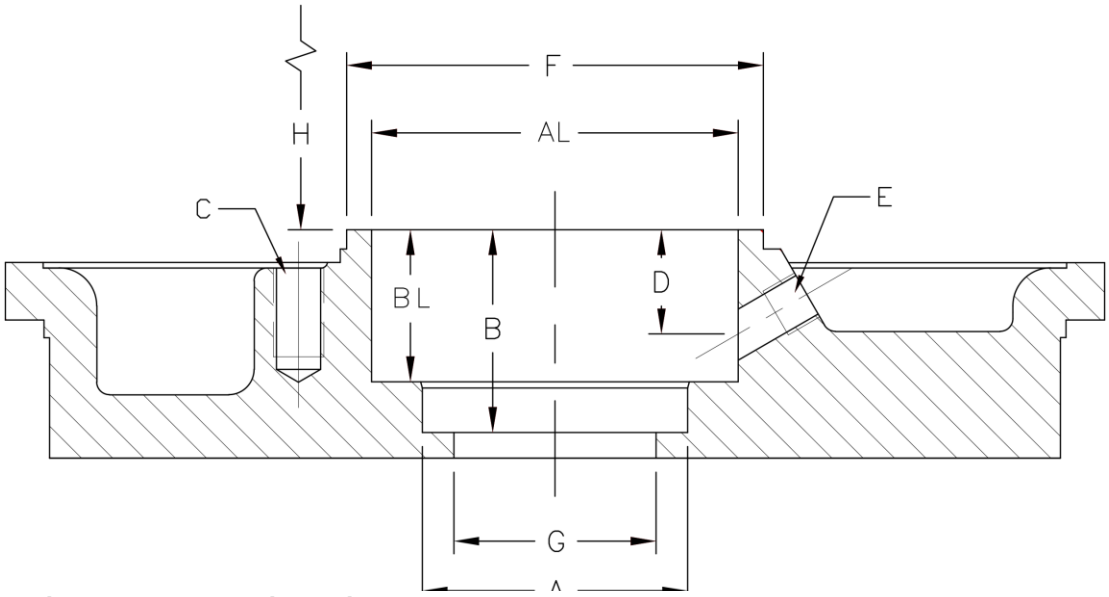


Figure 13-5: CBL Dimensions

Table 13-4:CBL & FML Dimension Values

STUFFING BOX RELATED DIMENSIONS (Cylindrical Bore Large, CBL)															
PUMP FRAME	SIZE	A	*AL	B	BL	*C		D	E	*F	G	*H	PACKING		LANTERN RING WIDTH
						B.C.	TAP					OBSTRUCTION	SIZE	# OF RINGS	
CLK3 GP1	6"& 8" CBL	-	2.88	-	2.00	4.00	3/8-16 UNC	1.00	1/4-18 NPT	3.37	2.25	2.38	N/A	N/A	7/16
CLK3 GP2	8" CBL	2.63	3.63	2.00	1.50	5.00	1/2-13 UNC	1.04	1/4-18 NPT	4.12	2.00	3.62	N/A	N/A	5/8
	10" CBL	2.63	3.63	2.00	1.50	5.00	1/2-13 UNC	1.04	1/4-18 NPT	4.12	2.00	3.62	N/A	N/A	5/8
	13"CBL	2.63	3.63	2.00	1.50	5.00	1/2-13 UNC	1.04	1/4-18 NPT	4.12	2.00	3.62	N/A	N/A	5/8
CLK3 GP3	14" CBL	-	4.63	-	3.00	6.00	1/2-13 UNC	1.03	1/4-18 NPT	5.12	4.13	4.13	N/A	N/A	3/4
	16"CBL	-	4.63	-	3.00	6.00	1/2-13 UNC	1.03	1/4-18 NPT	5.12	4.13	4.13	N/A	N/A	3/4

*Flow Modifier Large (FML) dimensions are same for corresponding CBL dimensions

FML Rear Cover

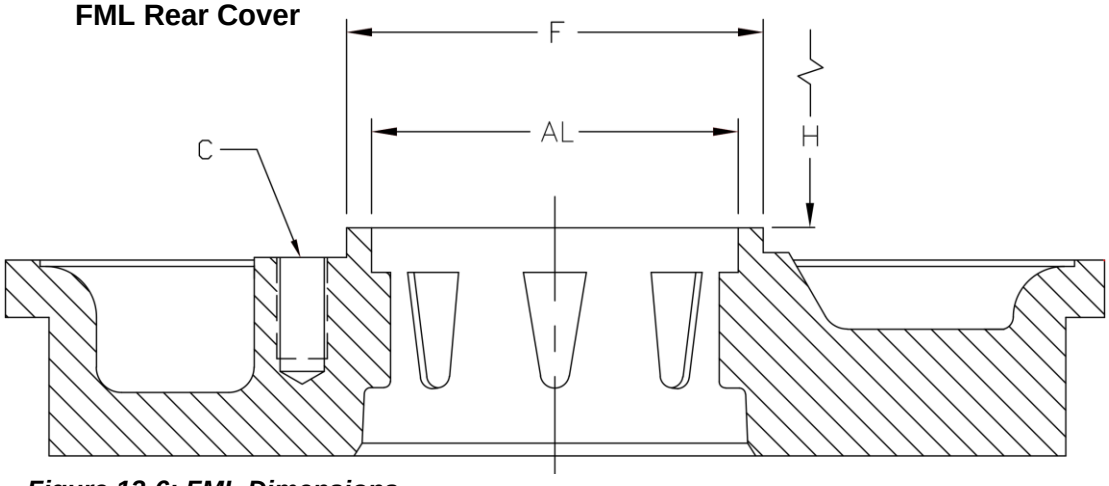


Figure 13-6: FML Dimensions

14. APPENDIX H - CONSTRUCTION DETAILS

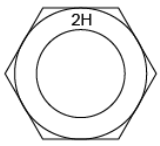
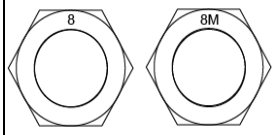
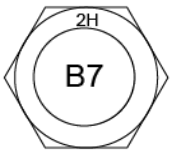
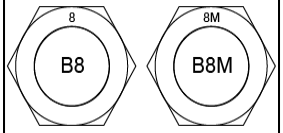
Table 14-1: Construction Details

Clark 3 Construction Details							
All Dimensions in inches and (mm)		Group 1		Group 2		Group 3	
		inch	mm	inch	mm	inch	mm
Shaft	Diameter at Impeller	0.75	(19.1)	1.5	(38.1)	2.1	(53.3)
	Diameter in Stuffing Box (Solid Shaft Const.)	1.375	(34.9)	1.875	(47.6)	2.624	(66.6)
	Diameter Between Bearings	1.6	(40.6)	2.5	(63.5)	3.4	(86.4)
	Diameter at Coupling	0.875	(22.2)	1.125	(28.6)	2.375	(60.3)
	Maximum Shaft Deflection	0.002 (0.05)					
	Shaft Deflection Index $(\frac{L^3}{D^4})$						
	Sleeved Shaft	143		70		36	
	Solid Shaft	65		30		17	
Sleeve	O.D. Thru Stuffing Box/Seal Chamber	1.375	(34.9)	1.875	(47.6)	2.625	(66.7)
SKF Bearings	Radial (Oil Bath)	6207-C3 Explorer		6210-C3 Explorer		6314-C3 Explorer	
	Thrust (Oil Bath)	3306A Explorer		3310A Explorer		3314A-C3 Explorer	
	Bearing Span (Between Inside Faces)	2 11/16	(68.3)	5 1/2	(139.7)	8 9/16	(217.5)
Max Allowable Horsepower	1150 RPM	13		50		210	
	1750 RPM	20		75		325	
	3600 RPM	40		150*		N/A	

* 6 x 4-10 is 175hp maximum, due to oversized shaft

14.1 CASING STUDS/NUTS TORQUES

Table 14-2: Casing Fastener Details

Clark 3 Casing Nut Torques - Dry						
Flange Rating			**150 LB CASING**		**300 LB CASING OR HIGH TEMPERATURE APPLICATIONS**	
Casing Material			**Ductiile Iron, WCB**	**316SS, CD4MCu, A20**	**Ductile Iron, WCB**	**316SS, CD4MCu, A20**
Threaded Rod/Stud Specification			ASTM A307 Grade A (CARBON)	(304SS) F593 Grade 1 OR (316SS) F593 Grade 2	ASTM A193 Grade B7 (CARBON)	ASTM A193 Grade B8/B8M (304SS/316SS) Class 2
Nut Specification			ASTM A194 Grade 2H	ASTM A194 Grade B8/B8M (304SS/316SS)	ASTM A194 Grade 2H	ASTM A194 Grade B8/B8M (304SS/316SS)
Markings						
Pump Size	**Stud Size**	**Length**	**Torque to ft-lb**	**Torque to ft-lb**	**Torque to ft-lb**	**Torque to ft-lb**
C3G1	**1/2"-13**	**2-1/2"**	30	54	87	60
C3G2	**5/8"-11**	**2-1/2"**	59	107	173	120
C3G3	**3/4"-10**	**3"**	105	132	306	213
	7/8"-9	**3-1/2"**	170	212	495	275

14.2 HARDWARE LIST & TORQUE

Table 14-3: General Hardware Details

Description	Item ID	Pump Size	Fastener - Thread Size	Length	QTY	Grade/Material	Torque (ftlb)
Mechanical Seal Studs (Do not use torque value for Packing)	353A	GRP1	3/8"-16	2-1/2" (0.50/1.25)	4	ASTM F593 Grade 2 (316 SS)	12 ftlb
		GRP2	3/8"-16 or 1/2"-13	2-1/2" (0.625/1.125)			12 ftlb or 40 ftlb
		GRP3	1/2"-13	4" (0.875/2.25)			30 ftlb
Mechanical Seal Nuts (Do not use torque value for Packing)	353	GRP1	3/8"-16	N/A	4	ASTM F594 Grade 1 (304SS)	12 ftlb
		GRP2	3/8"-16 or 1/2"-13				12 ftlb or 40 ftlb
		GRP3	1/2"-13				30 ftlb
Casing Studs and Nuts	370J (Studs) 370K (Nuts)	GRP1	1/2"-13	2-1/2"	See Casing Torque Chart		
		GRP2	1/2"-13 or 5/8"-11	2-1/2"			
		GRP3	3/4"-10 or 7/8"-9	3" or 3-1/2"			
Frame Adaptor to Bearing Housing	370B	GRP2	1/2"-13	1-1/2"	4	ASTM A307 Grade A (Carbon Steel)/ F593 Grade 1 (304 SS)	40 ftlb
		GRP3	5/8"-11	1-1/2"			90 ftlb
Bearing Carrier to Bearing Housing	500	GRP1	3/8"-16	1-1/4": w/ Guard 1-1/2"	3		12 ftlb
		GRP2	1/2"-13	1-1/2": w/ Guard 1-3/4"			30 ftlb
		GRP3					
Box Cover to Frame Adaptor	370H	GRP1	3/8"-16	1-1/4"	2		20 ftlb
		GRP2					
		GRP3	1/2"-13	1-1/2"			40 ftlb
Bearing Housing Foot Bolt	370	GRP1	1/2"-13	1-1/2"	1		40 ftlb
		GRP2	3/4"-10	1-1/2"	2		160 ftlb
		GRP3	1"-8	1-1/2"			228 ftlb
Bearing Retainer Bolts	370G	GRP3	5/16"-18	1-1/4"	8		12 ftlb
Casing Tap (Jack) Bolt	418	GRP1	3/8"-16	1-3/4"	2		N/A
		GRP2	1/2"-13	1-1/2"			
		GRP3 14"	5/8"-11	1-1/2"			
		GRP3 16" & 17"	7/8"-9	1-1/2"			
Bearing Housing Fill Plug/Vent	113	GRP1	1/2"-14 NPT	9/16"	1	Carbon Steel / Stainless	2 *T.F.F.T.
		GRP2					
		GRP3					
Bearing Housing Side Plug	135A (Not Shown)	GRP1	1/4"-18 NPT	7/16"	1	Carbon Steel / Stainless	2 *T.F.F.T.
		GRP2					
		GRP3					
Stuffing Box Flush Plug	484A	GRP1	1/4"-18 NPT	7/16"	1	Carbon Steel / Stainless	2 *T.F.F.T.
		GRP2					
		GRP3					
Bearing Housing Drain Plug	408A	GRP1	1/4"-18 NPT	N/A	1	Carbon Steel - Magnetic Plug	2 *T.F.F.T.
		GRP2					
		GRP3					
View Port	319	GRP1	1"-11 1/2 NPT	N/A	1	Brass/Glass	2 * T.F.F.T.
		GRP2					
		GRP3					

*T.F.F.T. - Turns From Finger Tight

14.3 BEARING FITS & TOLERANCES

Table 14-4: Bearing fitments

Clark 3 Bearing Fits & Tolerances							
All dimensions in inches and (mm)		Group 1		Group 2		Group 3	
		inch	mm	inch	mm	inch	mm
OB Bearing & Shaft	**Bearing**	1.1811	(30.000)	1.9685	(50.000)	2.7559	(70.000)
		1.1807	(29.990)	1.9680	(49.987)	2.7553	(69.985)
	Shaft	1.1816	(30.013)	1.9690	(50.013)	2.7565	(70.015)
		1.1812	(30.002)	1.9686	(50.002)	2.7560	(70.002)
	Clearance (Tight)	0.0009	(0.023)	0.0010	(0.025)	0.0012	(0.030)
		0.0001	(0.003)	0.0001	(0.003)	0.0001	(0.003)
IB Bearing & Shaft	**Bearing**	1.3780	(35.001)	1.9685	(50.000)	2.7559	(70.000)
		1.3775	(34.989)	1.9680	(49.987)	2.7553	(69.985)
	Shaft	1.3785	(35.014)	1.9690	(50.013)	2.7565	(70.015)
		1.3781	(35.004)	1.9686	(50.002)	2.7560	(70.002)
	Clearance (Tight)	0.0010	(0.025)	0.0010	(0.025)	0.0012	(0.030)
		0.0001	(0.003)	0.0001	(0.003)	0.0001	(0.003)
OB Bearing & Carrier	**Bearing**	2.8346	(71.999)	4.3307	(110.000)	5.9055	(150.000)
		2.8341	(71.986)	4.3301	(109.985)	5.9047	(149.979)
	Carrier	2.8346	(71.999)	4.3310	(110.007)	5.9056	(150.002)
		2.8353	(72.017)	4.3316	(110.023)	5.9067	(150.030)
	Clearance (Loose)	0.0012	(0.030)	0.0015	(0.038)	0.0020	(0.051)
		0.0000	(0.000)	0.0003	(0.008)	0.0001	(0.003)
IB Bearing & Frame	**Bearing**	2.8346	(71.999)	4.3307	(110.000)	5.9055	(150.000)
		2.8341	(71.986)	4.3301	(109.985)	5.9047	(149.979)
	Frame	2.8346	(71.999)	4.3310	(110.007)	5.9058	(150.007)
		2.8353	(72.017)	4.3316	(110.023)	5.9065	(150.025)
	Clearance (Loose)	0.0012	(0.030)	0.0015	(0.038)	0.0018	(0.046)
		0.0000	(0.000)	0.0003	(0.008)	0.0003	(0.008)

15. APPENDIX I - ACCEPTABLE LUBRICANTS

Table 15-1: Lubricants

Acceptable Lubricating Oils				
Chevron GTS Oil		46	68	100
Exxon Terrestic		46	68	100
Lubriplate		AC1	AC2	AC3
Mobil:	DTE	-	Medium	Heavy
Mobil:	Synthetic	525	626	627
Shell:	Tellus Fluids HD	46	68	100

Table 15-2: Greases

Acceptable Greases	
Citgo	Mystic EP2
Keystone	81EP2
Mobil	Mobil Grease XHP222
Mobil Synthetic	SCH 100

16. APPENDIX J – ANSI B15.1 COUPLING GUARD

⚠ DANGER

Lockout & Tag out driver power before performing any work on equipment.

⚠ WARNING

Replace all guards before re-energizing the equipment

NOTICE

Summit Pump, Inc. assumes no liability when these procedures are neglected.

16.1 GUARD COMPONENTS

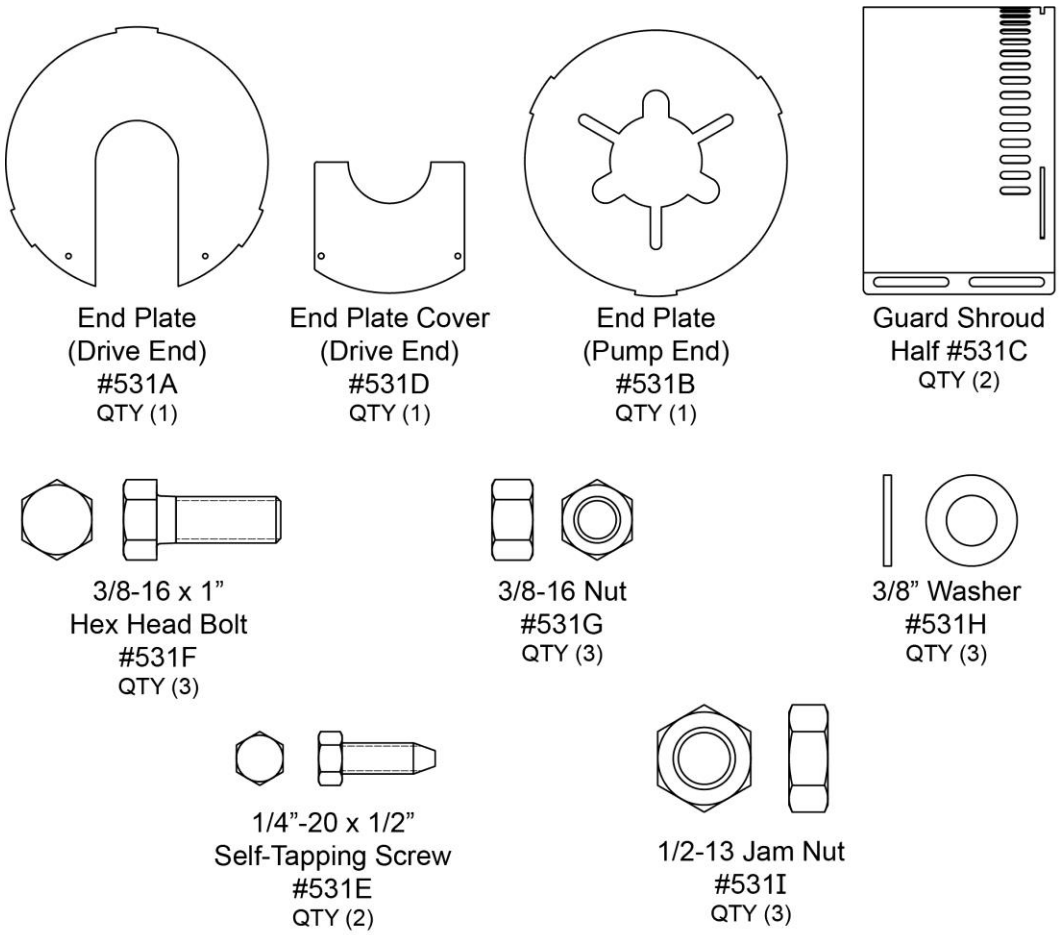


Figure 16-1: Barrel Coupling Guard Components

16.2 ASSEMBLY PROCEDURE

1. Set the impeller clearance but leave out the bearing carrier to bearing housing bolt (500). If not already, remove the coupling from both shafts to slide end plates over the shafts.
2. Position the pump end plate (531B) of the pump shaft and line up the longer slots with the bearing carrier (134). Thread in the bolts (500) with jam nuts (531I) and tighten to keep the bearing carrier (134) from rotating.
3. Center the pump end plate (531B) as close as possible with the pump shaft. Then tighten the jam nuts (531I) to fasten the pump end plate (531B) in place.

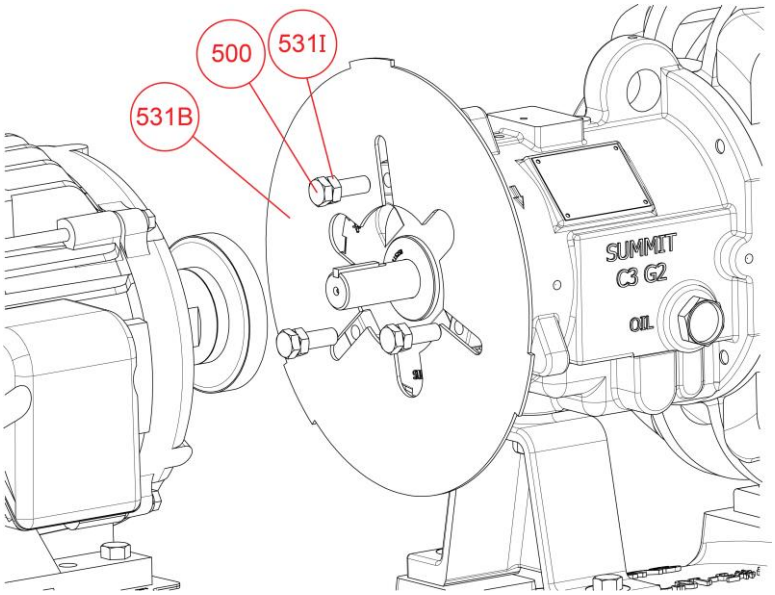


Figure 16-2: Pump End Plate

4. Assemble the motor end plate (531A) and the motor end plate cover (531D) with screws (531E). This can be done with coupling installed depending on coupling style and size. If not possible with coupling installed, slide the motor end plate (531A) assembly on motor shaft towards the motor as far as possible. Proceed to

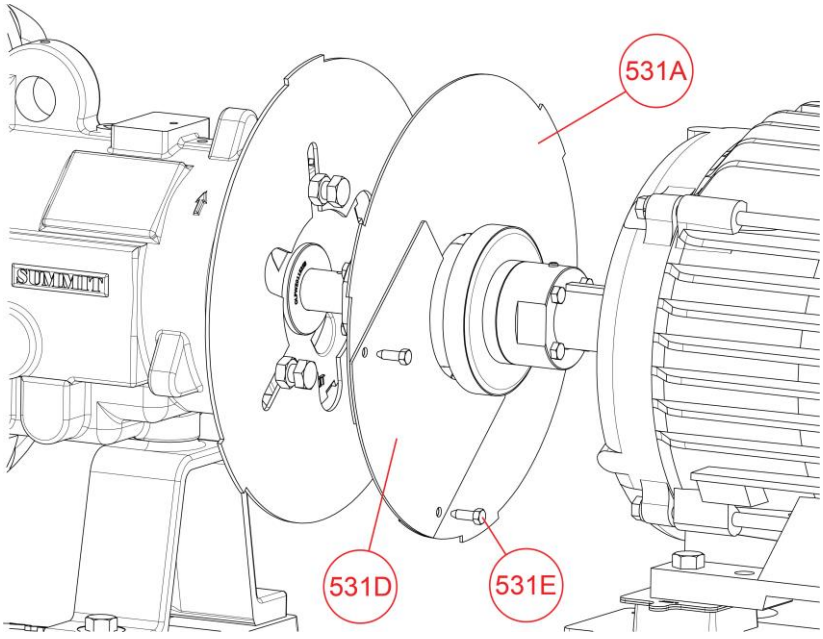


Figure 16-3: Motor End Plate

assemble coupling and align motor shaft to pump shaft.

5. Slightly spread the bottom of the guard shroud half (531C) and place it around the pump end plate. The annular tabs will insert into the grooves in the shroud. If needed secure in place with one set of bolt (531F), nut (531G) and washers (531H).

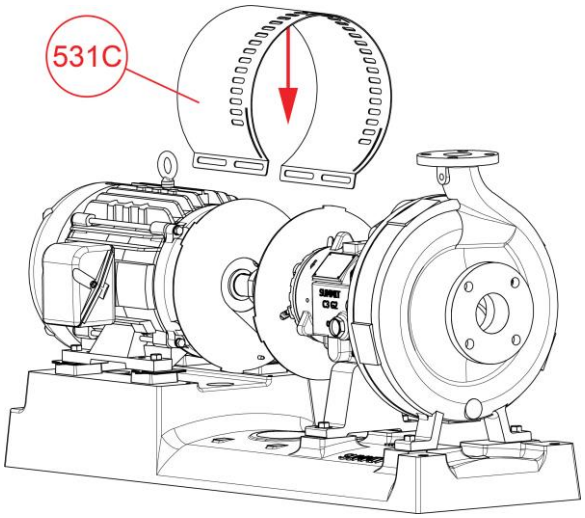


Figure 16-4: First Shroud Install

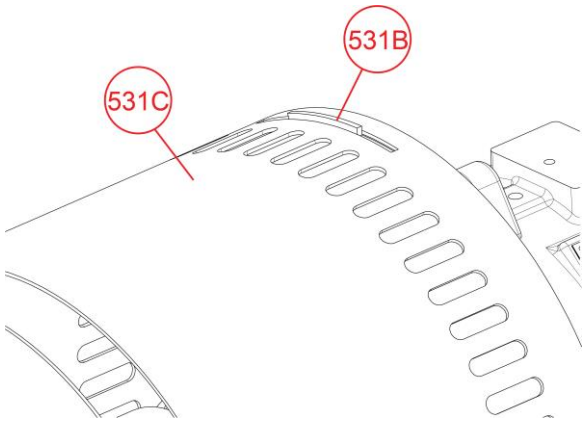


Figure 16-5: Annualar Tab Engagement

6. Spread the second guard shroud half (531C) around the motor end plate (521A) and into the annular tabs.

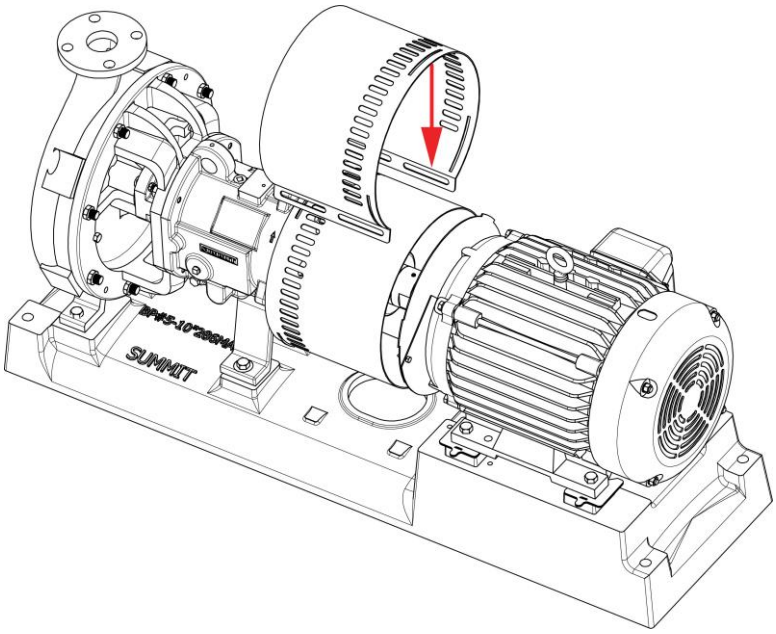


Figure 16-6: Second Shroud Install

7. Adjust coupling guard length as necessary. Bolt the two guard shroud halves (531C) together with bolts (531F), nuts (531G) and washers (531H).

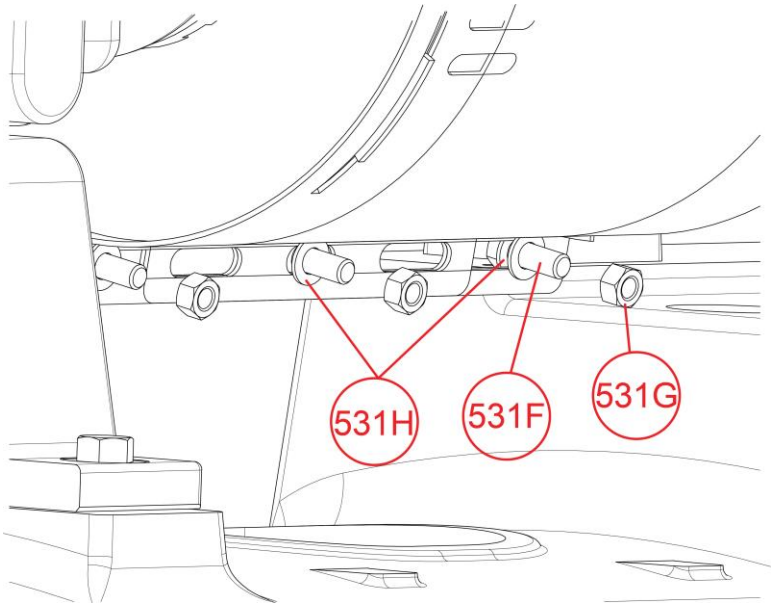


Figure 16-7: Clamp Bolts

17. APPENDIX K – ANSI B15.1 ADAPTOR GUARD

⚠ DANGER

Lockout & Tag out driver power before performing any work on equipment.

⚠ WARNING

Replace all guards before re-energizing the equipment

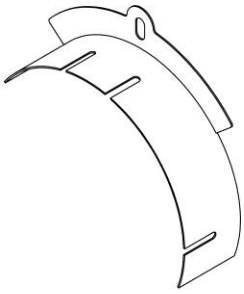
NOTICE

Summit Pump, Inc. assumes no liability when these procedures are neglected.

17.1 COMPONENTS

For the adaptor guard assembly, fastening will use the cover to adaptor bolt (370H) to fasten the guard halves (351J) in place for all Clark sizes.

Although adaptor guards are of different design and shape, all guards will install and fasten in the same way. Depicted below is the Group 2 13-inch adaptor guard.



Adaptor
Guard Half
#531J
QTY (2)

Figure 17-1: Adaptor Guard Components

17.2 GUARD ASSEMBLY

1. With pump assembled and all case bolts installed and torqued, remove adaptor to box cover bolts (370H).
2. Position each guard half (531J) into their respective side of the adaptor. The guard halves are identical have no left or right side.

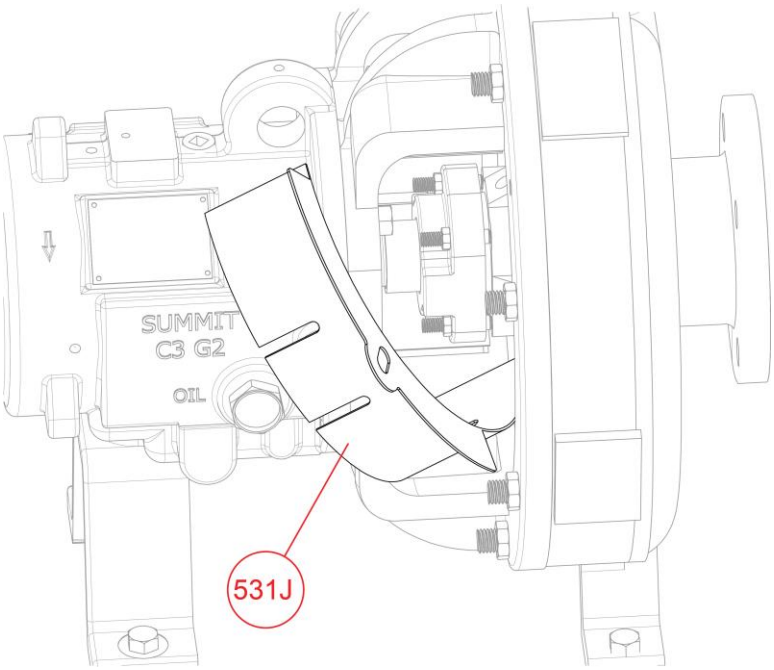


Figure 17-2: Fitting Adaptor Guard Half

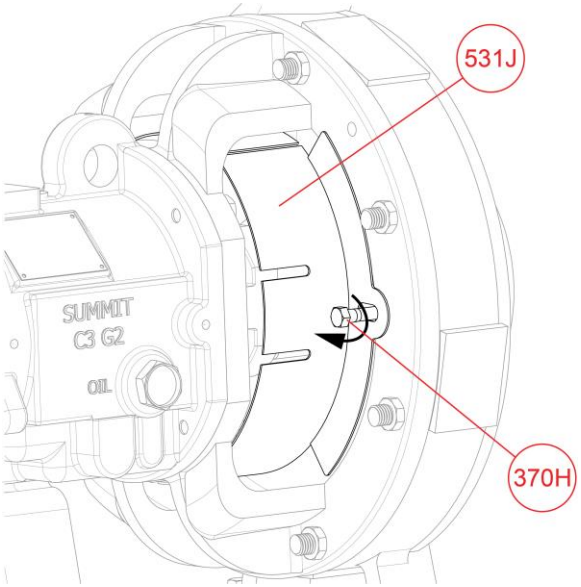


Figure 17-3: Bolt Guard into Place

3. Center the guard halves (531J) with the pump shaft.
4. Bolt the guards into place using the adaptor to cover bolts (370H). Torque to value in Table 14-3 on page 32.

Purchase Date: _____

Purchase Order #: _____

Serial Number: _____

Equipment Number: _____

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