

SUMMIT™

SPL

Installation, Operation, and Maintenance Manual
Model: SPL PROGRESSIVE CAVITY



SPL

Progressive Cavity Pumps



SUMMIT™
PUMP, Inc

www.SUMMITPUMP.com

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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.

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2 INTRODUCTION

This installation, operation, and maintenance manual is designed to help you achieve the best performance and longest life from your Summit Pump. This pump is a progressing cavity pump. It is designed for high viscosity liquids.

This pump is a single helical rotor rolling eccentrically in a double helix stator which creates the differential pressure. The rotor turns in conjunction with the stator which has a series of sealed cavities 180° apart. As one cavity diminishes the opposing cavity increases at exactly the same rate. Thus the sum of the two discharges is a constant volume. The result is a pulsation-free positive displacement flow utilizing no valves.

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

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

2.1 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.

2.2 PUMP SAFETY WARNINGS

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

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

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

2.3 NOMENCLATURE

On page 25 of this manual, record the nameplate data from your pump. This will assist with any maintenance questions or pump identification in the future.

Summit progressive cavity pumps are essentially identified by frame size (Example: 2SPL10 CDQ AAA). The format consists of the **Size Designation** (first set of characters, i.e. “2SPL10”), **Materials of Construction** (Middle 3 letters, i.e. “CDQ”) and **Trim Code** (last three letters, i.e. “AAA”).

2.3.1 Size Designation

The format consists of the pump’s stage (first number), model (next 3 letters) then the size of rotor-stator pumping elements (last numbers).

“SPL” represents a standard relationship with the pumping elements, housing, bearings and drive shaft. In the case of usage for one size smaller pumping elements with the same size drive end (housing, bearings, and drive shaft) the pump is referred to as an “SPM” frame. In the case of the pumping elements being two sizes smaller than the drive end, the pump is referred to as an “SPP” frame. This may be the case due to sensitivity in the pump application. (i.e. 3SPL6, 3SPM4 and a 3SPP3 will use a common drive end)

2.3.2 Materials of Construction

“Materials of Construction” (i.e. CDQ) is represented though a series of letters, usually 3 letters. The first letter indicates the housing material. The second letter indicates the minor metallic parts in contact with the pumping-solution (drive shaft, pins, connecting rod, rotor...). The third letter indicates only the malleable material of the stator. This does not include the outer shell of the stator. The following list decodes the Materials of Construction.

First and Second Letters:

- C: Cast Iron
- D: Alloy Steel
- E: Carpenter® 20 Stainless Steel
- G: 416 Stainless Steel
- H: Hastelloy® “C”
- J: 17-4 PH Stainless Steel
- M: Monel®
- S: 316 Stainless Steel
- W: Cast Steel
- X: Special to Application

Third Letter:

- B: EPDM 300, 70 Durometer
- C: Nitrile 103, 50 Durometer
- D: Tool Steel
- E: Nitrile 110, 70 Durometer
- F: Fluoroelastomer 500, 75 Durometer
- G: 416 Stainless Steel
- H: Hastelloy® “C”
- J: 17-4 PH Stainless Steel
- K: Hypalon® 800, 70 Durometer
- M: Nitrile 100M, 70 Durometer
- P: Thiokol® 70 Durometer
- Q: Nitrile 100, 70 Durometer
- R: Natural Rubber 200, 55 Durometer
- T: Teflon® 15% glass
- U: Urethane 70 Durometer
- X: Special to Application
- Z: White Nitrile 150, 70 Durometer

2.3.3 Trim Code

The “Trim Code” (i.e. “AAA”) is used to show the pump construction. Sealing variations are represented by the first letter; internal variations by the second letter and rotor variations by the third letter. With the letter “A” indicating standard construction as shown in the list below.

First Letter

- A: Braided Teflon® & Graphite Packing (Black)
- C: Braided Teflon® Packing (White)
- D: Double Mechanical Seal
- F: Braided Teflon® Food Grade Packing
- G: 100% Graphite Packing
- H: Flush Packing Gland
- S: Single Mechanical Seal
- W: Water Flush
- X: Special to Application

Second Letter

- A: Standard Plated Shaft
- B: Non-plated shaft
- C: Solid Drive Shaft Configuration
- D: Grit Seal (L-Frame only)
- E: Extension Tube with Extended Auger
- F: Extended Drive Shaft (for back stop or large pulley)
- G: Ceramic Coated Drive Shaft
- K: Tungsten Carbide Coated Drive Shaft
- M: Chromium Carbide Coated Drive Shaft
- R: Fiber Deflector
- S: Shaft Sleeve
- X: Special to Application

Third Letter

- A: Standard Size with Chrome Plating
- B: Non-plated
- C: Standard Undersize
- E: Standard Oversize
- F: Counter Clockwise Rotation
- G: Ceramic Coating
- K: Tungsten Carbide Coating
- M: Chromium Carbide Coating
- X: Special to Application

® Registered Trademarks –

- Carpenter®. 1981. Carpenter Technology Corporation. Reading, Pennsylvania, USA.
- Hastelloy®. 1955. Union Carbide and Carbon Corp. New York, New York, USA.
- Hypalon®. 1993. E.I. DuPont de Nemours and Company. Wilmington, Delaware, USA.
- Monel®. 1997. Inco Alloys International, Inc. Huntington, West Virginia, USA.
- Teflon®. 2005. E.I. DuPont de Nemours and Company. Wilmington, Delaware, USA.
- Thiokol®. 1957. Thiokol Chemical Corp. Trenton, New Jersey, USA.

3 RECEIPT AND STORAGE

3.1 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 distributor.

3.2 STORING THE PUMP

3.2.1 *Temporary*

Temporary storage: less than six months.

1. Store pump in a clean, dry place, free from extreme swings in temperature and humidity.
2. Cover with a protective covering to reduce dust contamination.
3. Rotate the shaft once a week to avoid the stator elastomers forming a set condition. If this happens, upon starting the pump the required torque to overcome static friction may damage equipment.
4. Take off inspection plates and or drain plugs to allow the pump to dry. When pump is dry re-install inspection plates and plugs to keep pump sanitary.
5. Loosen the packing gland nuts; remove the gland and packing rings and lantern ring. Apply grease to the stuffing box I.D. & packing rings. Return the packing and lantern rings to their position in the stuffing box. Snug down the packing gland nuts finger tight. Do not use grease if gland is water flushed. Only a small amount of light oil should be applied in this scenario.

3.2.2 *Long Term*

Long Term Storage: more than six months.

1. Follow temporary storage guidelines 1-5.
2. Coat all unpainted and machined surfaces with a rust inhibitor, such as LPS-3.
3. The removal of drive belts is also recommended per manufacturers recommendations.

3.3 HANDLING

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

⚠ WARNING

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

3.4 LIFTING

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

⚠ WARNING

Be sure all components are securely fastened to baseplate before lifting

4 INSTALLATION

4.1 GENERAL

Summit Pumps are fully assembled at the factory. The pumps are ready to be installed and put into service. Follow any instructions tagged on the pump.

4.2 LOCATION

If the pump is going to have a water flush it should be located as close as possible to a supply of water. Other location considerations are easy access for inspection, maintenance and ample overhead space for lifting with crane or hoist.

4.3 BASE PLATE

Each pump unit should be mounted on a fabricated steel base plate. Usual base configurations are inline, piggy back and L-shape. The base plate should be mounted on a concrete sub base 4" to 8" longer and wider than the fabricated baseplate.

4.4 FOUNDATION

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

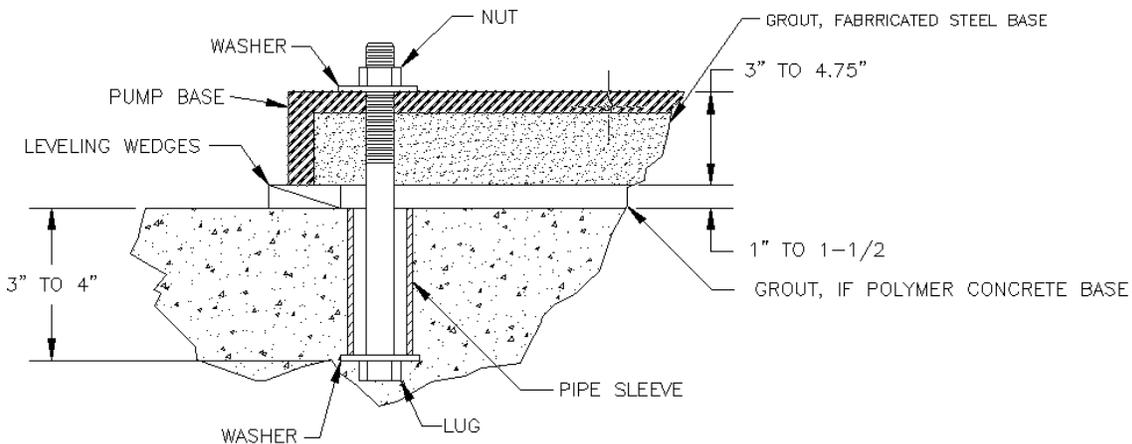


Figure 4-1: Anchor Bolt configuration

4.5 BASEPLATE GROUTING

1. This grouting instruction assumes a concrete sub base 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.

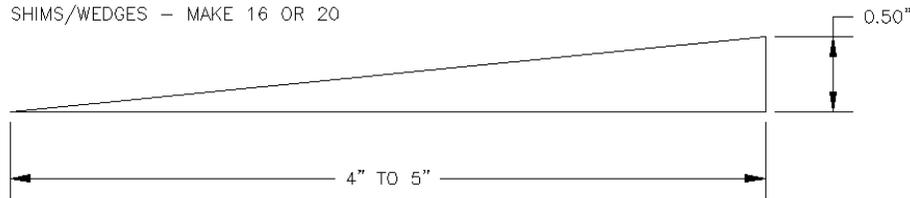


Figure 4-2: Wooden Wedges

3. Shims/wedges should be placed on the sub base, as shown in **Figure 4-3**. 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 sub base over anchor bolts.
5. Level baseplate to 0.125" over length and 0.088" in over width.
6. When leveling is complete, uniformly hand tighten the anchor bolts.
7. Build a plywood form around baseplate supported on the sub base. 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.

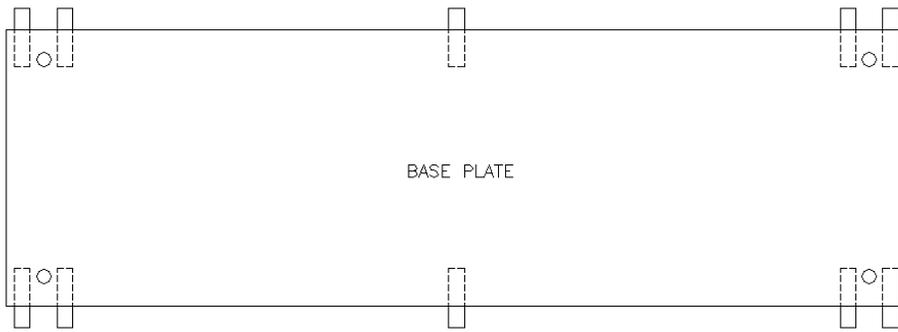
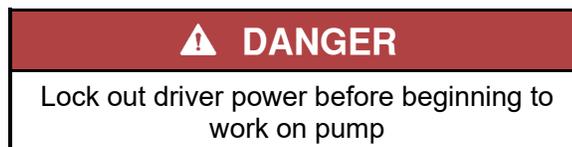


Figure 4-3: Wedge Locations

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.

4.6 PIPING CONNECTION – SUCTION / DISCHARGE



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 with pump flanges.** Ideally, you should place a short length of flexible or bellows type spool directly adjacent to the pump flange.

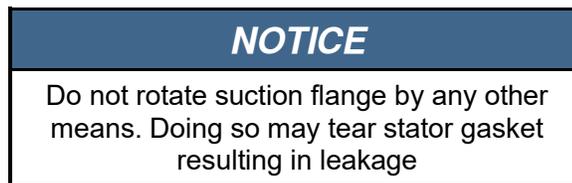


4.6.1 Suction Piping

The piping used should be as short as possible. Piping line size should be the same diameter as the suction nozzle. This may not always be the case as high viscosity or flow velocity may cause a change in size. All elbows 90° or 45° should be a long-sweep. Any piping that causes air to become trapped should be avoided.

4.6.2 Suction Housing Rotation

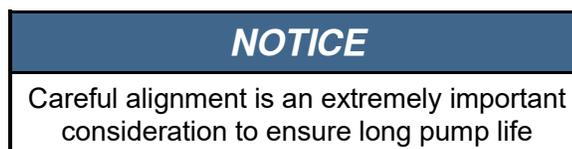
Suction housing can be rotated to any position within the centerline of the pump. Rotation of the suction housing is accomplished by loosen the bolts securing the clamp ring to the bearing housing. Next, remove the packing gland halves then the packing studs. Loosen the stator support cap at the suction housing. Stator and discharge flange will now rotate together.



4.6.3 Discharge Piping

Generally the diameter of the discharge piping should be the same as the pump's discharge. In certain circumstances, this will not be the case as the fluid being pumped will cause you to use different sized pipe. In order to ease the maintenance time of changing out the stator a length of piping twice the length of the connecting rod should be installed to the discharge port.

4.7 ALIGNMENT



4.7.1 Coupling Connected Units

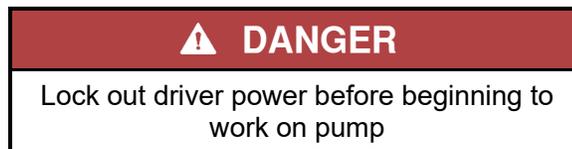
In-line configurations are shipped with the pump and motor leveled on the base plate with the coupling disconnected. If the pump and driver were aligned at the factory, that alignment will be disturbed during shipment. Alignment must be rechecked. If alignment is necessary, align the motor to the pump not the pump to the motor. Check both parallel and angular alignments. Final alignment should be within 0.005" in all planes at operating temperature.

4.7.2 Belt Driven Units

Check belt and sleeve alignment. Check belts for proper belt tension. Tension requirements will vary with the type of belt, centerline distance and belt speeds. Consult belt manufacture for specific recommendation.

4.7.3 Alignment Checks

Alignment checking needs to be done several times prior to pump start up. Those alignment recommendations are as follows:



1. Prior to grouting, to remedy misalignment caused by transportation
2. After grouting, to correct any changes that occurred during grouting.
3. After piping is connected, Check alignments to ensure possible pipe strains have not changed alignment.
4. Hot alignment, after the pump has reached operating temperature, if the pump is used in high temperature service.
5. Alignment is accomplished by adding or removing shims under the motor feet and moving the motor as required eliminating the misalignment.

5 OPERATION

5.1 CHECKING ROTATION



1. Lockout power to drive.
2. Remove coupling guard.
3. Remove coupling grid/sleeve element so that the motor half of coupling can spin free from the pump half.
4. Unlock power to motor.
5. Clear personnel from immediate area, jog motor just enough to determine direction of rotation. Rotation must be same as arrow on pump.
6. If rotation is the same direction, lockout motor and reassemble coupling grid/sleeve to connect pump half.
7. If the pump is rotating in the wrong direction the electrical wiring will need to be adjusted by qualified personnel. Then repeat Step 4, 5 and 6.
8. Install coupling guard
9. Unlock motor, pump is ready to run.

5.2 LUBRICATION

The packing should be greased every week with 2 to 3 pumps of grease for grease lubricated packing. Lubrication intervals may vary depending on application.

The bearings on Summit's progressing cavity pumps are grease lubricated and are greased at the factory. These bearings only need to be lubricated when pump is disassembled or every 1500 hours. Fill the bearing cavity only 1/3 full of grease. Upon reassembly, add a few drop of oil to the bearing seals.

Recommended grease lubrication for bearings, gears, pins joints and packing is NLG1 No. 2 consistency grease for pumping temperatures -60°F to 350°F. Grease is not recommended for temperatures above 350°F. Any type of Ep Lithium soap based grease is acceptable. Sodium or Calcium based grease is not. A list of some acceptable bearing grease is shown in **Table 5-1**.

Table 5-1: Acceptable Bearing Greases NLG1 No. 2 Grade

Acceptable Greases	
Citgo	Mystic EP2
Keystone	81EP2
Mobil	Mobilux EP2
Mobil Synthetic	SCH 100

NOTICE

Grease lubricated pumps are intended to use grease only. Do not add oil to the bearing housing

5.3 PACKING

Packing must be lubricated to avoid seizing of packing and failure.

⚠ DANGER

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

Packing can be grease or water lubricated.

⚠ CAUTION

Packing must be lubricated to avoid seizing of packing and sealing failure

5.3.1 Greased Packing

A grease zerk is located on the drive end side of the suction housing. The packing should be greased every week or sooner with 2 to 3 pumps of grease. Pumps with serial numbers of 016XXXXX or later are shipped with an installed grease zerk in the lubrication port and packing is not lubricated at the factory.

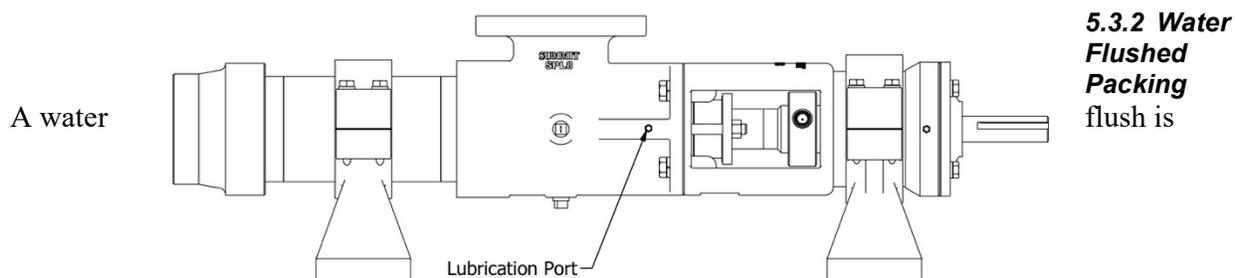


Figure 5-1: recommended to be used when highly abrasive material is being pumped. The flush will prevent packing leakage and excessive shaft wear. A clean water flush system is shown in **Figure 5-2**. A 1/8” NPT tapped hole in place of the grease zerk is used as the flush inlet. The outlet can either be another

tapped NPT hole in the stuffing box or allow the water to leak out near the packing. In either case, this discharge of the flush water should be approximately 10-15 psi higher than the pressure in the suction housing.

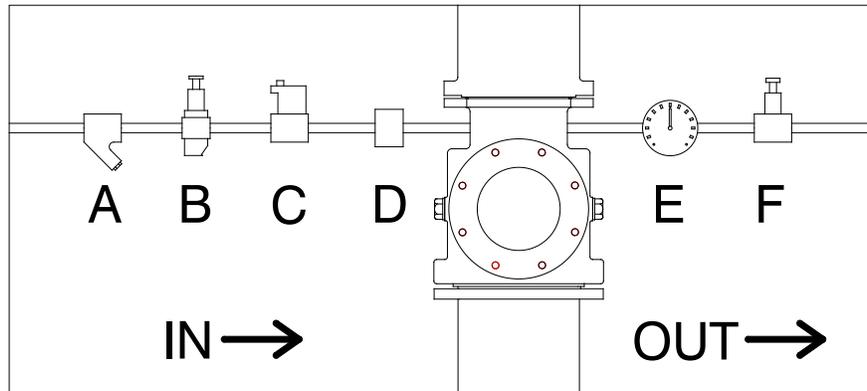


Figure 5-2: Water Flush System

- A) Y strainer
- B) Pressure regulating valve
- C) Sight flow meter
- D) Solenoid valve
- E) Pressure gauge
- F) Needle valve

5.4 MECHANICAL SEAL

⚠ WARNING
Failure of the mechanical seal could result in serious injury and environmental damage.

⚠ DANGER
Lock out driver power and make sure seal is depressurized before beginning work.

Refer to the manufacturer’s installation, operating, and maintenance instructions. Failure to do so can result in environmental damage, personal injury, and seal malfunction and / or seal failure.

Start Up

Read, understand and follow the manufacturer’s installation, operation, and maintenance instructions.

Storage, Assembly and Disassembly

Read, understand and follow the manufacturer's installation, operation, and maintenance instructions.

5.4.1 Type 1 Mechanical Seal

Type 1 mechanical seals require a set distance to obtain the proper pressure on the seal faces. Refer to the seal manufacture to retain the correct seal compression distance. This will locate the set collar on the drive shaft.

5.5 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. Proper alignment of pump, coupling, driver and coupling or sheaves.
2. All electrical connections.
3. All interments and gauges should be in working order.
4. Water flush connection to the stuffing box cover (if applicable)
5. Correct pump rotation as indicated on the pump.
6. Open the valves on the suction and discharge.

⚠ DANGER
This is a positive displacement pump. NEVER operate it against a closed valve or clogged discharge

NOTICE
Do not operate pump dry. Dry operation can cause premature damage to the stator

5.5.1 Start Up

1. Before operating the pump it must be filled with liquid. Use the drain plug hole in the suction housing to fill the pump with liquid.
2. Ensure the motor rotation is coincident with the pump rotation.
3. If water packing, turn on water to the stuffing box.
4. Start the pump.

 **DANGER**

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

5.5.2 Shut Down

1. Flush the pump with clean water.
2. Shut down the pump.
3. Close both the discharge and suction valves.
4. If water packing, turn off water to the stuffing box

6 APPENDIX A – MAINTENANCE TIMETABLE

6.1 DAILY MAINTENANCE

1. Check the lip seals (radial (06) & thrust (07)) on the bearing housing for tears and wear.
2. Inspect the packing or mechanical seal for correct flow, drip rate, noise and pressure.
3. Inspect the gear reducer for temperature and noise.

6.2 THREE MONTH MAINTENANCE

1. Daily maintenance and the following
2. Inspect and adjust packing so that it drips 2 to 5 times per minute. If packing is grease lubricated, lube the packing with 2 to 3 grease gun pumps, weekly.

6.3 SIX MONTH MAINTENANCE

1. Daily maintenance and the following,
2. The packing should be replaced.
3. Check for lip seals (06) & (07) and drive shaft wear. The suction and discharge piping spool pieces should be pulled to inspect the pipe's internal condition.

6.4 YEARLY MAINTENANCE

1. Depending on the fluid pumped and pump operating hours during the year, check pump performance. These inspections can range from once a year to once every three to five years.

7 APPENDIX B – TROUBLESHOOTING

7.1 PUMP PROBLEMS

The pump does not rotate.	1,2,3,4,5,6,7,21,22,24
The pump does not discharge.	8,9,10,11,12,13,14,15,16,21
The discharge output is too low.	1,2,6,7,8,9,10,11,12,13,14,16,17,18,19,21
The discharge output fluctuates.	6,7,8,9,11,13,14,17,18,20,21
The pump drive overloaded.	1,2,3,4,5,6,7,12,16,20,21,22,23
The pump makes excessive noise.	2,6,7,8,9,11,12,13,14,17,19,20,21,23,24,25,26
The shaft seal is leaking.	7,15,26,27,28
Stators wear out too quickly.	4,5,6,7,11,12,14,16,19,20
Rotors wear out too fast.	5,7,11,16,19,20

7.2 PROBABLE CAUSE AND REMEDY.

The power supply is incorrect or the drive is not wired properly. Check the motor nameplate data, test voltage, phase and frequency.	1
There is foreign matter in the pump. The foreign matter needs to be removed.	2
If the pump stator is new there can be too much static friction. The pump should be filled with liquid and turn shaft by hand.	3
The stator is swelled due to chemical attack. The stator should be exchanged for a different material.	4
The stator swelled due to high liquid temp. The liquid temp should be lowered, use undersized rotor.	5
There is a blockage due to solids in the liquid. The solid-to-liquid ratio should be decreased.	6
Leftover liquid settles and hardens in the pump after shutdown. The pump needs to be cleaned and rinsed after the pump is shutdown.	7
The suction pipe is not submerged. The suction pipe needs to be moved so it is submerged.	8
There is air in the suction pipe. The connections need to be tightened,	9
The pump is running too slow. Increase the drive speed.	10
The suction lift is too high causing cavitation. To remedy reduce the suction loss, move the pump to a lower elevation or increase the pump size.	11
The pump is running dry there is no prime. The pump needs to be filled with liquid	12
The stator is worn excessively. The stator needs to be replaced and the rotor needs to be inspected.	13
The rotor is worn excessively. The rotor needs to be replaced.	14
The pump is rotating in the wrong direction. The polarity of the motor needs to be replaced.	15
Pressure of the discharge is too high. The discharge valve needs to be opened, shorten the length of the discharge pipe, remove any obstructions from pipe or replace pipe with a larger size.	16
The suction pipe is leaking. Tighten the pipe fittings.	17
The Shaft packing is leaking. The packing gland needs to be tightened, replace the packing or the packing need lubrication.	18
The material of the stator is brittle. The stator needs replacement.	19
The speed of the pump is too high. The drive speed needs to be reduced.	20
The viscosity or specific gravity is too high. Measure the liquid and compare it with specification.	21
The packing is too tight. The gland nuts need to be loosened and the packing lubricated.	22
The drive shaft is bent. The drive shaft needs to be replaced.	23
Misalignment of the pump. The pump and drive need to be realigned.	24
The flexible drive coupling is worn. Replace the coupling.	25
The packing is incorrect. Change out the packing material.	26
The packing is too loose. The gland nuts need to be tightened and the packing lubricated.	27

8 APPENDIX C – DISASSEMBLY MODEL SPL

8.1 DISASSEMBLY MODEL SPL

(PROCEDURE AND PARTS MAY VARY BY PUMP SIZE)

1. Follow shutdown procedures on page 13.
2. Disconnect pump from the power source.



3. Undo the connection to the discharge pipe section.
4. Unscrew the stator support Hex Bolts (E) From the Stator Support (13).
5. With the aid of a strap wrench or large pipe wrench screw off the Stator (29) from the Suction Housing (22).
6. With the aid of a strap wrench or pipe wrench secure the stator and rotate the Drive Shaft(24) to rotate the Rotor(30) to walk the Stator (29) off the Rotor (30)
7. Unscrew the Drive Pin Retaining Screw (21) from the Drive Shaft (24). With the aid of a drift pin or small punch, force the Shaft Pin (20) out from the Drive Shaft (24).
8. Take out the Rotor (30) and Connecting Rod (18) from the rest of the pump.
9. Place the Connecting Rod (18) in a vice and tighten completely.
10. With the aid of a drift pin or small punch carefully drive the Pin Retainer Sleeve (15) from the rotor.
11. Using the drift pin or small punch carefully push the Rotor Pin (19) from the Rotor (30) head, separating the Connecting Rod(18) and Rotor (30). Repeat this step when disassembling SPL12 or SPL14 pumps to remove both Rotor Pins (19)
12. Take out the Connecting Rod Washer (17) from the Connecting Rod (18).
13. Take out the Hex Bolts (B) and Spring Washer (B) from the Bearing Cover Plate (09).
14. Put a rod or bar in past the suction housing stator port and into the open end of the drive shaft. By tapping on the end of the rod or bar, force the bearing assembly and drive shaft out of the Bearing Housing (08).
15. Take off the Bearing Lock Nut (04) and Lock Washer (05) (Section 10.1only) from the Drive Shaft (24). With the use of an arbor press, press on the inner race of the Bearing (02) removing the Bearing (02), Bearing Spacer (03), External Bearing Spacer (31)(Section 10.2 only) and Bearing (01) off the Drive Shaft (24).

9 APPENDIX C – ASSEMBLY MODEL SPL

9.1 ASSEMBLY MODEL SPL

(PROCEDURE AND PARTS MAY VARY BY PUMP SIZE)



1. Always replace all old washers and packing. It is also recommend replacing grease seals when new bearings are installed.
2. **Bearing Shaft Assembly:**
When installing new bearings, add enough grease to fill the space between 1/3 full. Be sure they are seated against the shoulder on the Drive Shaft (24). Thread on new Bearing Lock Washer (05) and bearing Lock Nut (04). Tighten Bearing Lock Nut (04) to secure. Bend tab lock washer (05) to nearest notch in lock nut.

Install Shaft Collar (11), Packing Gland (25) and Gland Packing Insert (27) are installed on the drive shaft’s hollow end as the bearing shaft assembly is pushed through the Bearing Housing. (08)

Install the Bearing Cover Plate (09), tighten all cap screws evenly as to prevent damage to the Bearing Cover Plate (09) and Oil/Grease Seal (07). **Do not over-lubricate bearings. (See Lubrication)**

3. Install the Connecting Rod (18) with the shaft pin hole aligned with the shaft pin hole on the Drive Shaft (24) and Shaft Collar (11). Then, insert the Shaft Pin (20). Drive Pin Retainer Screws (21) must seat on Retainer Screw Washers (16) and not on the Shaft Pin (20). Be sure the hollowed end of the Drive Pin Retainer Screw (21) fits over the end of the Shaft Pin (20) for a tight fit.
4. Replacing the Packing (26), insert the number of packing rings as shown in **Table 9-1** under the “IB Lantern Ring” column around the Drive Shaft (24) into the stuffing box. Then install the Lantern Ring (12) followed by the number of packing rings in **Table 9-1** under “OB Lantern Ring” column. This allows the Lantern Ring (12) to line up with the grease fitting on the stuffing box on the Suction Housing (22). **When inserting packing, stagger the ends of the packing rings.** If the final packing ring will not go on, the pump can run for a short period of time to allow the packing to compress; which will allow the final ring to be inserted.

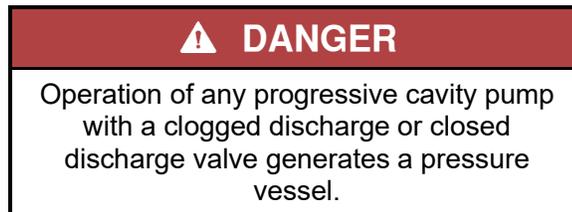
Table 9-1: Number of Packing Rings

Replacing Packing		
	Number of Packing Rings	
Pump Size	IB Lantern Ring	OB Lantern Ring
SPL2	1	3
SPL3	3	4
SPL4	3	4
SPL6	4	4
SPL8	3	4
SPL10	3	4
SPL12	3	4
SPL14	3	3

5. When installing the Stator (29) on the Rotor (30) it is ideal to lubricate the Rotor (30) with water or a lubricant that is compatible with the rubber in the Stator (29). **Grease or oil is not compatible with type “A” or “B” Stators (29).**

Always have the pipe wrench nearest the Suction Housing (22) on the Stator (29). Lubricate the rotor with water or compatible fluid to allow the stator to slip on easier. This prevents binding or damage to the threads. With outer Stator (29) material being stainless steel, use Teflon® tape or similar material on the threads before replacing. All carbon steel material, pipe dope should be applied.

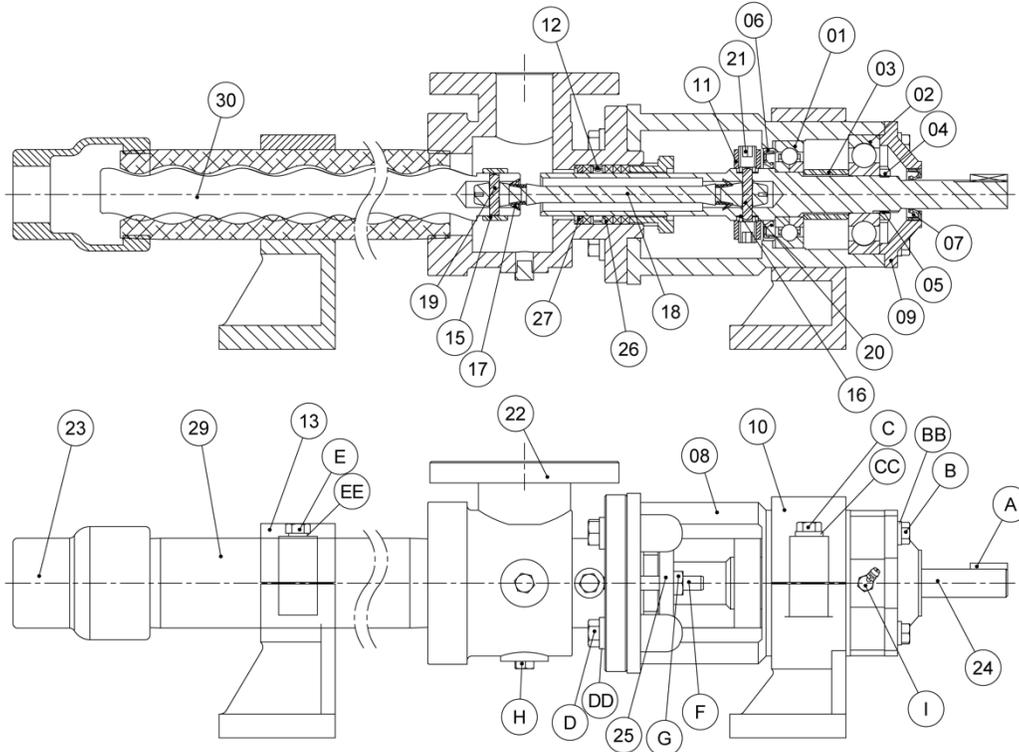
6. Do not operate the pump dry, dry operation is very harmful to the pump stator, rotor and drive components. Open suction and discharge valve to fill pump with the fluid the pump will be pumping. Be sure there are no restrictions in the discharge line prior to start up.



10 APPENDIX D – SECTION VIEW SPL

10.1 SPL2 to SPL10

(PARTS AND QUANTITIES MAY VARY BY PUMP SIZE)



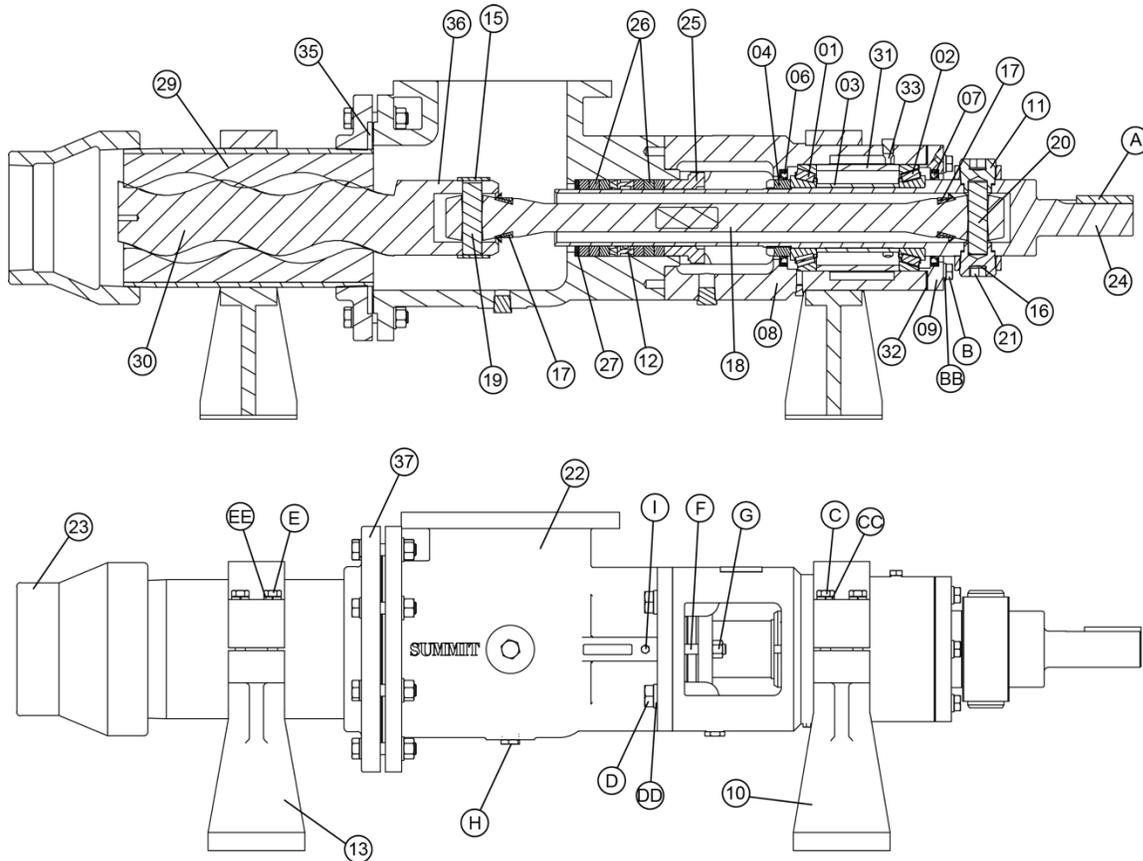
MODEL SPL PARTS LIST					
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
01	BALL BEARING (RADIAL)	16	RETAINER SCREW WASHER	A	PARALLEL KEY
02	BALL BEARING (THRUST)	17	CONNECTING ROD WASHER	B	HEX, BOLT
03	BEARING SPACER	18	CONNECTING ROD	BB	SPRING WASHER
04	BEARING LOCK NUT	19	ROTOR PIN	C	HEX, BOLT
05	BEARING LOCK WASHER	20	SHAFT PIN	CC	SPRING WASHER
06	OIL SEAL (RADIAL)	21	DRIVE PIN RETAINER SCREW	D	HEX, BOLT
07	OIL SEAL (THRUST)	22	SUCTION HOUSING	DD	SPRING WASHER
08	BEARING HOUSING	23	REDUCER	E	HEX, BOLT
09	BEARING COVER PLATE	24	DRIVE SHAFT	EE	SPRING WASHER
10	PUMP SUPPORT	25	PACKING GLAND	F	STUD
11	SHAFT COLLAR	26	PACKING	G	HEX, NUT
12	LANTERN RING	27	GLAND PACKING INSERT	H	DRAIN PLUG
13	STATOR SUPPORT	28	ADAPTOR BUSHING	I	GREASE NIPPLE
14	SUPPORT BUSHING	29	STATOR		
15	PIN RETAINER SLEEVE	30	ROTOR		

*Note: SPL10 Drive shaft pin joint assembly is external (OB) of the Bearing Housing (08).

*Note: SPL2 Drive shaft pin joint assembly uses Acorn Nuts (*21), Shaft Collar (11) and a Set Screw to hold drive pin in place. Acorn nuts thread onto the pin and Retainer Screw Washers (16) are not needed.

10.2 SPL12 & SPL14

(PARTS AND QUANTITIES MAY VARY BY PUMP SIZE)



MODEL SPL PARTS LIST					
ITEM	DESCRIPTION	ITEM	DESCRIPTION	ITEM	DESCRIPTION
01	TAPER ROLLER BEARING (IB)	20	SHAFT PIN	A	PARALLEL KEY
02	TAPER ROLLER BEARING (OB)	21	DRIVE PIN RETAINER SCREW	B	HEX, BOLT
03	INTERNAL BEARING SPACER	22	SUCTION HOUSING	BB	SPRING WASHER
04	BEARING LOCK NUT	23	REDUCER	C	HEX, BOLT
06	GREASE SEAL (RADIAL)	24	DRIVE SHAFT	CC	SPRING WASHER
07	GREASE SEAL (THRUST)	25	PACKING GLAND	D	HEX, BOLT
08	BEARING HOUSING	26	PACKING	DD	SPRING WASHER
09	BEARING COVER PLATE	27	GLAND PACKING INSERT	E	HEX, BOLT
10	PUMP SUPPORT	29	STATOR	EE	SPRING WASHER
11	SHAFT COLLAR	30	ROTOR	F	STUD
12	LANTERN RING	31	EXTERNAL BEARING SPACER	G	HEX, NUT
13	STATOR SUPPORT	32	COVER PLATE GASKET	H	DRAIN PLUG
15	PIN RETAINER SLEEVE	33	GREASE SPUD	I	GREASE NIPPLE
16	RETAINER SCREW WASHER	35	GASKET, ADAPTER FLANGE		
17	CONNECTING ROD WASHER	36	ROTOR HEAD		
18	CONNECTING ROD	37	ADAPTOR FLANGE		
19	ROTOR PIN				

11 APPENDIX E – Reference Tables

11.1 TORQUE GUIDELINES

11.1.1 Bolt Torques

Inch Pounds		Foot Pounds	
Size	Max. Torque	Size	Max Torque
10-24	22 inlb	5/16-18	10 ftlb
1/4-20	75 inlb	3/8-16	20 ftlb
5/16-18	132 inlb	7/16-14	32ftlb
3/8-16	236 inlb	1/2-13	43 ftlb
7/16-14	384 inlb	5/8-11	86 ftlb
1/2-13	517 inlb	3/4-10	150 ftlb

12 APPENDIX F – DIMENSIONS

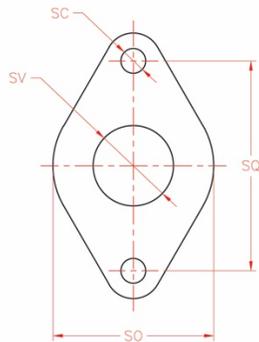
12.1 STUFFING BOX

Dimensions are in inches

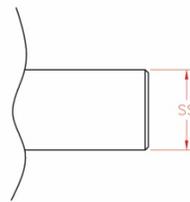
Size	Ø SS ± .001	Ø SX +.005	Ø SK +.005	SI	SQ	ST	Ø SP	SO	Ø SC	Ø SV
SPL2	0.800	1.188	1.01	1.444	1.125	5/16-18 UNC	1.875	1.125	0.38	0.85
SPL3	1.125	1.563*	1.305	2.19	3.000	3/8-16 UNC	2.305	2.25	0.44	1.19
SPL4	1.312	2.062	1.805	3.250	3.812	3/8-16 UNC	3.120	2.00	0.44	1.41
SPL6	1.625	2.375	2.125	4.080	4.250	7/16-14 UNC	3.250	2.34	0.50	1.69
SPL8	2.125	3.125	2.700	4.630	5.500	1/2-13 UNC	4.000	3.75	0.63	2.25
SPL10	2.500	3.500	3.110	4.625	6.125	1/2-13 UNC	4.500	4.31	0.56	2.55
SPL10H	2.500	3.500	3.110	4.625	6.125	1/2-13 UNC	4.500	4.31	0.56	2.55
SPL12	3.500	4.750	4.375	6.000	8.250	5/8-11 UNC	6.000	5.50	0.69	3.55
SPL12H	3.500	4.750	4.375	6.000	8.250	5/8-11 UNC	6.000	5.50	0.69	3.55

NOTE: "SX" dimension may not be any larger than 0.375 in. smaller than "SP" dimension to accept mechanical seal.

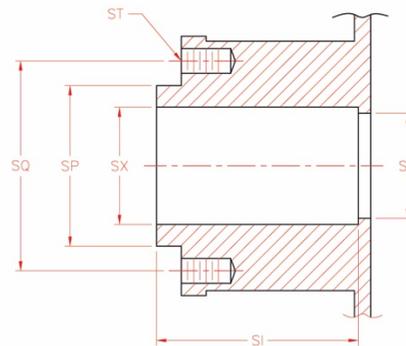
*Must be bored to 1.750" to accommodate a type 1 mechanical seal.



GLAND

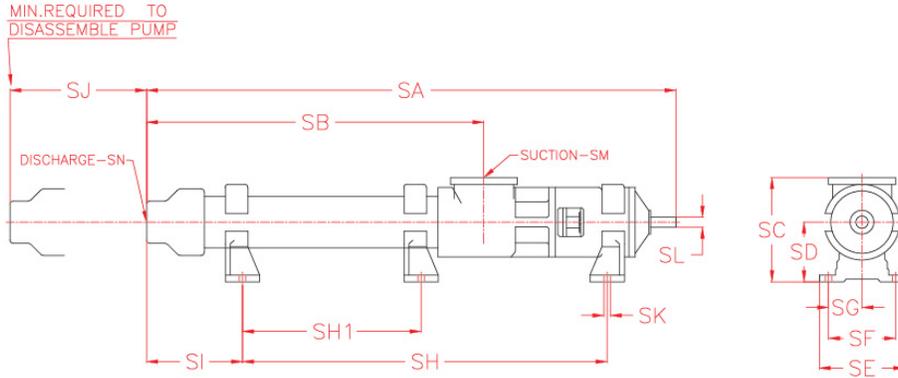


SHAFT



SUCTION HOUSING

12.2 OVERALL



Stage	Size	SA	SB	SC	SD	SE	SF	SG	SH	SH1	SI	SJ	Ø SK	Ø SL	SUCTION SM	DISCHARGE SN
1	SPL2	18.50	7.56	5.88	3.25	4.00	3.12	1.56	8.50	-	4.50	6.50	0.37	0.62	1.00	0.75
	SPL3	23.00	10.37	7.31	4.12	5.37	4.24	2.12	11.50	-	5.81	8.37	0.44	0.75	1.50	1.25
	SPL4	30.37	13.50	9.88	5.50	7.00	5.50	2.75	15.75	-	7.62	11.37	0.56	0.94	2.50	2.00
	SPL6	39.37	18.06	11.25	6.25	8.62	7.00	3.50	22.00	-	10.81	14.25	0.69	1.12	3.00	2.50
	SPL8	46.31	20.50	14.00	8.00	11.50	9.00	4.50	27.00	-	10.06	18.37	0.88	1.37	4.00	4.00
	SPL10	53.62	22.37	16.69	9.75	11.50	9.00	4.50	30.00	-	10.12	31.88	0.88	1.88	6.00	5.00
	SPL10H	59.00	27.75	16.69	9.75	11.50	9.00	4.50	30.00	-	15.50	31.88	0.88	1.88	6.00	5.00
	SPL12	70.19	31.44	21.00	12.50	14.50	12.62	6.31	37.50	-	14.69	37.75	1.00	2.25	8.00	6.00
	SPL12H	78.00	39.25	21.00	12.50	14.50	12.62	6.31	42.00	-	18.00	37.75	1.00	2.25	8.00	6.00
2	SPL2	20.75	11.06	5.88	3.25	4.00	3.12	1.56	10.50	-	6.00	6.50	0.37	0.62	1.00	0.75
	SPL3	28.31	15.96	7.31	4.12	5.37	4.24	2.12	13.00	-	9.62	8.37	0.44	0.75	1.50	1.25
	SPL4	37.44	20.56	9.88	5.50	7.00	5.50	2.75	22.00	-	8.44	11.37	0.56	0.94	2.50	2.00
	SPL6	50.00	28.69	11.25	6.25	8.62	7.00	3.50	26.00	-	15.44	14.25	0.69	1.12	3.00	2.50
	SPL8	58.75	32.94	14.00	8.00	11.50	9.00	4.50	32.00	-	17.50	18.37	0.88	1.37	4.00	4.00
	SPL10	64.00	32.75	16.69	9.75	11.50	9.00	4.50	35.50	-	15.00	31.88	0.88	1.88	6.00	5.00
	SPL10H	74.37	43.12	16.69	9.75	11.50	9.00	4.50	48.00	18.00	12.88	31.88	0.88	1.88	6.00	5.00
	SPL12	85.88	47.50	21.00	12.50	14.50	12.62	6.31	55.50	20.50	12.37	37.75	1.00	2.25	8.00	6.00
	SPL12H	101.44	62.69	21.00	12.50	14.50	12.62	6.31	69.00	27.00	14.44	37.75	1.00	2.25	8.00	6.00
3	SPL2	24.37	14.69	5.88	3.25	4.00	3.12	1.56	12.00	-	8.12	6.50	0.37	0.62	1.00	0.75
	SPL3	33.62	21.00	7.31	4.12	5.37	4.24	2.12	16.50	-	11.44	8.37	0.44	0.75	1.50	1.25
	SPL4	44.50	27.62	9.88	5.50	7.00	5.50	2.75	22.75	-	14.75	11.37	0.56	0.94	2.50	2.00
	SPL6	60.62	39.31	11.25	6.25	8.62	7.00	3.50	38.00	18.00	14.06	14.25	0.69	1.12	3.00	2.50
	SPL8	71.12	45.31	14.00	8.00	11.50	9.00	4.50	49.00	24.00	12.88	18.37	0.88	1.37	4.00	4.00
	SPL10	74.37	43.12	16.69	9.75	11.50	9.00	4.50	48.00	18.00	12.88	31.88	0.88	1.88	6.00	5.00
	SPL12	101.44	62.69	21.00	12.50	14.50	12.62	6.31	69.00	27.00	14.44	37.75	1.00	2.25	8.00	6.00

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13 PUMP INFORMATION

Purchase Date: _____

Purchase Order#: _____

Serial Number: _____

Equipment Number: _____

PO Box 12145 Green Bay, WI 54307
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