SUMMIT™

SNS

Installation, Operation, and Maintenance Manual

Model: SNS Self-Priming, Non-Clogging Centrifiugal Pump

Self-Priming Non-Clogging

SUMMIT™ PUMP, Inc

www.SUMMITPUMP.com

I.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.

II.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.

III.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.

1 CONTENTS

2 INTRODUCTION

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

The SNS is a redesign of the standard SN pump. With the addition of jacking bolts, an extra IB lip seal, and a cover plate O-ring gives the SNS increased reliability, quick setup, and maintenance times.

Like its predecessor the SNS is available as either an “A” version with a 2-vane impeller or a “B” version with a 5-vane impeller.

2.1 Centrifugal Principals

This pump is a centrifugal pump which generates pressure which induces flow. Velocity imparted to the casing from the impeller tip is converted to pressure energy; flow is a byproduct of the differential pressure.

Fluid from the suction eye is dispersed through the impeller in the volume between the impeller vanes. Fluid leaves the vane tip at approximately the same speed as the vane tip, the fluid immediately collides with the casing wall and the velocity energy is converted to pressure energy. If allowed, the fluid will leave the discharge port towards a lower pressure.

2.2 Self-Priming Principals

With self-priming pumps, the pump must be primed (filled with fluid) to generate a lift from the suction sump. Air must be removed from the suction pipe by generating a vacuum allowing the fluid to be pushed up through the suction pipe due to atmospheric or tank pressure. Removing the air requires the pumped fluid to recirculated in the volute of the casing. Fluid will drop back into the priming camber and the pressurized air will evacuate out the discharge.

With enough air removed from the suction piping, fluid will begin to rise to the pump’s impeller. Once the fluid reaches the pump’s impeller eye the pump will begin to operate normally.

Once the pump has been primed and in operation, priming the pump is no longer needed for the next startup. The flapper valve on the suction will keep fluid in the suction line and only some air may need to be removed upon second startup. This will likely go unnoticed upon startup.

If there are any questions regarding this pump or its application, which are not covered in this manual, please contact your local Summit Pump, Inc. Distributor.

For information or technical assistance on the driver service, contact the driver manufacturer’s local dealer or representative.

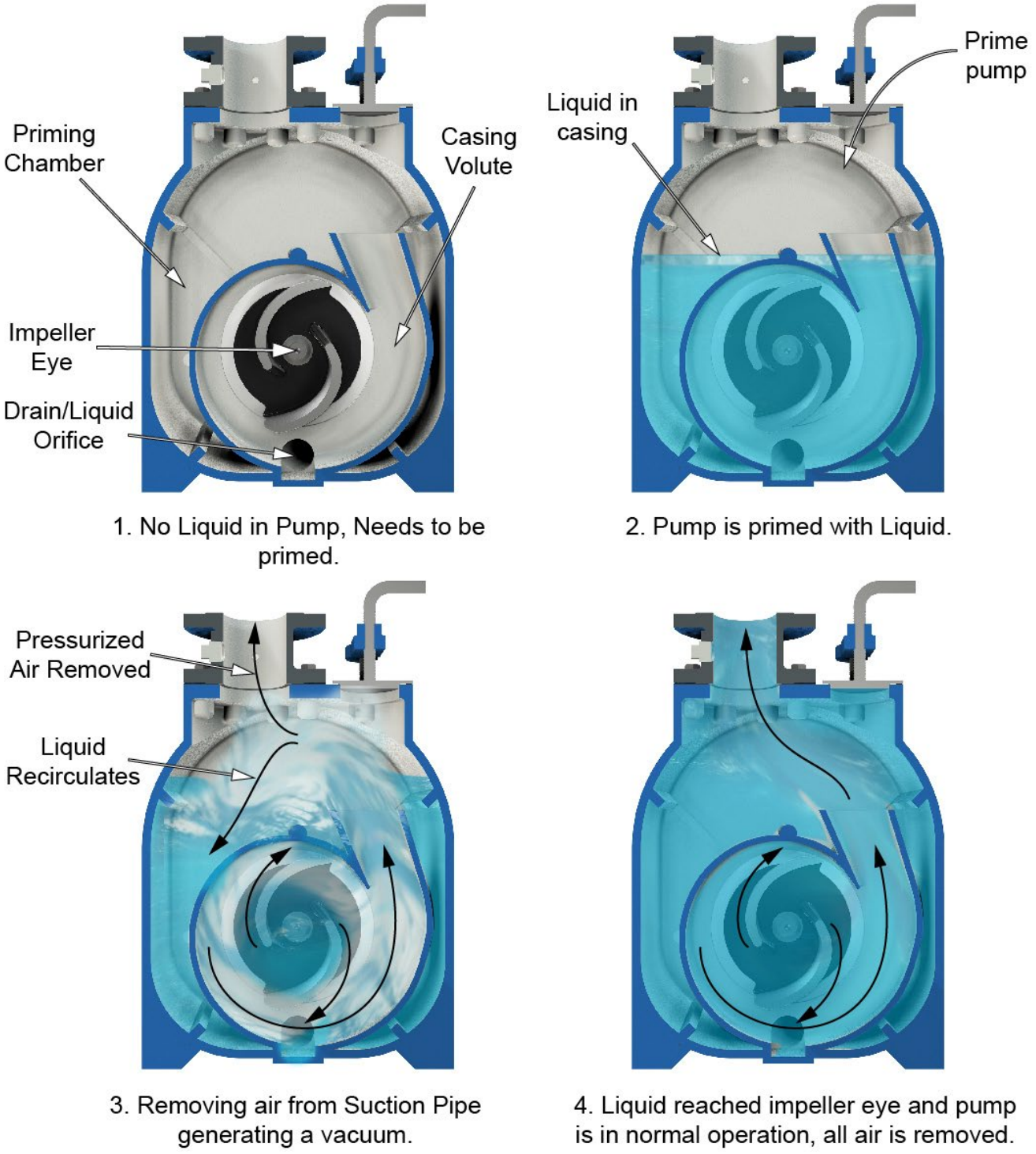

Figure 2-1: Basic principles of initial pump priming

3 SAFETY

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 personnel and equipment:

⚠ 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.

3.1 PUMP SAFETY WARNINGS

The safety information below should be followed and observed to prevent damage to equipment or injury to operators:

⚠ DANGER

Ensure discharge line is open and free of clogs before operation. Negligent acts may result in serious injury or death.

⚠ CAUTION

Feeding very hot or very cold fluid into the pump at room temperature may result in fracture of pump.

⚠ WARNING

Follow all auxiliary equipment (motors, drives, couplings etc.) manufacturer's manuals, instructions or procedures during installation, operation and maintenance of the pump.

⚠ WARNING

Avoid flashing of liquid. Ensure all priming and NPSHa calculations have been done and reviewed. Flashing of fluid may cause explosion of pump casing.

NOTICE

Check all clearances, drive to shaft alignments, fastener torques, equipment lubrication, gaskets and seals for leaks and that all equipment is fastened into place before operation.

4 NOMENCLATURE

4.1 Nameplate information

On page 54 of this manual, record the nameplate data from your pump. This will assist with any maintenance questions or pump identification in the future.

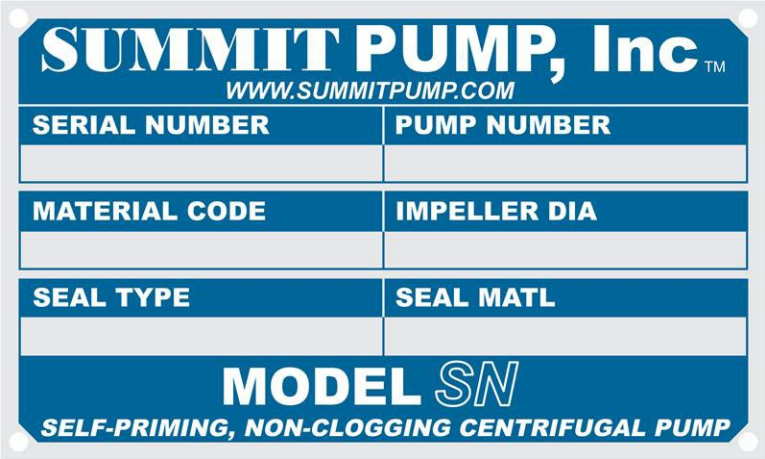

Figure 4-1 shows the pump nameplate for the SN product line. This will be attached to the completed pump and should be permanently fastened for the life of the pump.

Figure 4-1: SN, SNS & SNU nameplate (pump tag)

4.2 Serial Number

This is Summit Pump's number designated to each individual pump unit sold. Use this number to trace each individual pump build and order back to Summit Pump.

4.3 Pump Number

The pump number field identifies the model, size, pump type and impeller style.

Example: **SN 04 S A**

- **SN**: This is the pump model. The SN, SNS and SNU are all part of the SN model series.
- **04**: This states the size of the pump. These are the sizes of the suction and discharge ports.
- **S**: This is the pump type. If blank, the type is the SN series. "S" indicates the SNS and "U" indicates the SNU series.
- **A**: The final section identifies the impeller style. "A" indicates the standard 2-vane large solids handling impeller. "B" indicates the more efficient with more than 2-vane impeller, but solid size is limited.

4.4 Material Code

Material code identifies the category of materials for the pump components. Categories include but not limited to: STD, Iron/SS, 316SS, CD4, Iron/ADI, ADI.

Table 4-1: Standard Materials

Standard Pump Materials						
Matl Code- Seal Matl	**Bearing Housing**	**Impeller**	**Seal Plate**	***Shaft**	**Sleeve**	**Seal Material**
STD-TC/TC	Iron	Iron	Iron	Steel	Steel	TC/TC
**STD SOLID	Iron	Iron	Iron	17-4	None	TC/TC
IRON/SS-TC/TC	Iron	316SS	316SS	17-4	None	TC/TC
STD-SC/SC	Iron	Iron	Iron	Steel	Steel	SC/SC
IRON/SS-SC/SC	Iron	316SS	316SS	17-4	None	SC/SC
316SS-SC/SC	316SS	316SS	316SS	17-4	None	SC/SC
CD4-SC/SC	CD4MCU	CD4MCU	CD4MCU	17-4	None	SC/SC
IRON/SS-SC/SC	Iron	ADI	ADI	Steel	Steel	SC/SC
ADI-SC/SC	ADI	ADI	ADI	Steel	Steel	SC/SC

Notes: * 10" pump size is 17-4
** 10" pump size does not have this option

4.5 Impeller Dia.

The Imp. Dia. section is stating the impeller diameter the pump was sold with by the manufacturer.

4.6 Seal Type

Typically left blank as the standard is a cartridge style seal. Other option is a Type 1.

4.7 Seal Matl.

Seal material will identify the seal face materials of the installed seal from the factory. Options are Tungsten carbide (TC/TC) or Silicon Carbide (SC/SC).

5 RECEIPT AND STORAGE

5.1 RECEIVING THE PUMP

Immediately upon arrival, carefully inspect the pump for evidence of damage during transit. Immediately report any damage to your local Summit Pump, Inc. Distributor and make a claim with the shipping carrier. Locate, read and understand the following tags on pump:

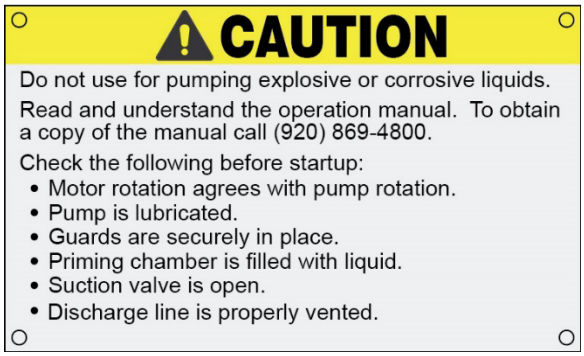

Figure 5-2: General Caution Tag

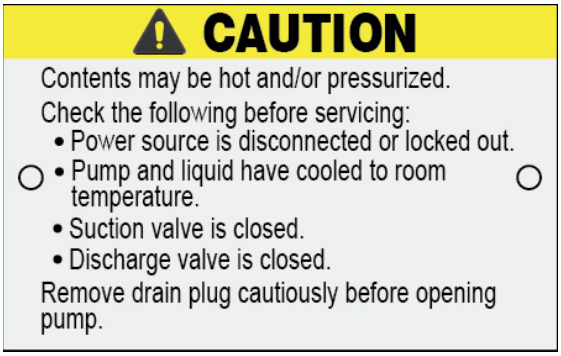

Figure 5-3: Priming Cover Caution Tag

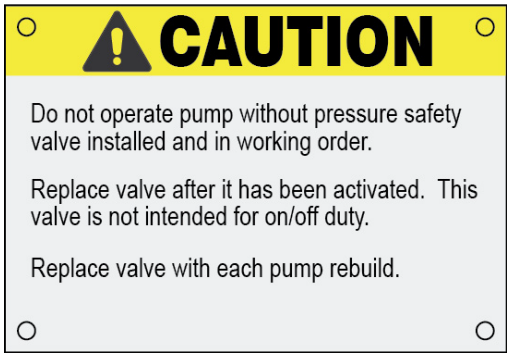

Figure 5-1: Front Cover Caution Tag

The pump and bearing housing were pressure tested and inspected before shipping from the factory. Check for loose hardware and tighten if needed, especially hardware for gasket clamping as gaskets tend to shrink upon drying.

5.2 STORING THE PUMP

5.2.1 Temporary

Temporary storage: less than six months.

1. Flush the pump with clean water. If pumped product is water reactive, remove the suction and discharge line after draining the pump, and with compressed air blow all liquid from cavity. Lightly cover all internal metal parts with oil and replace the suction and discharge lines if needed.
2. Store pump in a clean, dry place, free from extreme swings in temperature and humidity.
3. Cover with a protective covering to reduce dust contamination.
4. Rotate the shaft once a week to protect the bearings from brinelling the raceway and/or bearing balls. This also maintains an oil film on bearings and seals.

5.2.2 Long Term

Long Term Storage: more than six months.

1. Follow temporary storage guidelines 1-4 in section 5.2.1.
2. Remove front cover and remove all solid contents and clean casing internals. Replace front cover and install new O-rings on front cover assembly.
3. Coat all unpainted and machined surfaces with a rust inhibitor, such as LPS-3.

5.3 HANDLING

Pump unit boxes and crates may be unloaded using a forklift or slings depending on size and package construction.

⚠ CAUTION

Pump and assemblies are heavy, improper handling could result in serious injury.

5.4 LIFTING

To avoid damage to pump and/or motor use a nylon, chain, or a wire rope sling. The slings should be placed so the lift is equally supported at three or more points.

⚠ WARNING

Be sure all components are securely fastened to baseplate or pallet before lifting.

⚠ WARNING

Inspect all lifting equipment and rigging before lifting pump. Rig the pump securely ensuring a proper safety factor. Refer to Table 5-1 for pump weights

Table 5-1

Pump Size	Approximate Shipping Weight
3"	470 lbs
4"	605 lbs
6"	920 lbs
8"	1510 lbs
10"	1590 lbs

6 INSTALLATION

6.1 GENERAL

Summit pumps are assembled at the factory. Follow all instruction tags on the pump. Ensure all fluid properties and application requirements have been considered and relayed to manufacturer and/or distributor. Suction piping should be as short and direct as possible. With the SN pump series, it is likely the pump will be in a static lift which this manual will focus on.

6.2 LOCATION

Location considerations are easy access for inspection, maintenance and ample overhead space for lifting with crane or hoist. A recommended distance for front cover disassembly is 12 inches.

Locate the pump as close to the liquid supply as practical. The pump is designed to operate with a negative suction supply (vacuum), but also could operate with a positive suction supply. The suction pressure must never exceed 50% of the maximum pressure published on the pump curve.

⚠ CAUTION

Suction pressure must never exceed 50% of the maximum pressure published on the pump curve.

6.3 BASE PLATE

Each pump unit should be mounted on a fabricated steel base plate. The base plate should be mounted on a concrete subbase 4” to 8” longer and wider than the fabricated base plate.

6.4 FOUNDATION

Use a foundation that is sufficient to support all points of the pump baseplate. Level and grout the baseplate per standard construction practices.

6.4.1 Concrete Sub-Base

The concrete sub foundation performs a number of functions. It must support the weight of the entire pump assembly, maintain the alignment of all system components, and absorb the loads, forces and vibrations that are developed under normal operating conditions. The concrete material used must be top quality and conform to local building codes as well as the contractor’s strength requirements. Reinforcing bars and mesh should be used as required. The mounting surface of the concrete foundation must be flat and level beneath the footprint of the sub-base, or the pump could be installed out of square. This could create problems aligning the piping, place extra loads on the couplings and bearings, and alter the operating levels of lubricants or hydraulic fluids in the system. It is recommended that the top surface of the slab be held flat and level to at least F50 according to American Concrete Institute (#117) and the Canadian Standards Association (#A23.1) which is approximately 1/8” per 10 foot. The sub base height is usually determined by the process piping runs and elevation.

The weight of the sub foundation should be 3-5 times the weight of the pump, motor and baseplate. Dimensionally, it should be 4” to 8” longer and wider than the polymer concrete or fabricated steel

base plate. Anchor bolts are installed in pipe sleeves. The pipe diameter is 2.5 times larger than the anchor bolt diameter. This sleeve/bolt assembly is embedded in the base when poured.

The pipe sleeve should be filled with sand or plastic foam to the top of the sleeve. This will prevent the grout material from spilling into the sleeve and reducing the movement of the sleeve when pouring the grout.

Anchor bolt sizes: 1”-8UNC. Length is 7.5” to 10”, depending on base thickness and overall size.

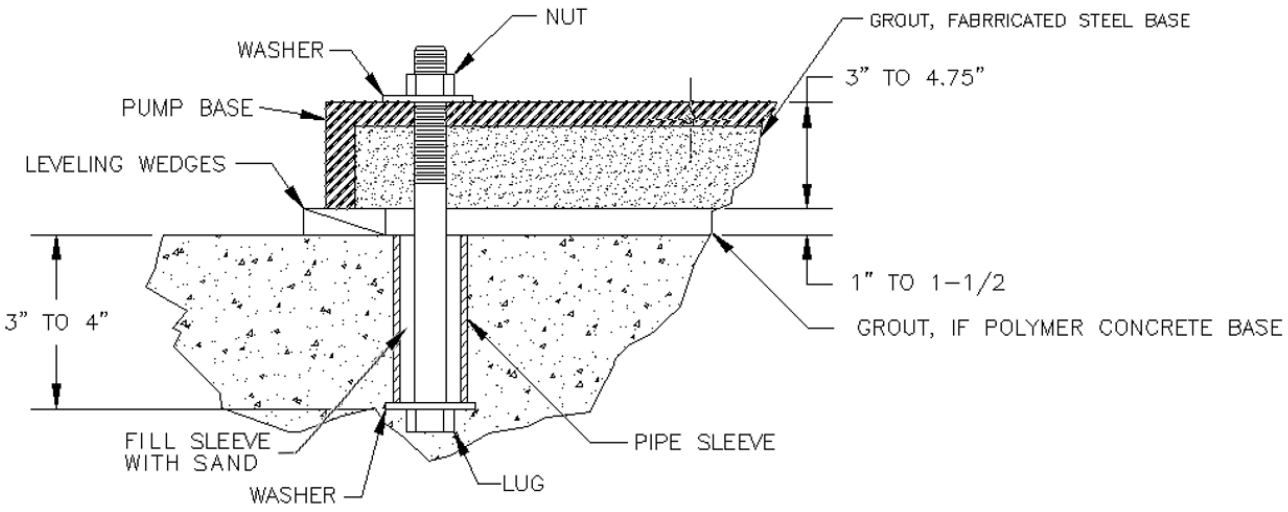

Figure 6-1: Anchor Bolt configuration

6.5 BASE PLATE GROUTING

1. This grouting instruction assumes a concrete subbase has been put in place to accept the baseplate. The subbase should be clean of dirt, oil and any other debris.
2. Shims/wedges should be wood.

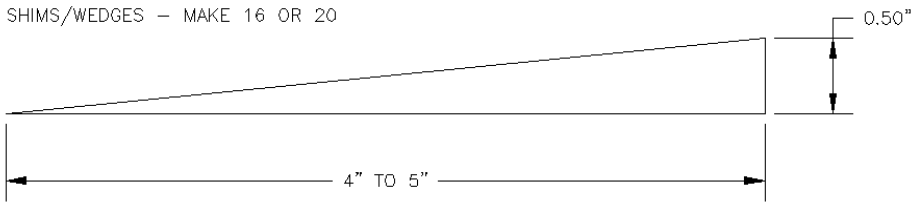

Figure 6-2: Wooden Wedges

3. Shims/wedges should be placed on the subbase, as shown in **Figure 6-3**. Use 2 to 3 per stack to obtain desired gap between baseplate and sub-base. Normal gap is 1” to 1-1/2”.
4. Carefully lower baseplate with pump and motor onto subbase over anchor bolts.
5. Level baseplate to 0.125” over length and 0.088” over width.
6. When leveling is complete, uniformly hand tighten the anchor bolts.

7. Build a plywood form around baseplate supported on the subbase. It should be 3” high and 1” to 1.5” larger than the baseplate. Its size should be large enough to include the shims or wedges that are left in place.

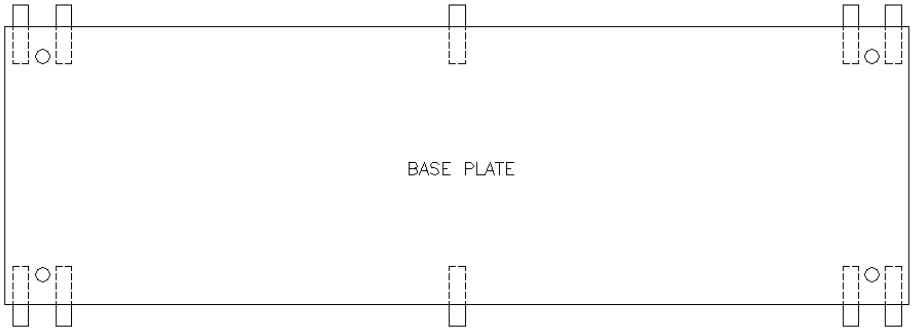

Figure 6-3: Wedge Locations

8. Use a high quality non-shrinking epoxy grout, following manufacturer’s mixing and installation instructions.
9. When grout has cured, per grout manufacturer’s recommended cure time, tighten anchor bolts till secure.
10. When grouting is complete, check coupling alignment and re-align as necessary.

6.6 PIPING CONNECTION – SUCTION / DISCHARGE

⚠ DANGER

Lock out driver power before beginning to work on pump.

Connect piping in a manner that is as short and direct as possible. Independent pipe supports, and anchors must be used in all installations. **Never support piping using the pump.** When threaded connections are used, an extendable pipe or flexible connection are possible options.

It is recommended to install an isolation discharge and suction valve to isolate the pump from the system when down for maintenance.

⚠ CAUTION

Never use force to align piping to the pump. Check shaft alignment after piping has been connected.

6.6.1 Suction Piping

The piping used should be as short and as straight as possible from suction source. Piping line size should be the same diameter as the suction nozzle. Generally, suction piping larger than the pump nozzles are avoided due to the added volume of air to be evacuated during priming. If a reducer fitting is needed it shall be eccentric type with the flat portion on top. All elbows 90° or 45° should be a long sweep. Slope the suction pipe upward towards the pump, any piping that causes air to become trapped should be avoided.

Flexible hose can be used for the suction line but must be of ridged wall type to avoid collapsing when under vacuum.

SN pumps have integral flapper valve on the suction side of the pump to keep fluid in the suction piping. This allows the pump to remain primed for the next startup.

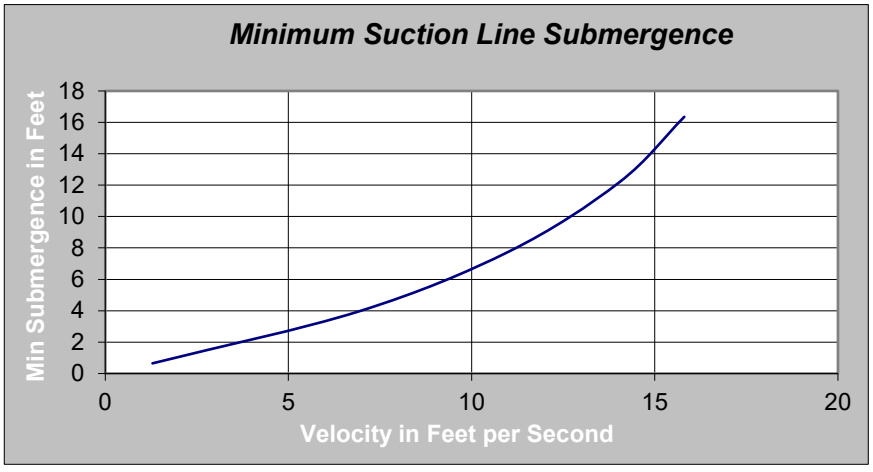

Figure 6-4: Recommended Minimum Submergence

When drawing from a sump with a single suction pipe, it is recommended to keep the center of the pipe 1.5 times the diameter from any walls. Keep the distance of the liquid's free surface and the entrance of the suction pipe (submergence) to the recommended values as shown in Figure 6-4.

$$Velocity\ \left(ft/s\right) = \frac{Flow\ (GPM) \times 0.4085}{(Pipe\ ID\ (in))^2}$$

If a bell suction is being used at the suction entrance, the maximum diameter of the bell is typically used to calculate velocity for determining minimum submergence.

6.6.2 Discharge Piping

Generally, the diameter of the discharge piping should be the same diameter as the discharge nozzle. In certain circumstances, this will not be the case, as the fluid being pumped will cause the use of a different pipe size. In these circumstances, the use of a reducer/expansion fitting is needed.

The discharge line should include a valve that can be used to throttle and shutoff flow. The size of this valve should be equal to the size of the largest discharge line. A check valve in the system should be installed to prevent excessive shock pressure and reverse rotation flow into the pump which could cause pump damage.

Do not terminate the discharge at a level lower than the surface of the liquid being pumped. Doing so may cause siphoning to occur which may cause damage to the pump. If this situation is unavoidable the use of a siphon breaker device should be used.

6.6.3 Bypass Line

A bypass line is needed when a check valve is in the discharge line. During the priming cycle, air in the suction piping side must be evacuated to the atmosphere. If a check valve is installed in the discharge line, the discharge side of the pump must be opened to vent the air in the system. The pump will not prime if there is sufficient static head to keep the discharge check valve closed.

The bypass line should be at least 1 inch diameter to minimize clogging yet small enough to prevent significantly impacting pump performance.

⚠ CAUTION

Bypass line must discharge into intake reservoir or appropriate vessel to avoid a hazardous spill

NOTICE

Bypass line discharge into intake reservoir should be secured and far enough from pump intake to avoid cavitation.

In applications with less than 30 feet of discharge head, the bypass line should run back to the wet well. Locate discharge end 6 to 8 inches below the minimum liquid level of the sump.

In applications with more than 30 feet of discharge head, a significant amount of liquid could be bypassed. This will negatively impact pump efficiency. To improve this condition an automatic air release valve should be installed in the bypass line. See section 6.6.4

6.6.4 Automatic Air Release Valve (AARV)

The AARV is designed to allow ventilation of air during the priming cycle. Once the pump is primed, the AARV will close due to the discharge pressure generated by the pump and liquid. A small amount of liquid (1 to 5 gallons per minute) will still bypass when the valve is in the closed position. Each AARV size must be chosen and adjusted for its specific application.

⚠ WARNING

Each AARV must be sized and adjusted for its specific application

The AARV is installed in the discharge line between the pump's discharge flange and the check valve as shown in Figure 6-5. The AARV inlet must be installed below the center line of the AARV as shown in Figure 6-5. The discharge of the valve must be safely directed back to the sump using an appropriate piping and piping support. The bleed line must slope towards the sump and be one inch or larger in size.

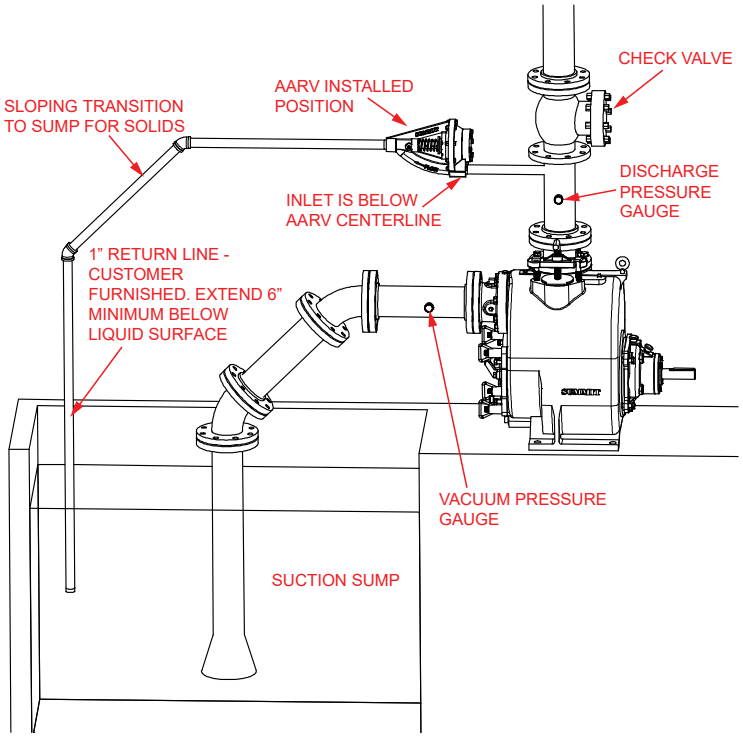

Figure 6-5: Typical Setup

6.7 Alignment

Alignment of the driver to the pump is imperative to the operating life of the equipment. Misalignment can lead to bearing failures, coupling wear, and shortened V-belt life.

Power sources mounted by Summit Pump are rough aligned prior to shipment. Shipping and handling may cause misalignment. Units must be checked before and after piping is attached to pump and prior to operation. It is recommended to check alignment again after pump has reached operation temperature and cooled again.

⚠ DANGER

Lock out driver power before beginning to work on pump. Disconnect coupling from pump for alignment.

6.7.1 DIRECT COUPLED 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. Check that driver rotation agrees with pump rotation. The pump shaft rotation should be clockwise when viewed from the driven end of the pump.
4. Install a coupling guard when alignment is complete.

6.7.2 BELT DRIVEN PUMP

Select belts for specified speed ratio and environment. Proper alignment and tension are critical for long equipment life. Over tension of belts will cause premature equipment failure.

Align driver shaft and sheaves parallel to the pump shaft and sheaves. If more than one belt is used, use a match set for belts. Belts of the same type, manufacturer and age should be used.

Tension belts to belt and sheave manufacturer's recommendations. Ideal tension is such that belt is as loose as possible without belt slippage.

⚠ CAUTION

A solid shaft must be used in all engine-driven applications. ***Note: Solid shafts require an extra spacer (801) for SN03SA and SN04SA.***

NOTICE

Align and Tension belts to belt manufacturer recommendations.

7 OPERATION

7.1 CHECKING ROTATION

The pump can only operate clockwise rotation when viewed from the driven end. If the pump has been accidently operated in a counter-clockwise rotation remove the front cover assembly and ensure no damage has been done to the impeller, wear plate or shaft. Check proper torque on the impeller bolt before reassembly. (As a general note, the pump will produce about half the expected head at an unknown flow if the pump is rotating counter-clockwise.)

Figure 7-1: Shaft Rotation

⚠ DANGER

Lock out power to avoid personal injury or death.

1. Lockout power to drive.
2. Disconnect the pump from the motor.
3. Unlock power to motor.
4. Clear personnel from immediate area, jog motor just enough to determine direction of rotation.
5. If the motor is rotating in the wrong direction the electrical wiring will need to be adjusted by qualified personnel. Then repeat Step 4 and 5.
6. Once rotation is in the desired direction, lockout motor and reattach pump to motor.
7. Check clearances and connect piping to pump. Shaft alignment should be checked.
8. Unlock motor.

7.2 FIRST RUN CHECK

Several items need to be checked before you put your pump into service. Each of the following items needs to be addressed to make certain that your equipment is correctly installed.

1. Reference the operations manual for the pump's driver
2. Ensure all plugs, seals and piping are installed correctly and properly supported.
3. Ensure proper alignment of pump.
4. Check all electrical connections.
5. All instruments and gauges should be in working accurate order.
6. Prime pump by filling casing though priming port (604).
7. Correct pump rotation, see Figure 7-1.
8. Open the suction valve and crack open the discharge valve. There must be some resistance when starting and to evacuate any air in the line.

⚠ CAUTION

Avoid operating against closed valves or wide open discharge valve. This can damage driving components and cause injury.

NOTICE

Never operate pump dry. Dry operation can cause damage to pump internals and destroy the seal.

7.3 Priming

With pump and piping installed and connected, remove the priming cover and fill the pump casing with water or the pumped liquid. The pump should be primed whenever the pump has been drained. Never start or operate the pump without liquid in the casing.

Once the pump has been primed, the pump will prime and reprime upon restart of the pump, only if there is liquid in the casing. Refer to Section 2.2 on page 1 for more information.

7.4 Lubrication

Ensure seals, bearings and motor bearings (see motor manufacturer's recommendations) are adequately lubricated for the service duty. Make sure lip seals are installed in the correct orientation, which is the sealing (spring exposed) side will face the lubrication oils.

In normal conditions, moderate duty, replace oil about once a year. Check oil and oil level daily for contaminated oil. Replace oil more frequently in more harsh environments such as regular temperature swings and continuous operation run time.

Acceptable lubrication oil is of SAE No. 30 (ISO VG 100) non-detergent oil. Examples of acceptable oils are in Table 7-1

Table 7-1: Acceptable Lubricating Oils

Acceptable Lubricating Oils	Available Grades		
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

Fill oil levels to the center of the sight gauge for corresponding chambers. Below are approximate oil capacities, use for purchasing oil quantities only, do not use the provided values for filling the appropriate chambers.

Table 7-2: Oil Chamber Capacities (Approximate)

Pump Size	Seal Chamber	Bearing Chamber
SN03S	40 oz	10 oz
SN04S	58 oz	11 oz
SN06S	64 oz	21 oz
SN08S	92 oz	16 oz
SN10S	84 oz	27 oz

Note: Values are approximate, always order more lubricate than needed.

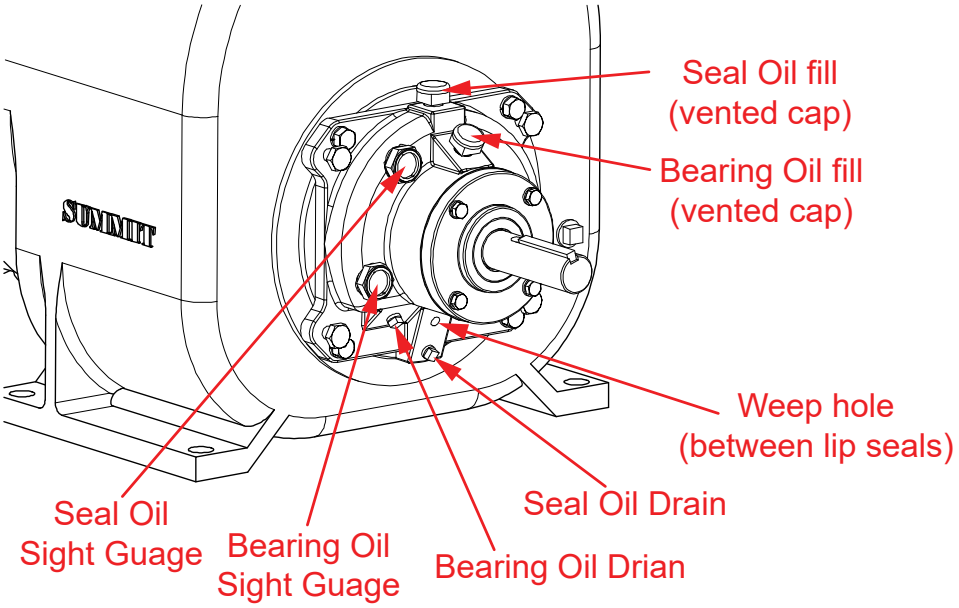

Figure 7-2: SNS Lubrication component locations and identifications

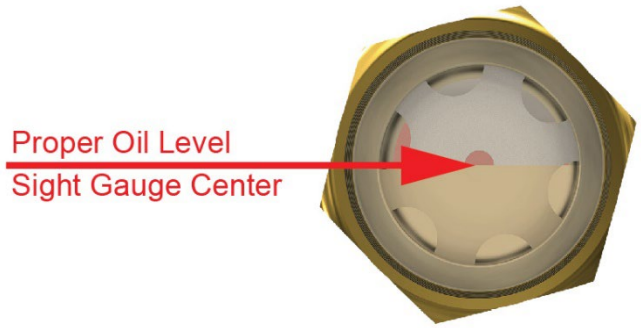

Figure 7-3: Sight gauge proper oil level

7.4.1 Seal Oil

The seal oil used is as listed in Table 7-1. The oil is designed to provide heat dispersion from the seal, extending the seal life. It also acts as an indicator if the mechanical seal begins to leak. Checking the sight gauge for a milky appearance will indicate if water has entered the seal oil cavity.

7.4.2 Bearing Oil

Bearing oil shall be as listed in Table 7-1.

It is considered normal for bearing temperature to be around 160°F with safe operation to 180°F. When pump is first started, bearings may run at higher temperatures. After continued operation bearings will cool to normal temperatures. Take note of this temperature by placing a magnetic temperature probe on the external part of the bearing housing. Continue to monitor the temperature of the bearing housing near the bearing over the lifetime of the pump, drastic temperature rise means the bearing is nearing failure.

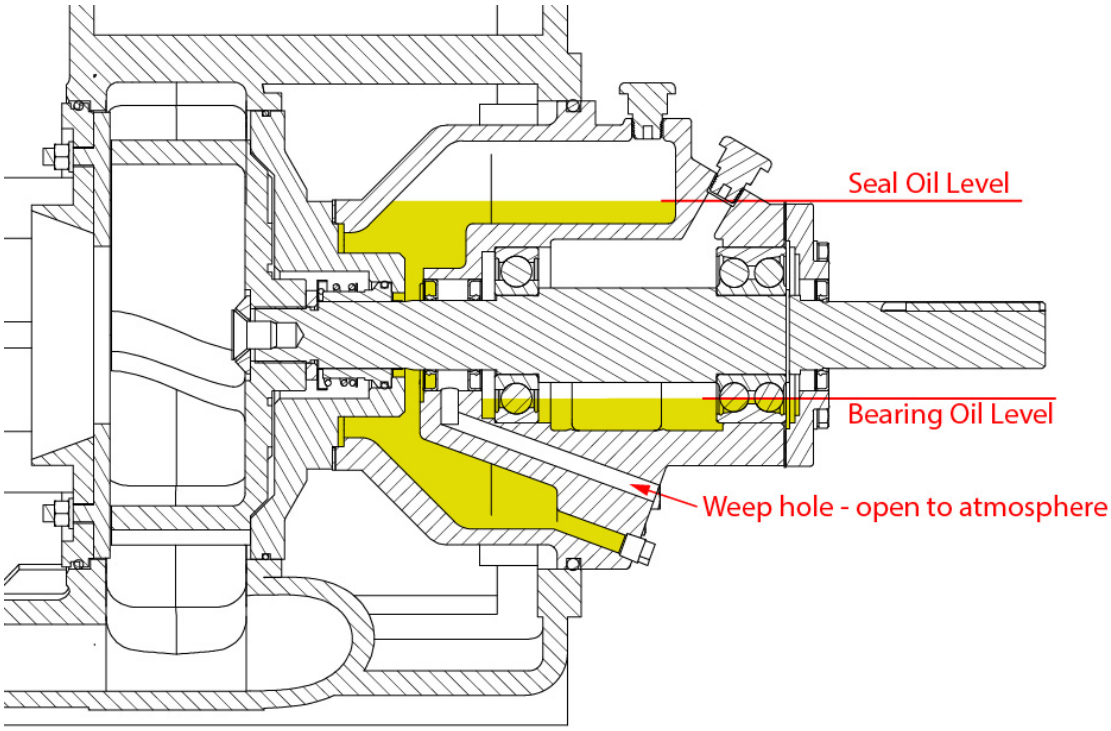

Figure 7-4: SNS Cross Section oil levels

7.5 Pressure Relief Valve

Pressure relief valves are fit standard to every pump for equipment protection only. Pressure relief valve will begin to open around 75psi. It is recommended to replace the relief valve at every overhaul or if pump overheats.

Maximum liquid temperature for the pump is **160°F (71°C).** Overheating is possible with liquid recirculation in the pump. This can happen when priming, running against a closed or partially closed suction or discharge valve. When the liquid heats and reaches its boiling point, the internal pressure increases due to the generated vapor as more volume is needed for the gas. In extreme cases this can cause the pump to explode or rupture.

If overheating occurs, stop the pump immediately and allow the pump to cool before approaching or servicing.

⚠ DANGER

NEVER approach an overheated pump.
Allow pump to cool before service.

⚠ DANGER

DO NOT remove pressure relief valve or operate without pressure release for pump.

7.6 Start Up

1. Refer to section 6.6.3 and 6.6.4 for by-pass and air-release piping setups. During priming cycle, air must be removed from the suction piping in an efficient way.
2. Ensure pump is primed by filling with water or pumped liquid.
3. Ensure the motor rotation is clockwise when viewing the pump from the driven end. Refer to Section 7.1 on page 16.
4. Crack open the discharge valve to allow flow yet still give the pump resistance. Fully open suction valve.
5. Ensure all plugs, gauges, seals are installed. Check piping for proper fitment and connection.
6. Start the pump.
7. Once pump is passed the priming cycle and liquid is being moved through the system, adjust the discharge valve to meet the desired flow rate and head.

7.7 Shut Down

1. If possible, flush the pump with clean water. (Only use water if it will not contaminate the pumping liquid.)
2. Slowly close the discharge valve to minimum flow for the pump.
3. Cut power to drive source or reduce the speed until shaft rotation has stopped.
4. Close both the discharge and suction valves. Disconnect all power to pump.

8 MAINTENANCE TIMETABLE

8.1 DAILY MAINTENANCE

1. Review pump: Check temperatures, vibration, leaks and any loose hardware.
2. Verify expected flow, head and power consumption are achieved.
3. Check seal oil and bearing oil sight gauge levels. Look at oil consistency, and color.
4. Inspect V-belts and sheaves. Lubricate if needed per sheave manufacture recommendations.
5. Inspect air release valve (if applicable) for any clogging in air release line.

8.2 SIX MONTH MAINTENANCE

1. Daily maintenance and the following.
2. Inspect wear plate clearance and seal plate clearance with impeller.
3. Inspect and/or clean suction and discharge spools for debris and wear.
4. Clean out air release line and automatic air release valve, if applicable.

8.3 YEARLY MAINTENANCE

1. All the above and the following:
2. Replace seal and bearing oil.
3. Inspect and clean pressure relief valve.
4. Check pump shaft alignment with driving equipment.
5. Rotate shaft by hand listen and feel for bearing wear and damage.
6. Check and compare pump performance with published performance curve and previous data recordings of the pump. These inspections can range from once a year, to once every three to five years.
7. Review driving equipment maintenance schedules per manufacturer’s recommendations.

9 TROUBLESHOOTING

9.1 PUMP PROBLEMS

Pump turns, no flow.	1,2,3,4,5,8,9,10,11,12,13,14,15,16,18,21,22
Pump flow rate below expected capacity.	1,3,4,5,8,9,11,12,13,14,15,16,18,19,28,29
Pump will not produce rated pressure.	1,2,3,4,10,11,13,15,16,18,19,22,27,28,29
Pump clogs frequently	5,8,10,11,12,13,15,16,21,22,28,29
Pump no longer or doesn’t prime	1,2,3,4,5,8,10,11,12,13,14,15,18,19,22,28
Pump won't turn/motor overloads.	2,5,15,20,24,25,26,29
Pump is very noisy/excessive vibration.	1,2,3,4,5,6,10,11,12,13,14,15,16,17,18,19,20,22,24,25,28,29
Pump or bearings runs hot.	1,2,3,4,5,6,8,9,10,11,12,13,14,15,16,18,19,20,22,24,25,28,29
Pumped fluid is coming from weep hole	19,30,31
Oil is coming from weep hole	31
Excessive pump wear.	1,2,3,6,7,11,12,13,15,16,17,19,20,22,23,24,25,28,29

9.2 PROBABLE CAUSE AND REMEDY.

NPSHA not sufficient.	1
Pump has run dry.	2
Air leak or air entrainment into pump	3
Liquid temperature higher than anticipated.	4
Viscosity higher than anticipated.	5
Pump running too fast for application.	6
Abrasives in liquid.	7
Losses in system are greater than calculated	8
Suction or differential pressure too high.	9
Suction valve not open.	10
Suction valve partially open.	11
Discharge valve not open or partially open.	12
Clogged strainer or check valve.	13
Supply vessel empty.	14
Pump rotation wrong.	15
Minimum submergence not met	16
Velocity in suction pipe too high	17
Suction hose collapsed	18
Leaking or worn seal, check seal oil	19
Inadequate lubrication.	20
Velocity in suction is too low for solids	21
Suction lift is too great and/or pump is not primed	22
Material compatibility.	23
Drive misalignment	24
Base plate loose	25
Drive not sized for horsepower required.	26
Pressure gauges are not near pump suction and discharge	27
Air vent in discharge is not installed or is plugged	28
Impeller clearances are worn or not set properly	29
Seal plate gasket failed, check seal oil	30
Inboard lip seal(s) has failed	31

9.3 Common Self-Priming Troubleshooting

9.3.1 Failure to First Prime:

- Pump not filled with liquid
- Lift is too high or long
- No air vent line or discharge is plugged
- Suction line has air leak
- Suction is plugged
- Incorrect shaft RPM or rotation
- Missing or damaged gaskets
- Suction valve is closed
- Improper impeller clearance
- No impeller or wear plate
- Mechanical seal failure
- Suction pipe too large
- Discharge valve closed
- External check valve stuck
- Temperature too high
- Specific gravity too high
- Freeze damage
- Check AARV spring tension

9.3.2 Failure to reprime

- Same as section 9.3.1 including:
- Internal clearance worn
- Air entering suction
- Evaporation of fluid in pump
- Rotation change after maintenance
- RPM change after maintenance
- Valve failure
- Improper submergence
- Strainer plugged
- Specific gravity too high
- Stuck float switch
- Lift too high
- Broken shaft

9.3.3 Failure to Pump

- Same as section 9.3.2 including
- Pump or piping plugged
- Discharge pressure too high
- Entrained air
- Temperature too high
- Specific gravity too high
- Improper submergence
- Suction entrance too close to sump wall
- Suction entrance too close to inflow into sump
- Suction entrance too close to second pump suction
- Suction entrance too close to sump bottom
- Drivetrain error/damage

10 EXPLODED VIEW

Use below figure and table with respect to identify item numbers {example: Shaft (106)}

10.1 SNS 4-Inch Exploded View

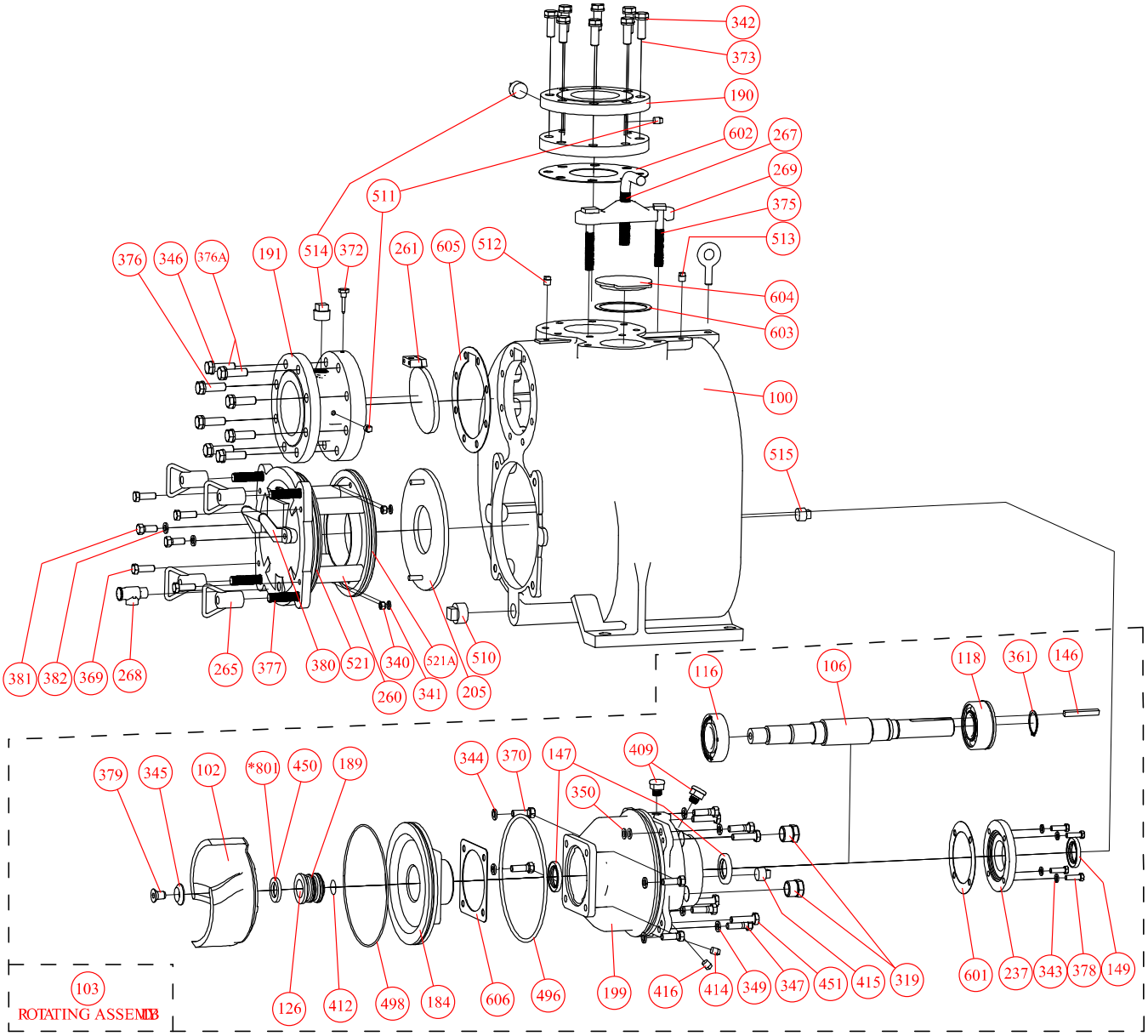

Figure 10-1: SNS Exploded View (SN04SA)

Table 10-1: SNS Item ID exploded view part list

MODEL SNS PARTS LIST

ITEM ID	QTY	DESCRIPTION	ITEM ID	QTY	DESCRIPTION	ITEM ID	QTY	DESCRIPTION
100	1	CASING	341	2	LOCK WASHER, WEAR PLATE	412	1	O-RING, SLEEVE
102	1	IMPELLER	342	8	LOCK WASHER, DISH FLANGE	414	1	PLUG, SEAL CAVITY DRAIN
106	1	SHAFT	343	4	LOCK WASHER, OB COVER	415	1	PLUG
116	1	BEARING, IB	344	4	LOCK WASHER, HSG TO SEAL PLATE	416	1	PLUG, BRG HSG DRAIN
118	1	BEARING, OB	345	1	WASHER, IMPELLER	450	1	SHIM SET - IMPELLER
126	1	SHAFT SLEEVE	346	8	LOCK WASHER, SUCT FLANGE	451	4	ADJ SCREW, ROT ASSY
146	1	COUPLING KEY	347	4	BOLT, HSG TO CASE	496	1	O-RING, ROT ASSY
147	2	LIP SEAL, IB	349	4	LOCK WASHER, HSG TO CASE	498	2	O-RING, SEAL PLATE
149	1	LIP SEAL, OB	350	8	ADJUSTMENT SHIM, BRG HSG	510	1	PLUG, CASING DRAIN
184	1	SEAL PLATE	361	1	RETAINING RING, OB	511	2	PLUG, SUCT & DISH FLG
189	1	CARTRIDGE SEAL ASSEMBLY	369	4	BOLT, JACK CVR TO CASE	512	1	PLUG, VENT
190	1	DISCHARGE FLG - STD - FLANGED	370	4	BOLT - HSG TO SEAL PLT	513	1	PLUG, VENT
191	1	SUCTION FLG- STD - FLANGED	372	1	PIN, FLAP VALVE	514	2	PLUG, SPOOLS
199	1	BEARING HOUSING	373	8	BOLT, DISH FLANGE	515	1	PLUG, BRG CMBER
205	1	WEAR PLATE	374	4	DRIVE SCREW, WARNING PLATE	521	1	O-RING, COVER TO CASE
237	1	BEARING CAP	375	2	BOLT, PRIMING COVER	521A	1	O-RING, COVER TO CASE
260	1	COVER PLATE ASSY	376	6	BOLT, SUCTION FLANGE	601	1	GASKET - BRG CAP
261	1	FLAPPER VALVE ASSY	376A	2	BOLT, SUCTION FLG TOP	602	1	GASKET - DISCHARGE FLG
265	4	HAND NUT, COVER TO CASE	377	4	STUD, COVER TO CASE	603	1	GASKET - PRIMING COVER
266	4	DRIVE SCREW - WARNING PLATE	378	4	BOLT, OB COVER TO HSG	604	1	PRIMING COVER WITH WARNING TAG
267	1	HAND SCREW, CLAMP BAR	379	1	IMPELLER BOLT	605	1	GASKET - SUCTION FLANGE
268	1	RELIEF VALVE	380	1	HANDLE, FRONT COVER	606	1	GASKET, SEAL PLATE
269	1	CLAMP BAR, PRIMING COVER	381	2	BOLT, HNDL TO FRNT CVR	700	1	WARNING PLATE, FRONT COVER
319	2	SIGHT GLASS, 3/4" NPT	382	2	LOCK WASHER, HNDL TO FRNT CVR	701	1	WARNING PLATE, PRIMING COVER
340	2	NUT, WEAR PLATE	409	2	VENTED PLUG	*801	1	SPACER

* THE USE OF A SOLID SHAFT REQUIRES THE USE OF A SPACER (ITEM 801), AND MUST BE USED WITH A COMPONENT SEAL ASSEMBLY WITHOUT THE SLEEVE (FOR SOLID SHAFT)

11 DISASSEMBLY MODEL SNS

This section will cover the disassembly of the model SNS if it becomes necessary. Follow all pump tags and instructions explained below. Follow all local codes and end user's or maintenance procedures as it is impractical to address all situations for which these pumps are installed.

Refer to Section 10 for part's item numbers and images. When item numbers are called out in this manual, they will be in parentheses following the description of the part. Example: Casing (100).

Notes:

- For devices that are other than Summit Pump such as motors, couplings and seals refer to the equipment manufacturer for repair literature and consult.
- Most repairs can be completed by removing the Cover Plate Assembly (260) while leaving the piping and driving equipment connected. NEVER open an overheated pump or a pump that is still able to rotate. Close both suction and discharge valves and lockout all power to pump and driving equipment.

Before continuing to service anything of the pump, drain the pump by removing the casing drain plug (510). Clean and reinstall the drain plug (510).

⚠ DANGER

Lock out power to avoid personal injury or death when working on pump.

⚠ DANGER

Properly vent any pressure in pump, fittings and connecting lines.

⚠ DANGER

Allow overheated pump to cool before opening any covers, plates or plugs.

⚠ WARNING

Understand material being pumped. Obtain MSDS information for product. Take all necessary precautions.

⚠ WARNING

Wear eye protection and proper personal protective equipment.

⚠ CAUTION

Secure pump before disassembly to avoid damage. Pump's center of gravity changes when removing parts.

NOTICE

Recycle used oil and worn parts which shall be completed by the end user. Follow local guidelines and regulations.

11.1 COVER PLATE / WEAR PLATE

To access the wear plate (205) the cover plate assembly (260) will need to be removed from the pump casing (100). Unthread the hand nuts (265) in a counterclockwise rotation, a pry bar maybe needed to initially rotate. Use the jack bolts (369) to begin to move the cover plate assembly (260) out of the casing (100).

Once the cover plate assembly (260) is out of the casing (100) inspect the wear plate (205) for deep scores and ware. If found, wear plate (205) will need to be replaced. To remove the wear plate (205), loosen nuts (340) and remove with lock washers (341). Slide out the wear plate (205), the threaded studs will stay connected with the wear plate (205).

Inspect O-Rings (251, 251A) for cracking or flat spots. It is recommended to replace these O-rings (251, 251A) whenever the cover plate assembly (260) is removed from the casing (100).

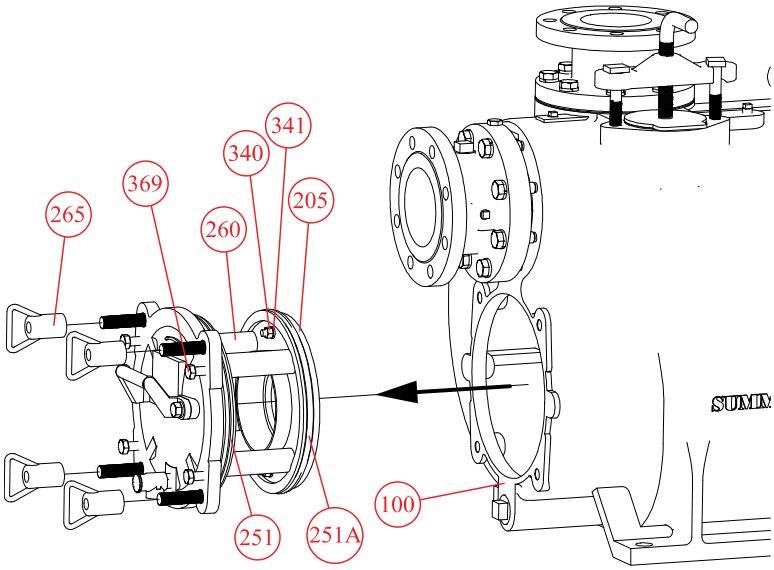

Figure 11-1: Cover Plate Assembly Removal

⚠ WARNING

Replace pressure relief valve if clogged or engaged due to high pressure.

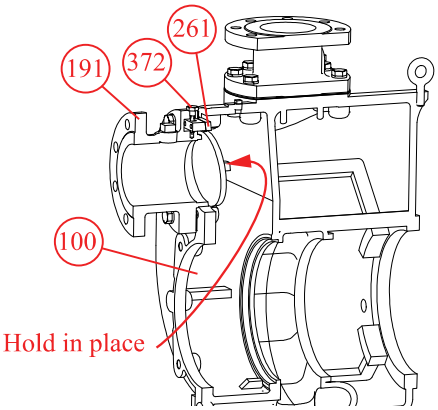

Figure 11-2: Flapper Valve

11.2 FLAPPER VALVE

If removal of the flapper valve assembly (261) is required remove the check valve pin (372) by unthreading it from the suction flange spool (191). When pulling out the check valve pin (372) hold the flapper valve assembly (261) by hand through the cover plate (260) opening to keep it from falling into the casing (100). Once the pin (372) is removed the flapper valve assembly (261) can be removed.

There is no need to disassemble the flapper valve (261) any further. The flapper valve assembly (261) must be purchased as a unit.

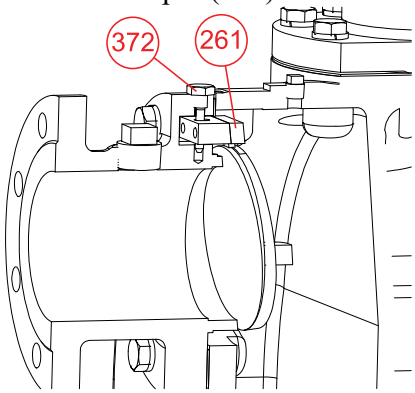

Figure 11-3: Flapper Valve

11.3 ROTATING ASSEMBLY REMOVAL

The rotating assembly (103) is defined as the parts within the dashed line shown in Figure 10-1 on page 24. The assembly can be removed without disconnecting piping from the pump but the drive components may need removal to allow space for the rotating assembly (103) removal.

11.3.1 Loosen Impeller

Before removing the rotating assembly (103) from the casing (100) it is recommended to loosen the impeller (102) as it is difficult to loosen after it is removed from the casing (100).

Drain the seal cavity oil before loosening the impeller (102) on the shaft (106). Loosening the impeller (102) could allow the mechanical seal (189) sleeve (126) to slide off the sleeve O-ring (412) causing the seal oil to leak out near the mechanical seal. To drain the seal oil remove plug (414).

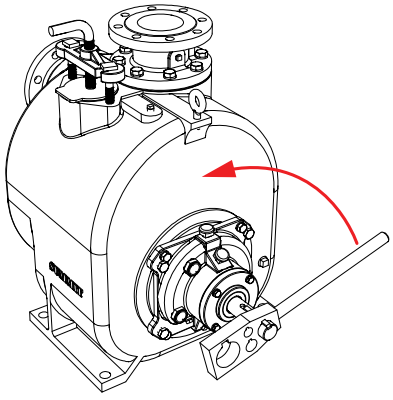

Figure 11-4: Loosen impeller with impeller wrench

Access and remove the impeller bolt (379) through the opening of the cover plate assembly (260). Use an impeller wrench on the coupling end of the shaft (106) and a soft block of wood wedged between an impeller (102) vane and casing (100). Turn the shaft (106) counterclockwise when viewed from the driven end of the pump a quarter turn.

⚠ CAUTION

Do not remove impeller until rotating assembly is removed from casing.

11.3.2 Assembly Removal

Remove bolts (347) and lock washers (349) from bearing housing (199). Using adjusting bolts (451) to begin to move rotating assembly (103) out of the casing (100).

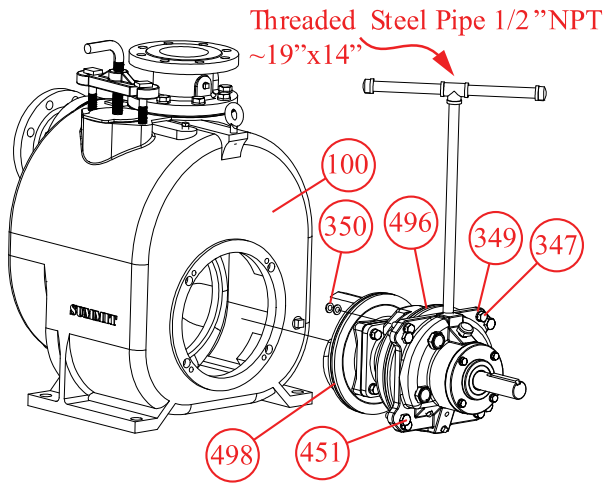

Figure 11-5: Alternative removal fixture

Using a jig or power end removal fixture, connect this fixture to the bearing housing (199) tapped bolt holes and remove rotating assembly (103).

If a removal fixture is not available remove the vent plug (409) for the seal chamber and thread in ½" NPT steel pipe to use as a handle to lift and haul out the rotating assembly (103). Center of gravity will be closer to impeller side of rotating assembly (103).

Inspect the O-ring (496 & 498) for damage, wear or flat spots. It is recommended to replace all O-rings when removed from service. Set aside adjustment shims (350) for reassembly.

11.3.3 Impeller Removal

If not already, remove impeller bolt (379) and impeller washer (345), threads are right-hand thread. Unthread the impeller (102) from the shaft (106), threads are right-hand thread. Take care when unthreading as the mechanical seal (189) spring will decompress with impeller (102) removal.

Remove the impeller shims (450). Tie shims and label or measure thickness for reassembly easement.

11.3.4 Mechanical Seal Removal

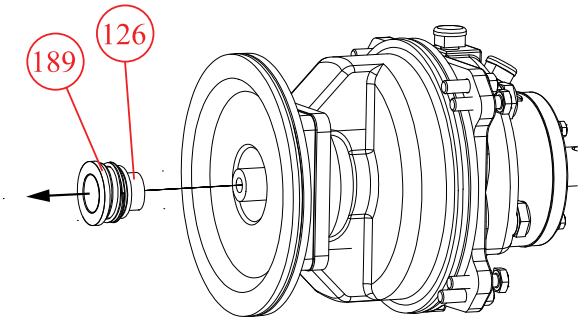

Figure 11-6: Rotating Component Removal

With the impeller (102) removed the rotating component of the mechanical seal (189) and sleeve (126) will be accessible. Grab the rotating components, spring and integral sleeve (126) and remove from the shaft (106). The sleeve O-ring (412) might stay with the sleeve (126), if not the O-ring (412) can be accessed when the seal plate (184) is removed.

To remove the stationary portion of the mechanical seal (189) the use of two wire hooks to reach in near the shaft around to the back side of the seal face can be used to pull the stationary component out from the seal plate (184).

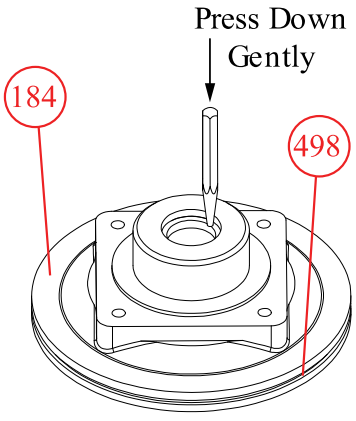

Figure 11-7: Stationary Component Removal

NOTICE

Push stationary element out by hand. DO NOT use hammer

The other method is to remove the seal plate (184) by removing bolts (370) and lock washers (344). The stationary component will be removed with the seal plate (184). Placing the square face of the seal plate (184) up, the stationary component can be pressed out by hand or by use of a soft dowel. Press evenly working around the back side of the stationary component. If reusing the seal, it is recommended not to remove the stationary component of the mechanical seal (189).

NOTICE

It is recommended that seals be replaced if removed to ensure best sealing.

With the seal plate (184) unbolted from the bearing housing (199), remove the O-ring (498), seal plate gasket (606) and if not already shaft sleeve O-ring (412). If damaged, torn or flat spots are present replace these parts.

11.3.5 Shaft/Bearing Removal

Drain all bearing oil from the bearing housing (199) by removing the bearing housing drain plug (416). See Figure 7-2 for plug locations.

Unthread the bolts (378) from the bearing housing (199) and remove lock washers (343). Bearing cap (237) can be removed from coupling end of shaft (106) and remove bearing cap gasket (601). Take care as not to damage lip seal (149). Check for damage of gasket (601), replacement is recommended. Press out the lip seal (149) from bearing cap (237) if replacing.

Remove shaft (106) and bearings (116, 118) as a unit from the bearing housing (199). Using a soft rubber mallet, lightly tap on the inboard end of the shaft (106) to initially get the shaft unit to move. Once unit is moving, removal of the shaft unit should slide out with ease. Take care as to not damage lip seals (147) when removing shaft (106).

Bearings (116, 118) have an interference fit with the shaft (106) and if bearings (116, 118) need removing they will need to be pressed off using a hydraulic press. Before thrust bearing (118) removal, use a spanner wrench to remove the retaining ring (361) from the outboard end of the shaft (106).

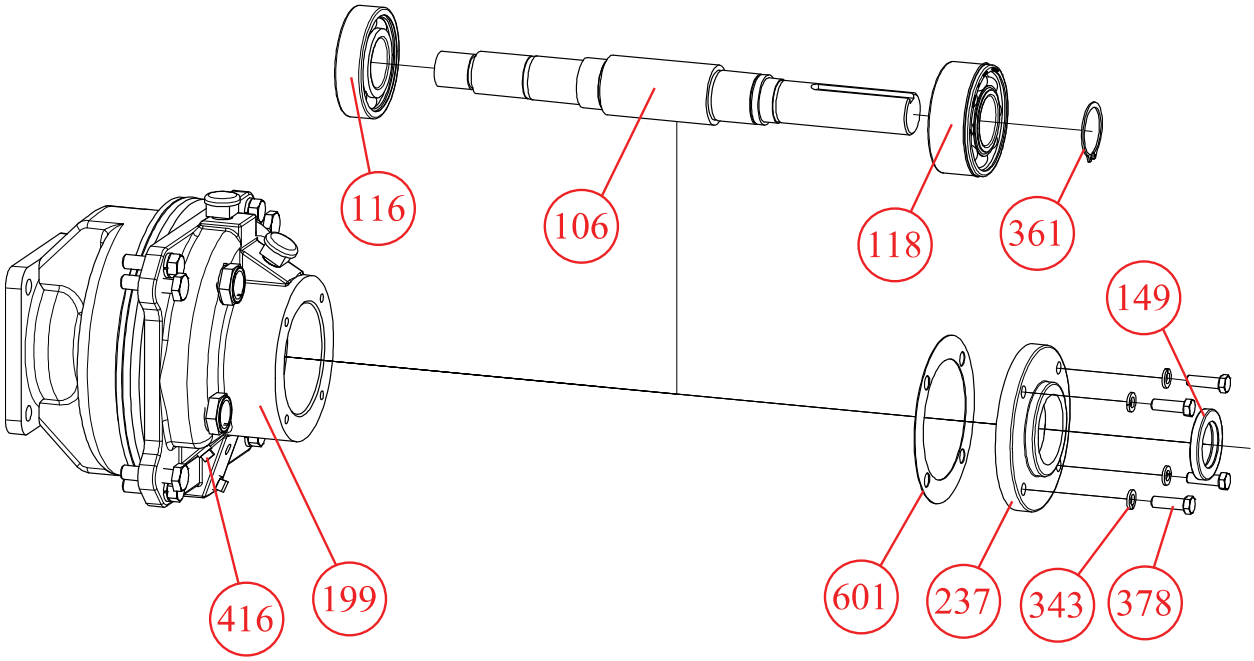

Figure 11-8: Shaft and Bearing Removal

11.3.6 Bearing Housing

Remove the O-ring (496) from the bearing housing (199) and check for flat spots, tears or damage. It is recommended to replace upon reassembly. Remove any plugs, vents and sight glasses if needed.

Remove the lip seals (147) if replacing. Using a sleeve or punch tap out each lip seal (147) from the bearing housing (199). Take care as not to damage the bearing housing (199).

Once all parts are removed clean and inspect for damage, make sure parts are labeled to improve the reassembly process.

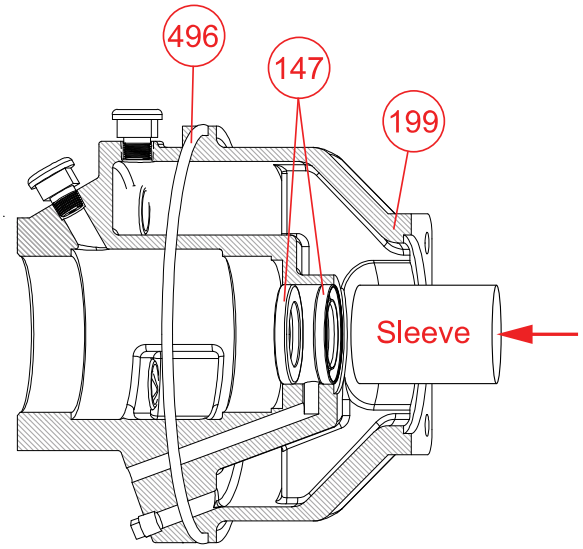

Figure 11-9: Bearing Housing Lip Seal Removal

12 ASSEMBLY MODEL SNS

This section will cover assembly of model SNS and its components. This section for assembly starts with all parts separated from their assembled location, including bearings, plugs and bolts. Use the following steps as a general guideline, as it is impractical to cover every situation. Ensure all local code and procedures are followed within the assembly and installation environment.

When item numbers are called out in this manual, they will be in parentheses following the description of the part. Example: Casing (100).

Notes:

- The 10" SN10SA will have the suction spool (191) attached to the casing in line with the impeller eye. Assembly and disassembly of the bearing housing components and impeller will be similar as the other sizes. When working with the seal plate and cover plate assembly use the instructions in this section as reference.
- When using a solid shaft, the use of a spacer between the impeller and shaft is needed for all sizes except the SN06SA, SN08SA, and SN10SA. Do not use a sleeve type shaft with an engine driven pump.

⚠ DANGER

Lock out power to avoid personal injury or death.

⚠ DANGER

Mechanically disconnect pump from driving equipment

⚠ WARNING

Wear eye protection and proper personal protective equipment.

⚠ CAUTION

Use solid shaft with engine driven equipment

NOTICE

Secure pump before assembly to avoid damage. Pump's center of gravity changes when adding parts.

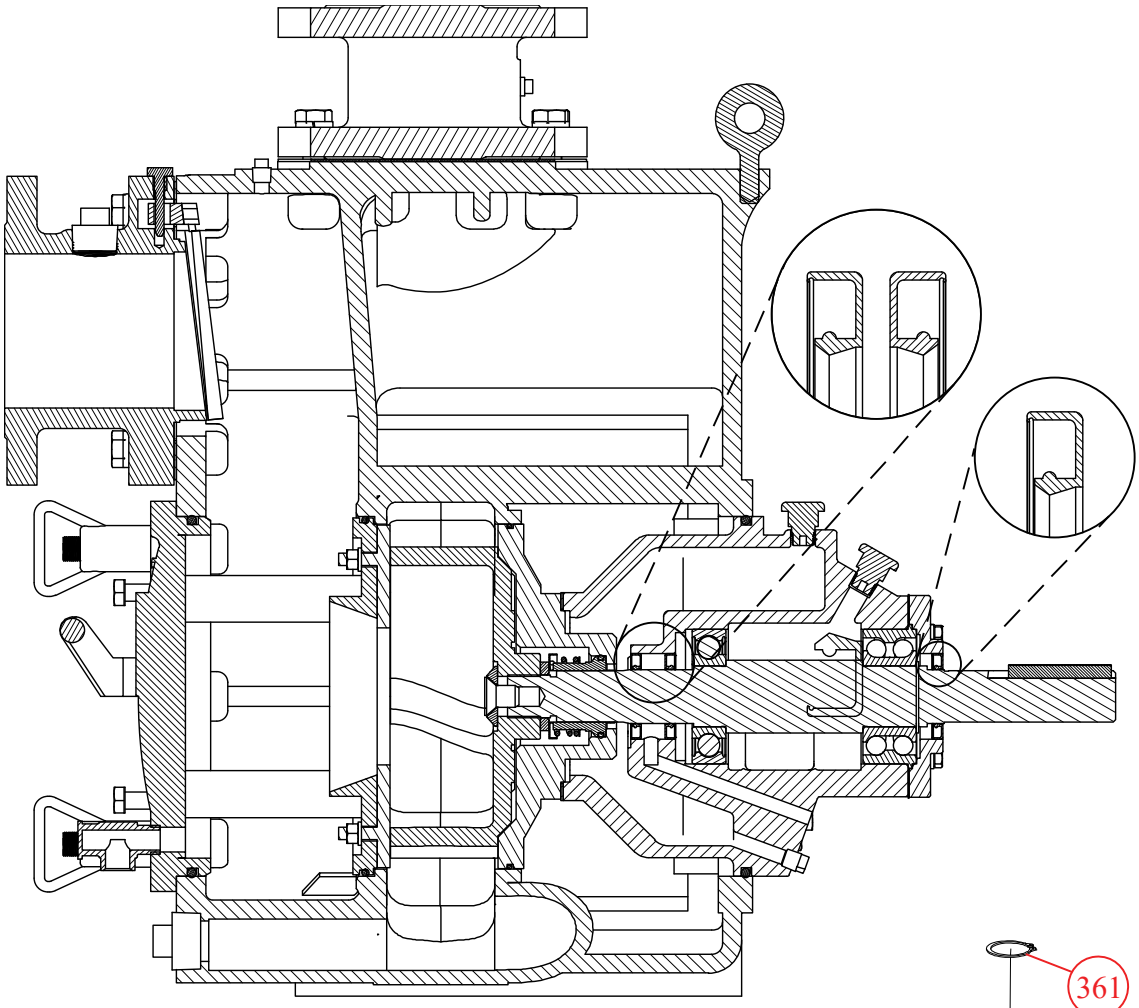

Figure 12-1: Assembled Pump (SN10SA not represented)

12.1 Shaft & Bearings

When assembling components for the rotating assembly (103), a clean work area and room is imperative to pump life. Keep bearings (116, 118) free of debris after removed from packaging and before installing into the bearing housing (199).

⚠ WARNING

Cleaning solvents can be toxic and flammable. USE IN VENTILATED AREA FREE OF SPARKS AND HEAT.

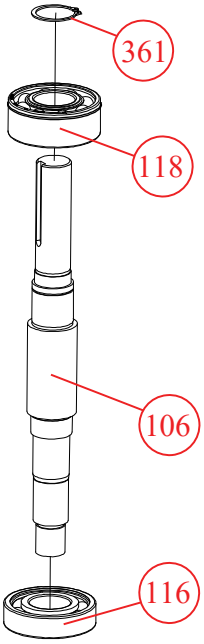

Figure 12-2: Shaft Assembly

12.1.1 Bearing Heater

1. Clean shaft (106) surfaces with appropriate cleaner, wipe clean and allow to dry. Remove bearings (116, 118) from packaging. Using a

bearing heater, heat bearings (116, 118) approximately 160°F higher than ambient, do not exceed 240°F for bearing temperature.

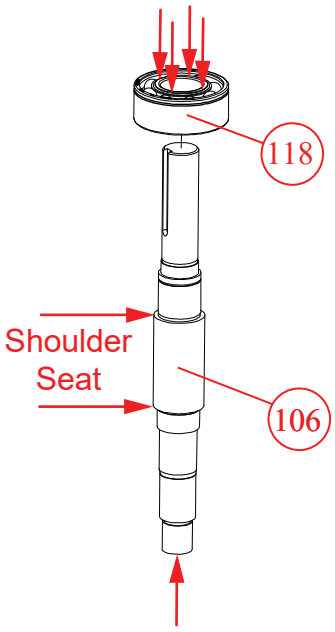

Figure 12-3: Pressing Bearing locations

2.Place shaft (106) in a vertical position such that the heated bearing can drop into its location on the shaft (106). Bearings shall be oriented with the bearing identification on the outer diameter raceway towards the outboard ends of the shaft (106). Take extreme care to fit bearing square onto shaft, if not square the bearing could cool quickly and become stuck before reaching correct seating position. If this happens use of hydraulic press is needed to remove and try again if shaft (106) or bearing (116, 118) is not damaged in this process.

3.If correctly done, bearings (116, 118) will easily drop over shaft (106) all the way to the shoulder seat. Allow bearings (116, 118) to cool to touch. After cooling, check to make sure bearings (116 , 118) have not contracted away from shaft seat shoulder.

12.1.2 Bearing Press

4.It is possible to press bearings (116, 118) onto shaft (106) although this method is not recommended especially with stainless steel shafts. If bearing (116, 118) is not pressed on with continuous force or bearing (116, 118) is not square to shaft (106) galling can occur to shaft or bearings can get damaged. When pressing, press from the end of the shaft (106) and the inner diameter of the bearing (116, 118).

⚠ CAUTION

NEVER press or hit against bearing balls, outer race or cage.

5. Install the retaining ring (361) once bearing (118) has cooled using a spanner wrench.

12.2 Bearing Housing

6. Install all plugs and fittings into the bearing housing (199). Clean all machined surfaces with appropriate cleaner and let dry.

12.2.1 Inboard Lip Seals

7. Install lip seals (147) into bearing housing (199). The open (spring) side of the lip seals (147) should face the fluid they are sealing. The bearing oil lip seal spring should be exposed to the bearing oil and the seal oil lip seal spring should be exposed to the seal oil.

8. To best avoid damage during installation, use an oversized sleeve which over hangs the outer diameter of the lip seals (147). Install each seal from its respected side, the bearing oil seal from the outboard end of the bearing housing (199) and the seal oil seal from the inboard side of the bearing housing (199).

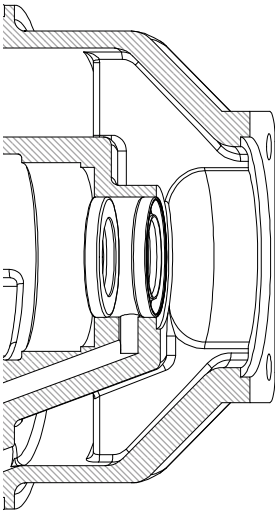

Figure 12-4: Lip Seal (147) installed position

9. Using the same oil for the bearings and seal, lubricate the seal bore and the outer diameter of each lip seal (147). Place the seal (147) in the bore, ensure lip seal (147) is set square and by hand push seal in. Use the oversized sleeve and light taps of a hammer to set the lip seal (147) flush inside the seal bore.

12.2.2 Shaft Installation

1. Using the recommended bearing oil, lightly lubricate the bearing bores and outer diameter of the bearings (116, 118). Also lightly lubricate the lip seals (147) lips and area on shaft where seals come in contact.
2. Take the assembled shaft (106) and bearings (116, 118) and install it into the bearing housing (199). When moving the shaft (106) through the lip seals (147) take extreme care not to damage or pop out the spring from the seals (147). If the spring were to pop out, remove the shaft (106) and reinstall the spring into the seal (147). If rubber is damaged on the seals (147) replace the damaged seal.
3. Push in the shaft (106) until the outer retaining ring on the bearing (118) rests against the bearing housing (199). Light tapping with a rubber mallet might be needed on the end of the shaft to slide the shaft (106) and bearings (116, 118) into place.

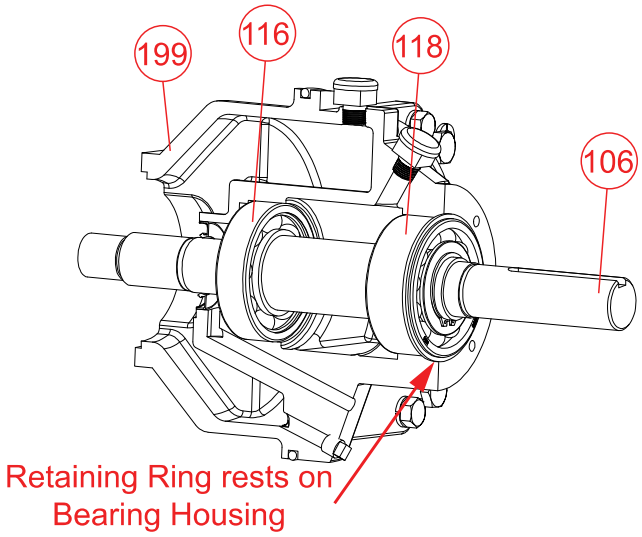

Figure 12-5: Shaft into Bearing Housing

12.2.3 Bearing Cap

1. Lubricate lip seal (149) outer diameter and bearing cap (237) inner diameter where lip seal (149) comes in contact, this will ease with installation. Place lip seal (149) squarely on bearing cap (237) with the open (spring) side towards the bearings and begin to push the lip seal (149) in by hand. The open side of the lip seal (149) should face the bearing oil.

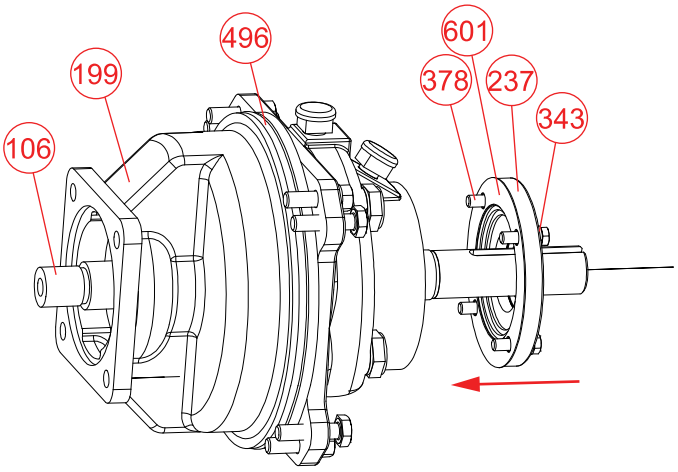

Figure 12-6: Bearing Cap Installation

2. Finish the installation using a flat bar stock, or oversized sleeve and hammer by tapping the lip seal (149) into the bearing cap (237). When lip seal (149) is flush with the baring cap (237) surface towards the outside of the bearing cap (237).
3. Apply a light amount of bearing oil to the bearing cap gasket (601) to hold in place on the bearing cap (237). Place bearing cap gasket (601) on the machined inside surface of the bearing cap (237), line up the bolt holes in the two parts.
4. Lubricate the lip of the lip seal (149) to ease installation of the bearing cap (237) over the coupling end of the shaft (106). Slide bearing cap (237), bearing cap gasket (601) and lip seal (149) over the shaft (106), take extreme care not to damage lip seal (149) on the keyway. Rest the bearing cap (237) against the bearing housing and thread bolts (378) and lock washers (343). Torque bolts (378) to values in Table 13-1.
5. Install O-ring (496). Bearing oil can now be filled in bearing housing (199) if desired.

12.3 Cartridge Mechanical Seal

It is recommended that the mechanical seal (189) be replaced if old seal was removed. Alignment of seal faces (H,P) from old wear pattern is unlikely upon reassembly and could cause premature seal failure. Removal of bellows (D) from shaft or sleeve (126) can cause permanent damage to bellows (D) as they tend to adhere to the metal during use.

⚠ CAUTION

Replace seal (189) when reassembling pump.

⚠ WARNING

Seal operation temperature is not to exceed 160°F.

12.3.1 Cross Section

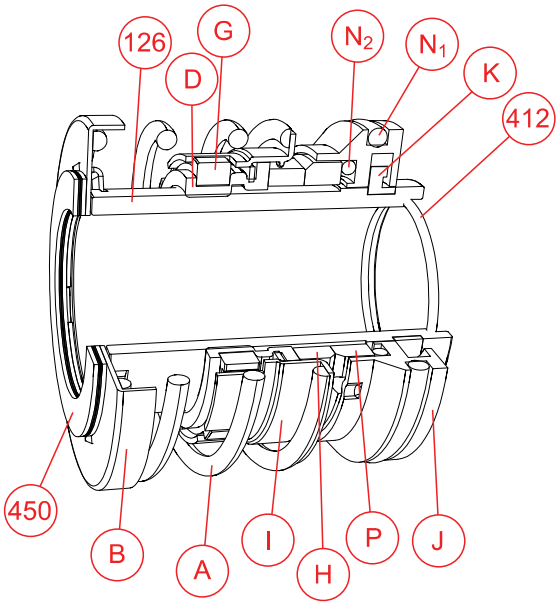

Figure 12-8: Assembled Mechanical Seal (189)]

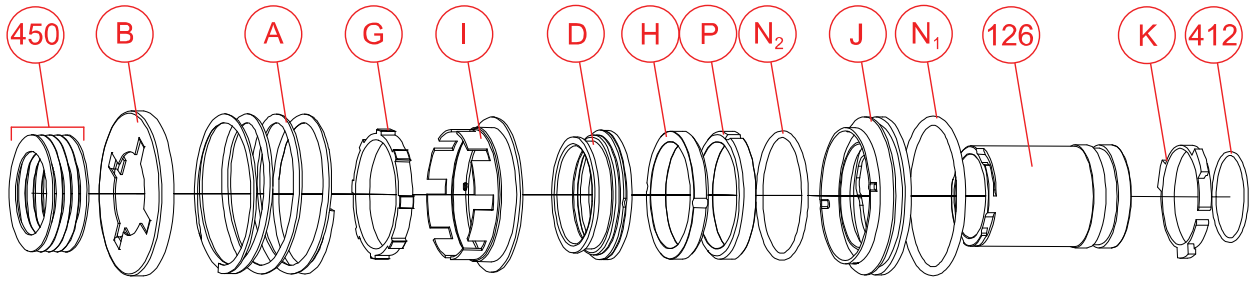

Figure 12-7: Exploded Mechanical Seal (189)

Table 12-1: Mechanical Seal (189) Parts List

MODEL SNS MECHANICAL SEAL PARTS LIST					
ITEM ID	QTY	DESCRIPTION	ITEM ID	QTY	DESCRIPTION
A	1	SPRING	J	1	STATIONARY SEAT
B	1	SPRING CENTERING WASHER	K	1	SHEAR RING
D	1	BELLOWS	412	1	SLEEVE O-RING
450	1	IMPELLER SHIMS (SET)	126	1	SHAFT SLEEVE
G	1	DRIVE BAND	N_1	1	O-RING, OUTTER
H	1	ROTATING ELEMENT	N_2	1	O-RING, INNER
I	1	RETAINER, SPRING	P	1	STATIONARY ELEMENT

12.3.2 SLEEVED SHAFT

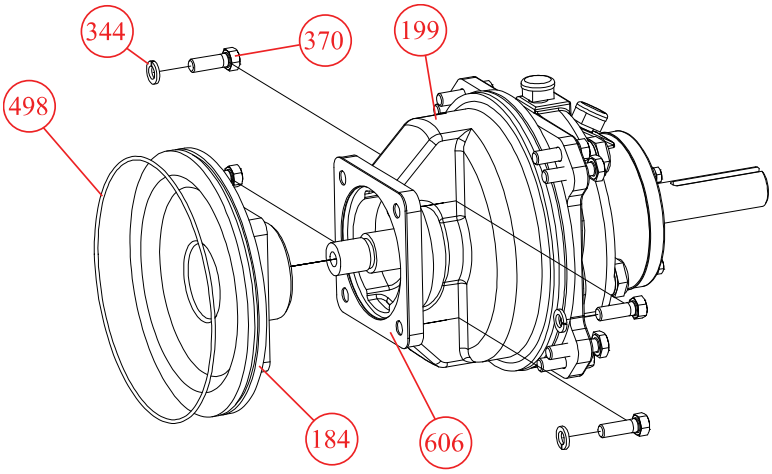

Figure 12-9: Seal Plate (184) Installation

1. If not already, the seal plate (184) will need to be installed before the mechanical seal (189). Replace cork seal plate gasket (606) with a new gasket. Use a light amount of seal oil to hold in place on the bearing housing (199) when fitting the seal plate (184).

2. Fit seal plate (184) over the shaft (106) and into the bearing housing (199). Bolt in place with lock washers (344) and bolts (370) Ensure seal plate (184) in centered in bearing housing (199) and torque bolts (370) to corresponding values in Table 13-1.

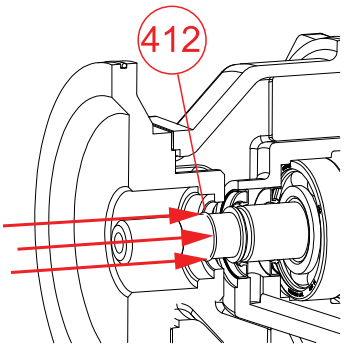

Figure 12-10: Sleeve O-ring (412)

3. Install seal plate O-ring (498) over the seal plate (184), take care not to slice or damage O-ring (498) on the seal plate (184) edges.

4. Cover the threads of the shaft (106) with electrical tape or a sheet of paper to protect the sleeve O-ring (412) from getting damaged from the threads. Using an appropriate lubricant lightly lubricate the sleeve O-ring (412) and shaft (106) where the mechanical seal (189) rests. Slide the sleeve O-ring (412) over the impeller end of the shaft (106).

5. Push the sleeve O-ring (412) as far back on the shaft (106) as possible. Do not worry if sleeve O-ring (412) is not set into position, the sleeve (126) will engage with the sleeve O-ring (412) and set it into proper position when installing.

6. Lubricate outer O-ring (N_1) on the mechanical seal. Lubricate the bore in the seal plate (184) where the outer O-ring (N_1) will seat.

7. Slide the mechanical seal (189) over the shaft (106) until the O-ring (N_1) rests against the seal plate (184) bore. When sliding the mechanical seal (189), ensure the sleeve O-ring (412) engages with the groove in the sleeve (126) for a proper seal. No need to press the mechanical seal (189) any further as the final setting will be done with impeller (102) install.

8. Clean threads in impeller (102) and threads on shaft (106). Ensure all dirt and debris are eliminated.

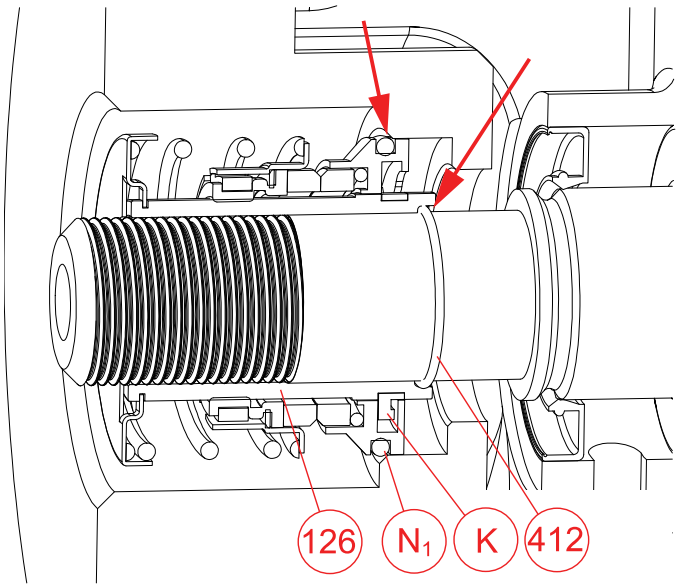

Figure 12-11: Mechanical Seal on sleeved Shaft (unsheared)

9. Install the full supply of impeller shims (450) and thread impeller (102) on the shaft (106) until it just touches the impeller shims (450).

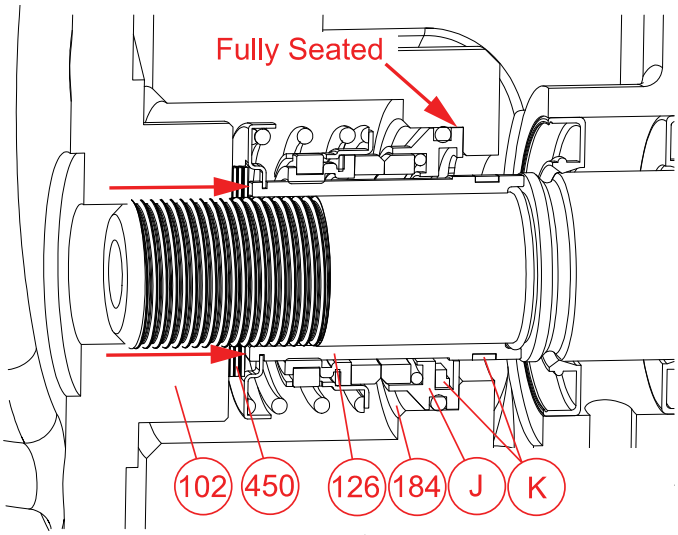

Figure 12-12: Mechanical Seal on sleeved Shaft (sheared)

10. Continue to thread the impeller (102) onto the shaft (106), during this process the mechanical seal stationary seat (J) will seat into place in the seal plate (184). The shear ring (K) will break allowing the sleeve (126) to slide back on the shaft (106) and rest against the shaft (106) shoulder. At this point, the impeller (102) will no longer be able to turn with the shaft (106) remaining stationary.

12.3.3 SOLID SHAFT

When using a solid shaft (106), the cartridge mechanical seal (189) can be used without the integral sleeve (126). It is preferred to use a component seal as to avoid damage when removing the sleeve from the cartridge mechanical seal (189). The following procedure will explain how to remove the sleeve from the cartridge mechanical seal (189) and install the seal using a solid shaft (106) within the pump.

1. Follow Section 12.3.2 steps 1 through 3 to install the seal plate (184) if not already.
2. To install the mechanical seal (189) with a solid shaft (106) the sleeve (126) will need to be removed. Begin compressing the seal by pressing on the stationary seat (J), this will break the shear ring (K), Figure 12-13. This will take some force, use of a hydraulic press may be needed.

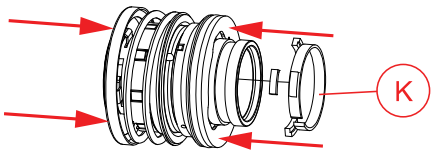

Figure 12-13: Compress Seal

3. Once the shear ring (K) is broken, remove the shear ring (K) from the sleeve (126) and the remaining shear ring (K) pieces from inside the stationary seat (J). Take extreme care not to break or cause stress on the rotating element (H) and stationary element (P). If the two elements (H,P) stay together, do not separate the seal faces.
4. Remove the stationary seat (J) and O-rings (N_1, N_2) from the sleeve (126) and set aside. Remove the stationary element (P) and rotating element (H) as a unit to protect the machined seal faces, Figure 12-15.

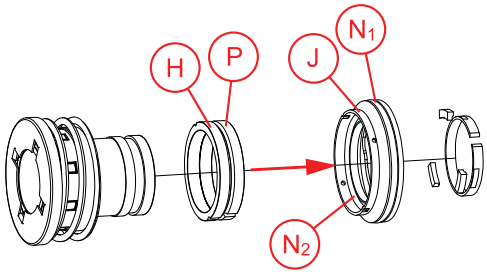

Figure 12-15: Remove Stationary Seat / Elements

5. Rotate the spring centering washer (B) counter-clockwise about 35 degrees to remove from the sleeve (126). When doing this, apply compressive pressure to the washer (B) as the spring (A) will want to decompress. Remove the spring (A) from the sleeve (126), Figure 12-14.

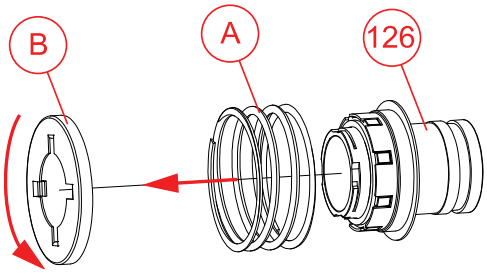

Figure 12-14: Remove Spring

6. Separate the sleeve (126) from the spring retainer (I), bellows (D) and drive band (G) by sliding components off the end of the sleeve (126). Discard the sleeve (126).

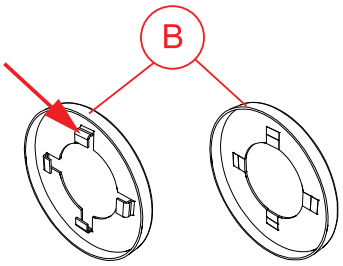

Figure 12-17: Flatten Tabs

7.Flatten the 4 tabs on spring centering washer (B). If tabs protrude past the inner diameter when flattened, file smooth with neighboring edges.

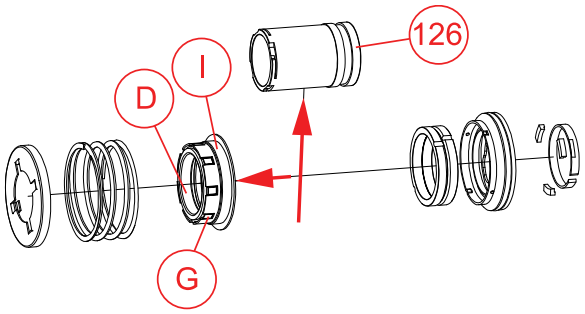

Figure 12-16: Remove Sleeve

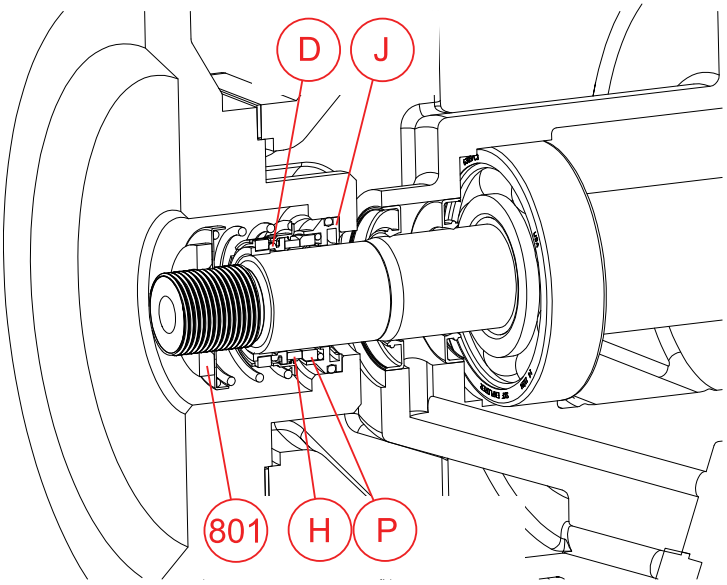

Figure 12-18: Seal install Solid Shaft

8. With the seal plate (184) and O-ring (498) installed and bolted to the bearing housing (199) install the stationary seat (J) with O-rings (N_1, N_2) installed and lubricated. Use a sleeve to gently tap the stationary seat (J) into bottom of bore in seal plate (184), the stationary element (P) should not be installed when doing this.

9. Slide Stationary element (P) into stationary seat (J), do not contaminate machined seal face with oils or debris.

10. Aline the rotating element (H) into the two tabs in retainer (I) and slide lubricated bellows (D), retainer (I), drive band (G) and rotating element (H) over shaft (106) as a unit. Ensure the rotating element (H) does not fall out of alignment with the two tabs in the retainer (I). Slide over shaft (106) until the two seal faces meet.

11. Install spring (A), spring centering washer (B) with flattened tabs and shaft spacer (801) as the spacer is necessary for sold shaft construction for SN03SA and SN04SA. Larger sizes do not use spacer (801).

12. Install the full set of impeller shims (450) between the spacer (801) and impeller (102). Thread on impeller (102) compressing the spring (A) until impeller (102) stops threading. At this point the seal is fully compressed against the shaft shoulder.

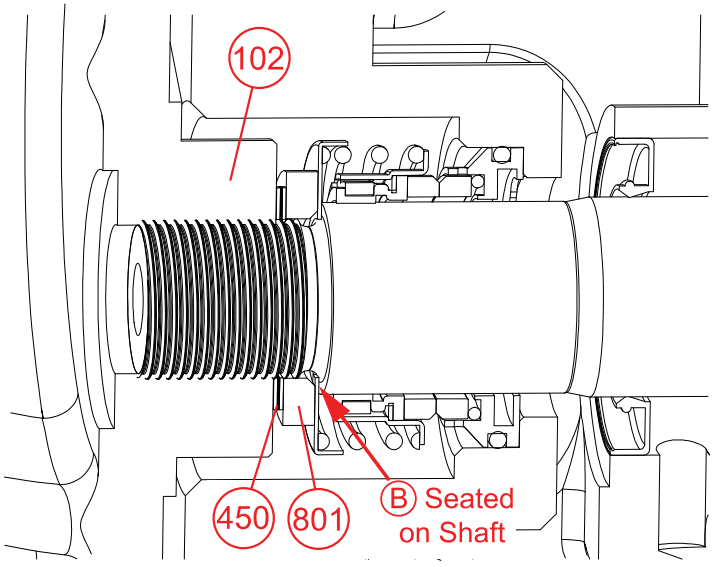

Figure 12-19: Mechanical Seal on Solid Shaft

12.4 Rotating Assembly

This section will start at setting the impeller (102) to seal plate (184) clearance and finishing at setting the clearance of the wear plate (205) and impeller (102).

1. To set the seal plate (184) clearance, ensure the impeller (102) is fully threaded into position such that the seal is fully compressed and the full set of impeller shims (450) are installed. The impeller bolt (379) and washer (345) do not need to be installed for this process.
2. Measure the gap between the backside of the impeller (102) and seal plate (184). Record this measurement, this distance is "**A_m**" as shown in Figure 12-20.

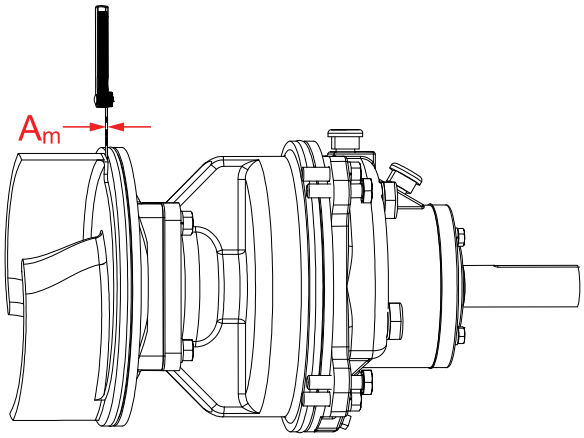

Figure 12-20: Dimension "A_m"

3. Refer to Table 12-2 for recommended seal plate (184) impeller (102) clearance. Subtract distance "A" from distance measured "A_m" to determine the thickness of impeller shims (450) to remove. This impeller shim (450) removal amount will be denoted as "A_r".

Table 12-2: Seal plate/Impeller clearance

Pump Size	Seal Plate Impeller Clearance (inch) - "A"
3	0.025 to 0.040
4	
6	
8	
10	0.020 to 0.025

Equation 12-1: Impeller shim removal

$$A_r = A_m - A$$

Use the average of the range in Table 12-2 to define "A" explicitly.

4. Remove impeller shims (450) as defined by thickness "A_r". If the exact distance is not obtainable with the available shims, add or remove impeller shims (450) to achieve the closest value to "A_r" but within the range of "A" in Table 12-2. If needed the centering washer (B) can be removed.
5. Apply anti seize lubricate to the impeller and shaft threads. Thread impeller (102) back onto shaft with proper amount of impeller shims (450). Take care with mechanical seal (189) as spring (A) will have decompressed when impeller was removed and could have adjusted seal and sleeve O-ring (412) out of place.
6. Remeasure clearance "A_m" check Table 12-2 to ensure "A_m" is within specified range.
7. Use the same tool that was made with threaded pipe to remove the rotating assembly (103) from the casing (100) to install the rotating assembly (103) back into the casing (100). Thread the tool into the vent plug (409) for the seal cavity.

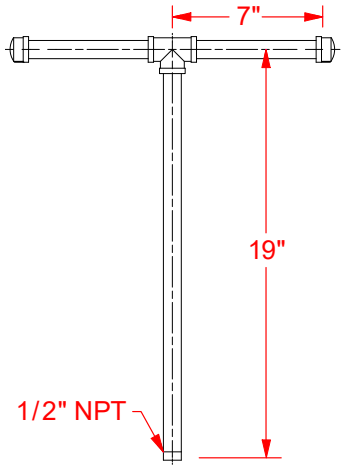

Figure 12-21: Rotating assembly tool

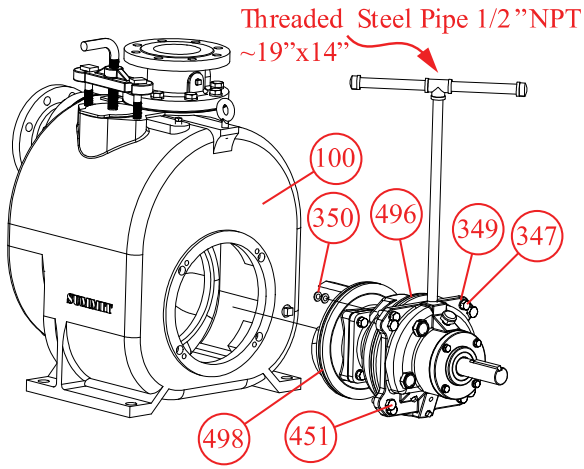

Figure 12-22: Rotating assembly installation

8. Lubricate the seal plate O-ring (498), rotating assembly O-ring (496) and shims (350). If using the same impeller and wear plate from disassembly use the same thickness of shims removed. If a new install, replace with new shims, thickness shall be 0.125 inches. Install rotating assembly (103) into casing (100) take care not to damage O-rings (496, 498) in the process.

9. Bolt the rotating assembly (103) to the casing (100) using bolts (347) and adjusting bolts (451). Adjust the bolts such that the rotating assembly (103) is as far outboard but still rotating assembly O-ring (496) remains engaged with the casing (100). This will prevent the wear plate (205) from interfering with the impeller (102) when the cover plate assembly (260) is installed.

10. Slide the coupling key (146) into shaft (106) and use an impeller wrench as shown in Figure 11-4 on page 28 to keep shaft (106) from rotating. Apply an anti-seize/lubricant to impeller bolt (379) threads. Install the impeller washer (345) and impeller bolt (379). Toque to value shown in Table 13-2 on page 44.

11. Remove the threaded pipe assembly tool and impeller wrench. Turn the shaft (106) by hand to check for smooth rotation.

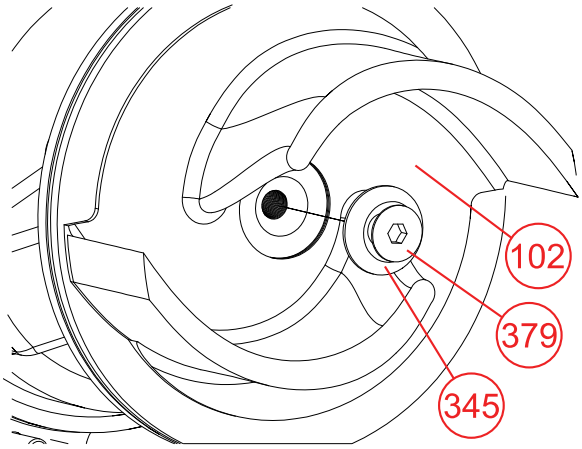

Figure 12-23: Impeller Bolt Installation

12.4.1 Cover Plate Assembly

12. Cover plate assembly (260) should be removed if not already. Refer to Section 11.1 for removal instructions. Install the flapper valve assembly (261) before cover plate assembly (260) is installed

13. Install any hardware removed from the cover plate assembly. Bolt the front cover handle (380) with bolts (381) and lock washers (382). Thread in studs (377) to casing (100). Pressure relief valve (268) replacement is needed if pump was overheated or previous valve was opened due to over pressure.

14. Inspect wear plate (205) for wear, deep gouges and damage, replace if found. Bolt wear plate (205) using nuts (340) and lock washers (341) to cover plate assembly (260). Nuts (340) will fasten to studs welded on wear plate (205).

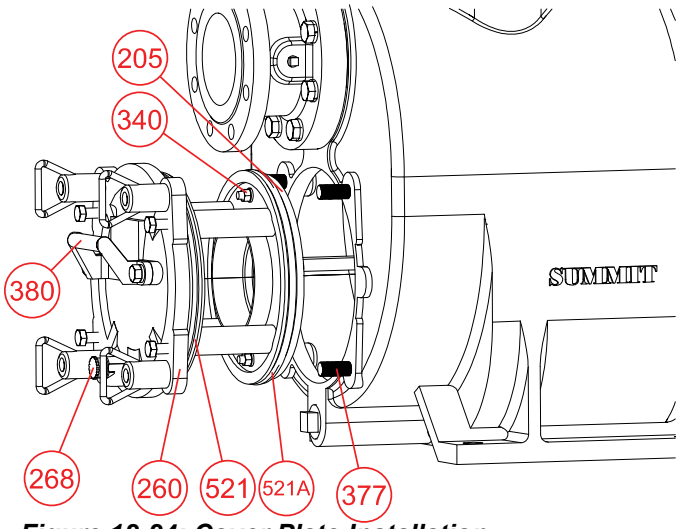

Figure 12-24: Cover Plate Installation

15. Lubricate O-rings (521, 521A) and install into grooves on cover plate assembly (260). Take care as not to damage O-rings (521, 521A) when installing.
16. Secure hand nuts (265) hand snug do not tighten with a breaker bar. Thread in jack bolts (369) by hand until they just touch the casing (100). Cover plate assembly (260) should be as far out as possible to prepare for setting the impeller clearance.

12.4.2 Impeller Clearance

17. The cover plate assembly (260) will be adjusted axially to set the impeller (102) and wear plate (205) clearance.
18. Loosen adjusting bolts (451) and tighten bolts (347). Shims (350) should be tight with casing (100) and bearing housing (199).
19. Using hand nuts (265) move cover plate assembly (260) in towards the impeller (102) until the wear plate (205) just touches the impeller (102). It will help to rotate the shaft (106) by hand while moving the cover plate assembly (260) to feel the slight rubbing of the impeller (102) to wear plate (205).
20. Adjust the bolts and hand nuts (369, 265) such that only a slight noticeable drag is felt when rotating the shaft (106) by hand. This drag should be from impeller (102) and wear plate (205) interaction, a slight rubbing sound may be heard.

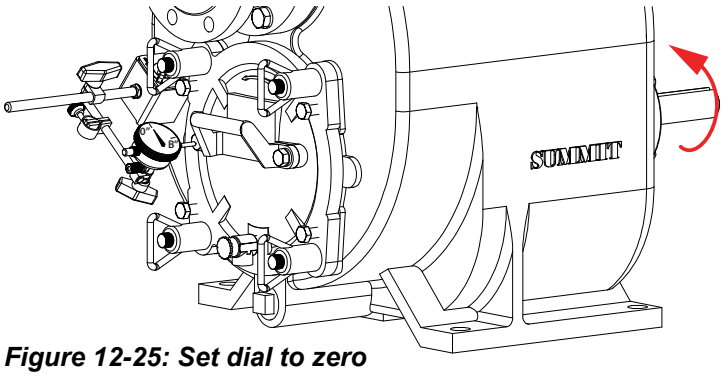

Figure 12-25: Set dial to zero

21. Using a dial indicator, set the dial to zero against the cover plate assembly (260). The base of the dial indicator should be against the casing (100), pump foundation or something that will not move when moving the cover plate assembly (260).
22. Using bolts and hand nuts (369 & 265), back out the cover plate assembly (260) until the desired clearance is reached, denoted as dimension “B”. Clearance “B” is shown in Table 12-3.

Table 12-3: Wear plate/Impeller Clearance

Pump Size	Wear Plate Impeller Clearance (inch) - "B"	SNSU B-version
3	0.010 to 0.020	0.003 to 0.010
4		
6		
8		N/A
10	0.020 to 0.025	

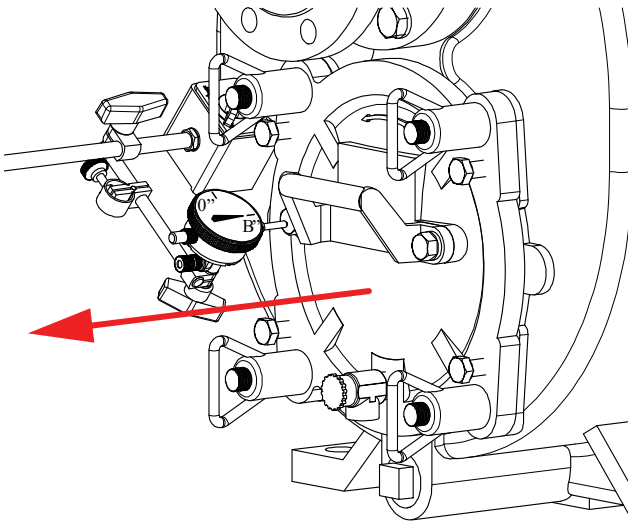

Figure 12-26: Clearance set to "B"

23. Tighten hand nuts (265) then torque bolts (369) to torque values shown in Table 13-1. Keep the dial indicator in position to ensure

clearance “B” remains within the recommendation. Repeat impeller (102) and wear plate (205) clearance “B” steps if needed.

24. With pump use, it may be necessary to check and reset the impeller clearances “A” and “B”. If pump performance becomes lower on flow or head. It is best practice to check these clearances on a regular schedule and record the “as found” and “as left” clearance values.
25. Adjustment shims (350) can be removed to retain the initial clearances after wear plate (205) and impeller (102) have been worn.

12.5 Final Pump Assembly

1. Install discharge spool (190) and suction spool (191) using appropriate hardware and gaskets. Torque bolts to values in Table 13-1.
2. Ensure priming cover is installed once pump is primed and ready to begin operation.
3. Check all plugs are present and properly installed.
4. Fill bearing and seal chamber with proper oil. Refer to Section 7.4 for proper lubrication.
5. Connect piping, check shaft alignments and install proper guarding. Prime the pump and reconnect power to driver.

⚠ DANGER

Operate pump only when guards are secured in proper position.

13 APPENDIX E – Reference Tables

13.1 TORQUE GUIDELINES

13.1.1 Bolt Torques

Table 13-1: General Max bolt torque values

Bolt Size	Stainless Steel Bolts ASTM F593	Carbon Steel Bolts SAE J429 Grade 5
Size	**Max. Torque**	**Max. Torque**
#10-24	24 inlb	-
#10-32	33 inlb	-
1/4"-20	45 inlb	100 inlb
5/16"-18	92 inlb	17 ftlb
3/8"-16	14 ftlb	30 ftlb
7/16"-14	22 ftlb	49 ftlb
1/2"-13	33 ftlb	75 ftlb
9/16"-12	48 ftlb	110 ftlb
5/8"-11	66 ftlb	150 ftlb
3/4"-10	120 ftlb	265 ftlb
7/8"-9	190 ftlb	429 ftlb
1"-8	280 ftlb	644 ftlb

13.1.2 Pump Components

Table 13-2: Pump Components

Item	Recommended Torque (ftlb)
Impeller Bolt (379)	90

13.2 Hardware List

Table 13-3: SNS Hardware Details

Item ID	Pump Size	Fastener/Thread Size	Length	Qty Per Pump	Grade/Material	Carbon Torque (ftlb)	Stainless Torque (ftlb)	Description
319	SN03SA SN04SA SN06SA SN08SA SN10SA	3/4" NPT	N/A	2	Aluminum & Glass	2 T.F.F.T.		Sight Glass
340	SN03SA SN04SA SN06SA	3/8"-16	N/A	2 4	SAE J995 Grade 2 or ASTM F594 Grade 1 (18-8)	30	14	Nut, Wear Plate (SN10SA Rear Wear Plate)
	SN08SA	1/2"-13		3		75	33	
	SN10SA	3/8"-16		4		30	14	
341	SN03SA SN04SA SN06SA	3/8"	N/A	2 4	Carbon Steel or Stainless Steel (304, 18-8)	N/A	N/A	Lock Washer, Wear Plate (SN10SA Rear Wear Plate)
	SN08SA	1/2"		3				
	SN10SA	3/8"		4				
342	SN03SA SN04SA	5/8"	N/A	4 8	Carbon Steel or Stainless Steel (304, 18-8)	N/A	N/A	Lock Washer, Discharge Flange
	SN06SA SN08SA	3/4"						
	SN10SA	N/A		0				
343	SN03SA SN04SA	3/8"	N/A	4	Carbon Steel or Stainless Steel (304, 18-8)	N/A	N/A	Lock Washer, Outboard Cover
	SN06SA SN08SA SN10SA	5/8"		6				
344	SN03SA SN04SA SN06SA	1/2"	N/A	4	Carbon Steel or Stainless Steel (304, 18-8)	N/A	N/A	Lock Washer, Bearing Housing to Seal Plate
	SN08SA SN10SA	5/8"						
346	SN03SA SN04SA	5/8"	N/A	4 8	Carbon Steel or Stainless Steel (304, 18-8)	N/A	N/A	Lock Washer, Suction Flange
	SN06SA SN08SA	3/4"						
	SN10SA			4				
		7/8"		2				
347	SN03SA SN04SA SN06SA	1/2"-13	1-1/2"	4	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	75	33	Bolt, Bearing Housing to Case
	SN08SA SN10SA			6				
349	SN03SA SN04SA SN06SA	1/2"	N/A	4	Carbon Steel or Stainless Steel (304, 18-8)	N/A	N/A	Lock Washer, Bearing Housing to Case
	SN08SA SN10SA			6				
369	SN03SA SN04SA SN06SA SN08SA	1/2"-13	1-3/4"	4	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	75	33	Bolt Jack, Front Cover to Case
	SN10SA	N/A	N/A	0		N/A	N/A	
370	SN03SA SN04SA SN06SA	1/2"-13	1-1/4"	4	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	75	33	Bolt, Bearing Housing to Seal Plate
	SN08SA	5/8"-11	1-3/4"	4		150	66	
	SN10SA	1/2"-13	1-1/4"	4		75	33	

Table 13-4: SNS Hardware Details (cont.)

Item ID	Pump Size	Fastener/ Thread Size	Length	Qty Per Pump	Grade/ Material	Carbon Torque (ftlb)	Stainless Torque (ftlb)	Description
373	SN03SA	5/8"-11	1-3/4"	4	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	150	66	Bolt, Discharge Flange
	SN04SA			8				
	SN06SA	3/4"-10	2"			265	120	
	SN08SA							
	SN10SA	N/A	N/A	0		N/A	N/A	
376	SN03SA	5/8"-11	1-3/4"	4	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	150	66	Bolt, Suction Flange
	SN04SA			6				
	SN06SA	3/4"-10	2"			265	120	
	SN08SA			8				
	SN10SA		1-3/4"	4				
		7/8"-9	2"	2		429	190	
376A	SN03SA	N/A	N/A	0	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	N/A	N/A	Bolt, Suction Flange Top
	SN04SA	5/8"-11	2"	2		150	66	
	SN06SA	3/4"-10	2.5"			265	120	
	SN08SA	N/A	N/A	0		N/A	N/A	
	SN10SA			0				
377	SN03SA	3/4"-10	4"	4	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	N/A	N/A	Stud, Front Cover to Case
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA	N/A	N/A	0				
378	SN03SA	3/8"-16	1-1/4"	4	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	30	14	Bolt, Outboard Cover to Bearing Housing
	SN04SA			6				
	SN06SA							
	SN08SA							
	SN10SA							
381	SN03SA	3/8"-16	1"	2	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	30	14	Bolt, Handle to Front Cover
	SN04SA							
	SN06SA							
	SN08SA			4				
	SN10SA	N/A	N/A	0		N/A	N/A	
382	SN03SA	3/8"	N/A	2	Carbon Steel or Stainless Steel (304, 18-8)	N/A	N/A	Lock Washer, Handle to Front Cover
	SN04SA							
	SN06SA							
	SN08SA			4				
	SN10SA	N/A		0				
409	SN03SA	1/2"-14 NPT	N/A	2	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Vented Plug
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA							
414	SN03SA	1/4"-18 NPT	N/A	1	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug, Seal Cavity Drain
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA							
415	SN03SA	3/4"-14 NPT	N/A	1	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA							
416	SN03SA	1/4"-18 NPT	N/A	1	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug, Bearing Housing Drain
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA							

Table 13-5: SNS Hardware Details (cont.)

Item ID	Pump Size	Fastener/Thread Size	Length	Qty Per Pump	Grade/Material	Carbon Torque (ftlb)	Stainless Torque (ftlb)	Description
451	SN03SA	1/2"-13	1-3/4"	4	SAE J429 Grade 5 or ASTM F593 Grade 1 (18-8)	All Bolts Evenly Tight to Rotating Assembly		Bolt or Socket Head Adjusting Screw Rotat ng Assembly
	SN04SA							
	SN06SA	1/2"-20	7/8"		Carbon Steel Black Oxide Finish or ASTM F593 Grade 1 (18-8)			
	SN08SA							
	SN10SA							
510	SN03SA	1"-11-1/2 NPT	N/A	1	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug, Casing Drain
	SN04SA	1-1/4"-11-1/2 NPT						
	SN06SA							
	SN08SA							
	SN10SA							
511	SN03SA	1/4"-18 NPT	N/A	2	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug, Suction & Discharge FLG
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA	1/2"-14 NPT		1				
512	SN03SA	1/4"-18 NPT	N/A	1	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug, Vent
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA							
513	SN03SA	1/4"-18 NPT	N/A	1	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug,Vent
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA	N/A		N/A				
514	SN03SA	1"-11-1/2 NPT	N/A	2	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug, Spools
	SN04SA							
	SN06SA							
	SN08SA							
	SN10SA							
515	SN03SA	1/2"-14 NPT	N/A	1	Carbon Steel or Stainless Steel (304, 18-8)	2 T.F.F.T.		Plug, Bearing Chamber
	SN04SA							
	SN06SA							
	SN08SA	N/A	N/A	0				
	SN10SA							

Note: T.F.F.T. - Turns From Finger Tight

* Part Numbers are 316SS

**Black Oxide Finish

14 APPENDIX F – PUMP DIMENSIONS

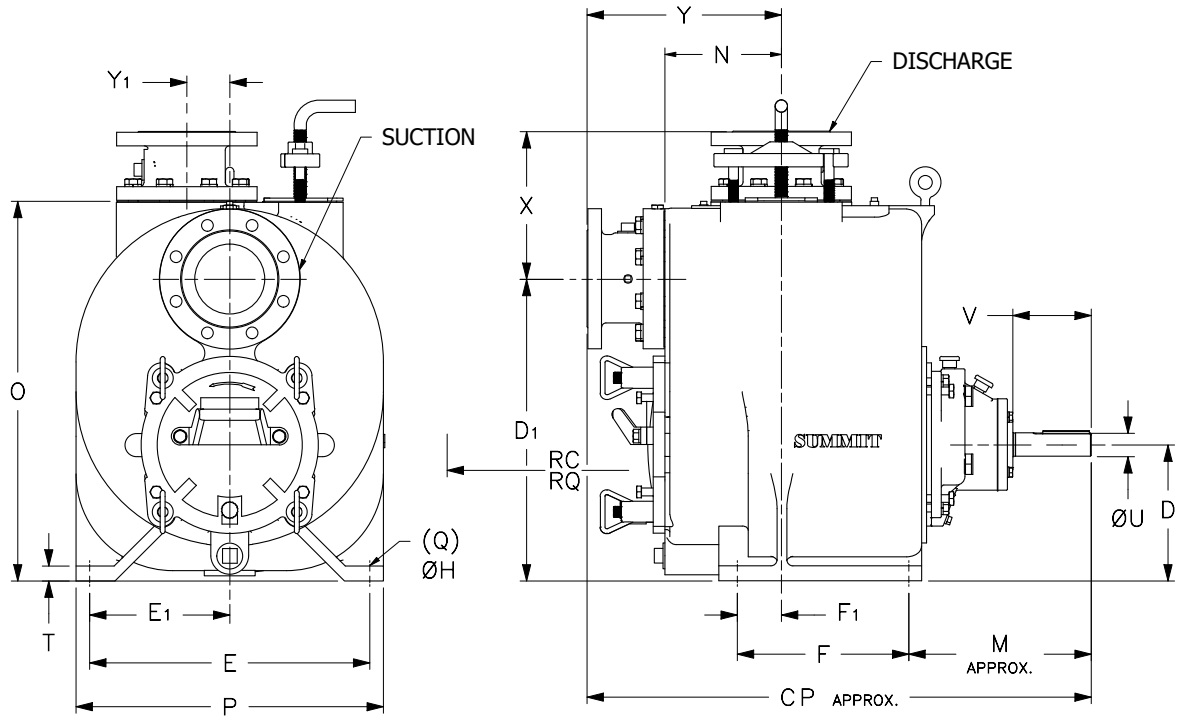

Figure 14-1: SNS Dimension Identification

Table 14-1: SNS Dimensions

SNS General Pump Dimensions (inch)					
Dimension	SN03SA	SN04SA	SN06SA	SN08SA	**SN10SA
Suction	3 FLG	4 FLG	6 FLG	8 FLG	10 FLG
Discharge	3 FLG	4 FLG	6 FLG	8 FLG	10 FLG
CP	28.85	32.07	35.56	40.20	48.71
P	17.00	20.00	22.75	27.75	27.75
D	7.50	8.75	10.12	13.00	14.00
D_1	17.00	19.50	22.37	28.50	25.06
X	10.07	9.73	32.93	13.56	15.94
O	21.00	24.79	28.94	36.85	41.00
Y	11.57	12.49	15.85	16.25	28.00
Y_1	2.75	2.75	2.75	0.00	0.00
N	6.37	8.00	9.62	-	-
U	1.50	1.50	1.50	1.75	1.75
V	4.01	4.99	5.00	6.75	4.81
M	11.31	11.65	11.65	16.16	12.68
F	9.00	11.00	11.00	12.00	12.00
F_1	3.00	3.06	3.06	4.00	4.00
E	15.50	18.00	20.75	25.00	25.00
E_1	7.75	9.00	10.38	12.50	12.50
T	0.75	1.00	1.06	1.25	1.25
Q	4.00	4.00	4.00	4.00	4.00
H	0.69	0.69	0.69	0.88	0.88
*RC	18.00	18.00	18.00	24.00	-
*RQ	9.00	11.50	12.00	13.00	-
Appx. Pump Weight	445 lbs	575 lbs	890 lbs	1480 lbs	1540 lbs

*RC is Recommended, RQ is Required for Cover Plate Assembly removal

**No Discharge Spool

15 APPENDIX G – LIMITS AND CAPACITIES

Table 15-1: SNS Limits and Capacities

SNS Limits and Capacities - Based on Water						
Pump Size		**SN03SA**	**SN04SA**	**SN06SA**	**SN08SA**	**SN010SA**
Maximum Speed	**RPM**	2150	1950	*1750	**1550	***1750
Minimum Speed	**RPM**	650				
Maximum Impeller Diameter	**(in)**	8.75	9.75	12.38	14.75	14.75
Minimum Impeller Diameter	**(in)**	7.75	8.50	11.00	12.75	12.25
Max Solids - Spherical Diameter	**(in)**	2.50	3.00			
Maximum Allowable Working Pressure (MAWP)	**PSIG**	98.0				114.0
Maximum Liquid Temp.	**°F**	160				
Shaft Rotation (Viewed from Driven End)		Clockwise (Right hand rotation)				

*Max Impeller 11.50" at this speed
**Max Impeller 13.75" at this speed
***Max Impeller 13.25" at this speed

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16 APPENDIX H – CONSTRUCTION DETAILS

Table 16-1: SNS Construction Details

SNS Construction Details (All dimensions in inches and (mm)						
		SN03SA	**SN04SA**	**SN06SA**	**SN08SA**	**SN010SA**
Shaft	Impeller Thread size	1-1/4"-12 UNF RH	1-1/4"-12 UNF RH	1-1/4"-12 UNF RH	1-1/2"-12 UNF RH	1-1/2"-12 UNF RH
	"D" Diameter at Seal					
	Solid Shaft construction	1.50 (38.1)	1.50 (38.1)	1.50 (38.1)	1.875 (47.6)	1.875 (47.6)
	Sleeved Shaft - (OD of s haft under s leeve)	1.125 (29)	1.25 (31.8)	1.25 (31.8)	1.50 (38.1)	1.50 (38.1)
	Diameter between Bearings	1.90 (48.3)	2.00 (50.8)	1.97 (50.0)	2.45 (62.2)	2.49 (63.2)
	Diameter at Coupling	1.50 (38.1)	1.50 (38.1)	1.50 (38.1)	1.75 (44.5)	1.75 (44.5)
	Keyway Length	3.00 (76.2)	3.50 (88.9)	3.50 (88.9)	4.81 (122.2)	3.74 (95.0) Sled Runner Type
	Keyway Width	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)	0.375 (9.5)
	"L" Overhang (Centers of radial bearing to impeller)	4.875 (123.8)	4.875 (123.8)	4.53 (115)	5.78 (146.8)	5.63 (142.9)
	Shaft Stiffness Ratio (L^3/D^4)					
	Solid Shaft	23	23	18	16	14
	Sleeved Shaft	72	47	38	38	35
Sleeve	Outter Diameter	1.50 (38.1)	1.50 (38.1)	1.50 (38.1)	1.875 (47.6)	1.875 (47.6)
Oil Seals	IB & OB Seals (IDxODxWidth)	1.562 x 2.506 x 0.5	1.562 x 2.506 x 0.5	1.875 x 3.005 x 0.5	1.875 x 3.005 x 0.5	1.875 x 3.005 x 0.5
Bearings	Radial Bearing (116)	SKF 6208	SKF 6309	SKF 6308	SKF 3310 A/C3	SKF 3310 A/C3
	Thrust Bearing (118)	SKF 6208 NR	SKF 3309 ANR	SKF 3308 ANR	SKF 3311 ANR	SKF 3311 ANR
	Bearing Span	5.00 (127.0)	5.00 (127.0)	5.97 (151.6)	7.60 (193.0)	8.59 (218.2)
Relief Valve	Thread Size	1/2" MPT to pump / 1/2" FPT to drain				
	Pressure Setting	75 PSIG				

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17 PUMP INFORMATION

Purchase Date: _____

Purchase Order#: _____

Serial Number: _____

Equipment Number: _____

PO Box 12145 Green Bay, WI 54307
www.summitpump.com

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