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Installation Operation & Maintenance Instructions

Model SSP & SSPC

Description and Specifications: The Model **SSP** is a close coupled, end suction, single stage, open-impeller, back-pullout centrifugal pump. The model **SSPC** is the enclosed impeller version of the same pump. Connections are NPT threaded. All wetted metal pump parts are 18-8, 304SS, or better. Most parts are formed from stainless steel sheet. O-rings and elastomeric seal parts are Buna (Viton, EPR are optional). Motors are NEMA 56J frame, with a C-Face mounting flange and a threaded shaft. All pumps use a mechanical seal to prevent leakage around the motor shaft.

Operating limits: The models **SSP & SSPC** are designed for 75-PSIG operating pressure at 212 deg. F., with the standard Type-6, carbon vs. ceramic with buna-n elastomers mechanical seal, and a maximum temperature limit of 250 deg. F., with a Type-21 mechanical seal with viton elastomers. The motor is limited to 20 starts per hour, evenly distributed.

Notice: Upon receipt of this equipment, inspect the carton and the equipment for any damages that might have occurred during shipment and notify the carrier immediately. Damage that occurs during shipment is not the responsibility of American Stainless Pumps. Failure to notify the carrier will place responsibility on the purchaser for any repairs or damages occurring during shipment.

Safety Instructions: To avoid serious or fatal injury and/or property damage, read and follow all instructions in this manual. Review all instructions and warnings included in this manual before attempting any work on this pump or pump/motor assembly. Do not remove or alter any decals.

The motor used to drive this pump is an electrical device connected to a potentially lethal voltage power source. Take all precautions required when working with or on the motor and its power source, including but not limited to:

1. Always disconnect and lockout the electrical power source before attempting any connection, maintenance or repairs. Failure to do so can cause electrical shocks, burns and death.
2. Install, ground and wire motors in accordance with all local and national electrical codes.
3. Install an all leg disconnect switch near the motor for quick access.
4. The electrical supply must match the motor nameplate specifications and the motor must be wired per the wiring diagram on the motor to match the selected voltage. **Incorrect wiring can cause fire and motor damage and will void the warranty.**
5. Most single-phase motors and some three phase motors will have automatic thermal protection switches wired in the motor. These switches will open and stop the motor if the motor overheats. As the motor cools, these switches will close and start the motor automatically and unexpectedly.
6. Motors which do not have thermal overloads must have a properly sized contractor or magnetic starters and overload switches (or fuses) in the starter panel. Three phase motors require all leg protection.
7. Use only stranded copper wire to motor and ground. Wire size must limit the maximum voltage drop to 10% of the motor nameplate voltage at the motor terminals.
8. Three phase motors can rotate in either direction. The pump will operate properly only in one direction (clockwise when looking from the motor end, counterclockwise when viewed from the pump end). **Operating the pump in the reverse rotation may damage or destroy the pump and motor and voids the warranty**.

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Installation:

Units may be installed horizontally, at an angle or vertically with the motor on top. **Do not mount the motor below the pump as leakage from the pump will damage the motor and can cause a shock, burns or death.**

- ☑ Locate the pump as near to the liquid source as possible. The pump must be primed with little or no air in the case to begin operation. The pump must be located below the liquid level when starting. This pump is not self-priming.
- ☑ Protect the pump and motor from freezing. Although the pump may survive a freeze up, the mechanical seal and O-Rings may not.
- ☑ Allow adequate space around the unit for service and ventilation.
- ☑ Units mounted horizontally should be located on a flat, rigid surface. Unit may be free standing, but some vibrations may occur. If attached to a foundation, tighten hold down bolts before connecting the piping.

Piping:

- ☑ All piping must be independently supported. No piping loads may be carried by the pump.
- ☑ Piping should be the same size or larger than the pump connections.
- ☑ Proper Piping to the suction is critical for proper pump operation. Suction pipe should be short and direct, with a minimum of fittings and turns.
- ☑ Suction pipe must continuously rise to the pump to avoid air pockets. All pipe connections must be airtight.
- ☑ If suction pipe is larger than the pump, an eccentric reducer must be used with the straight side on top to avoid an air pocket.
- ☑ If suction of pump is above the liquid source level, a foot valve or other isolation valve will be needed to prime the pump. A continuous stream of liquid must be made available for the pump suction to hold its prime.
- ☑ Do not use any suction valve for throttling the pump. This will cause loss of prime and damage to the pump that is not covered by warranty.
- ☑ Be sure that the source liquid level is sufficient to prevent vortices from drawing air into the pump.
- ☑ Install a valve on the discharge line for use in regulating the pump flow and for isolating the pump during maintenance and inspection.

Rotation:

The models SSP & SSPC will operate properly only in one direction (clockwise when looking from the motor end, counterclockwise when viewed from the pump end). **Operating the pump in the reverse rotation may cause the impeller to unscrew, breaking the shaft, damaging the pump and/or the motor, and voids the warranty**. Three phase motors can rotate in either direction. Single phase motors normally only rotate in the proper direction.

To check rotation, you must observe the motor shaft from the back of the motor.

1. Remove the end cover from the center of the back of the motor by prying off the cap. You do not need to remove any screws on most motors.
2. Quickly switch on and off the motor and watch the shaft rotation as it slows down. Motor shaft should be turning in the clockwise direction when viewed from the back of the motor.
3. If your three-phase motor is turning in the wrong direction, **have a qualified electrician interchange two of the three motor power wires**. This should reverse the rotation. If a single-phase motor is turning in the wrong direction, it has been wired wrong internally. Consult the motor manufacturer or American Stainless Pumps for instructions.
4. Check the rotation again, if it is correct, replace the end cover cap.

Operation:

- ☑ Pump must be completely primed before starting. Air in the suction lines or case must be vented.
- ☑ **Model SSPC Only:** If the pump case is rotated so that the discharge nozzle is not vertical, an air pocket may form in the case that will prevent the pump from operating properly. Loosen the case bolts until this air is removed for proper operation. Be sure to retighten the bolts before operating the pump.
- ☑ **Do not operate the pump at or near zero flow**. At zero flow, heat will build up in the pump and can cause extreme damage to the pump, property damage and/or possible injury to operating personal. Minimum flows of 10% of the pumps best efficiency point are recommended unless otherwise authorized by ASP.
- ☑ Do not operate the pump beyond the flow rates shown on published curves. Noisy pumps or the sounds of "pumping rocks" may be signs of cavitation or operation beyond the pumps capacity.

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Operation Continued:

- ☑ Check pump and motor for vibration. Vibration may be a sign of pipe strain, insufficient mounting or operation beyond the pumps capacity.
- ☑ The pump models SSP & SSPC are not designed for handling large amounts of solids. For the model SSP, Spherical solids size should not exceed the vane height of the impeller, less 0.060". For the model SSPC, solid sizes must be smaller than the impeller vane family expressed in thousandths of an inch, less 0.140".

Maintenance:

There is no scheduled maintenance required. Close-coupled pumps have no bearings. Bearings in the motors are permanently grease lubricated and cannot be re-greased. Mechanical seals will need to be replaced when leaking. O-Rings may harden with age and may need to be replaced when they leak.

Motor Bearings and Pump Thrust: Model SSP Only

Open impellers generate significantly more thrust than do enclosed impellers. The Model SSP with a 4.38" diameter impeller operating at 20 psig generates about 150 pounds of thrust. This thrust load is carried by the motor bearing. The standard jet pump motor and the standard SSP motor uses as a front and rear bearing a size 203 grease lubricated bearing. This bearing has a B10 rated life of approximately 6,000 hours when operated with a thrust load of 150 pounds at 3500 RPM. This rating means that 10% of all bearings operated in this condition will fail within 6,000 hours of operation. The average bearing life will be 3 to 4 times this 6,000 hours.

Pumps and motors which operate intermittently, or only operate 40 hours per week, will usually have acceptable bearing lives with the standard jet pump motor bearing. Pumps that operate continuously, 24 hours per day, will have about 10% of their thrust bearings fail in the first year of operation.

For service applications that are critical, for installations that are difficult to access, or for pumps operating at differential pressures above 25 psig, American Stainless Pumps recommends that motors with a larger thrust bearings and higher load ratings be used. Consult factory for pricing and details.

Disassembly:

Disconnect and lockout the electrical power before attempting any disassembly. Casing may contain hazardous fluids. Drain and flush and take necessary precautions.

It is not necessary to remove piping from the case to disassemble. Pump is a back pullout design and unless casing needs to be repaired or replaced, it can stay in place during servicing.

- ☑ See page 7 for model SSP, and page 8 for model SSPC cross sectional drawings.

1. Close all valves and drain pump and pipes and flush if necessary.
2. Remove any motor hold down bolts.
3. Remove the eight (8) case bolts (Item 7CS) with a 3/16" allen wrench.
4. Pull the motor and pump internals back out of the case. The baseplate (Item 800) will slip off when the bottom two case bolts are removed and can be left with the pump case. Remove the case o-ring (item 500) and inspect for damage or hardness.
5. If the motor is a three phase motor, a locking mechanism (item 7SC) is used to prevent the impeller (item 200) from unthreading if started in the wrong direction. If motor horsepower is less than 1 HP, the starting torque is relatively weak. ASP uses a locking compound to prevent the impeller from unthreading at start-up. If the motor horsepower is equal to or greater than 1.0 HP, ASP will provide a left hand threaded, button head locking screw with an impeller washer to prevent unthreading. The locking screw (item 7SC) is installed with removable Loctite to prevent it from coming out when operating in the correct rotation. Remove this locking screw by turning it **clockwise** while holding the impeller against rotation.
6. Remove the impeller (item 200) by turning the impeller counterclockwise (when looking at the impeller from the pump end) while holding the motor shaft. It will be necessary to remove the motor shaft cover plate in the center of the rear of the motor to get access to the shaft. Using a screwdriver, wrench or vise grips as needed, hold the shaft tightly against rotation while turning the impeller. **Do apply any heat to the components**. If you are unable to hold the shaft in this manner, remove the rear motor housing and grip the motor shaft with vise grips or other similar device (do not hold shaft where bearings will mount).
7. **Model SSP Only:** There should be several spacing washers behind the impeller. These spacers locate the open impeller vanes close to the case for efficient operation. Measure the thickness of this stack of spacers for future reference. Remove them from the shaft but do not lose these washers. You will need them for reassembly.

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Disassembly continued...

8. Remove the rotating element of the mechanical shaft seal (item 300). This element is held in place by the impeller only. If the rotating element does not come off easily, it is stuck to the shaft. Pry up the seal plate (Item 400) with screwdrivers or pry bars. The seal plate should compress the seal spring and force the seal off the shaft. If seal is stuck, and you must pry with force, do not pry towards your face or body. The seal and seal plate can come free unexpectedly and injure you.
9. If the seal plate (item 400) did not come off with the seal, remove it now. If you plan to replace the stationary seat, you will need to press it out from the back. Do not push with your finger, as you will probably cut it on the edges of the seal plate when the seal pushes out.
10. If you plan to replace the motor, remove the four motor adapter bolts (Item 7MB) with a 7/32" allen wrench and remove the motor adapter plate (Item 600). If you are not replacing the motor, leave the adapter plate in place.
11. If the motor comes with a deflector, the deflector should go outside of the motor adapter plate and must be removed if the adapter plate is to be removed.
12. Check the suction o-ring (item 510) in the case suction nozzle. It may be difficult to remove. Use a sharp pointed awl or similar device to pry the o-ring from the groove. Replace if damaged, swollen, fretted, or just worn out.

Assembly or Reassembly: SSP & SSPC

☑ See page xxx for model SSP, and page xxx for model SSPC cross sectional drawings.
☑ Assembly of the pump and motor is easier when the motor is standing face up so that parts do not fall off, although access to the motor shaft at the rear of the motor will require a horizontal position.
☑ It is considered good practice to replace the mechanical seal whenever you have to disassemble the pump.

1. If replacing the motor, remove the deflector from the motor shaft. There may not be enough room behind the motor adapter plate for the deflector to spin freely.
2. Install the motor adapter plate (Item 600) with the four motor bolts (Item 7MB) using a 7/32" allen wrench. You must use the low profile button head socket screws that came with the pump or other low profile head bolts. There is not enough room for a standard cap head screw/bolt. Tighten the bolts. Install the deflector now.
3. Install the mechanical seal stationary seat into the Seal Plate (Item 400) by putting a suitable lubricant on the cup seat and gently pressing into the seal plate bore. **Do not get any lubricant on the seal faces**. Use the foam sheet from the seal box to protect the seal face from dirt and scratches while pressing into the seal plate. Place the seal plate onto the motor adapter plate.
4. Lubricate the sealing elastomers on the rotating assembly of the mechanical seal and press gently onto the shaft. You may have to hold the seal in place until the impeller is installed.
5. **Model SSP Only:** Place the necessary number and thickness of impeller spacer/washers onto the threaded portion of the shaft. If you are not changing the impeller or the motor, use the same batch of spacer/washers you removed. See the section on ***Setting Impeller Clearance*** for procedures if you have changed the impeller to case setting.
6. (If motor is three-phase, read section 7 below for Loctite instructions, then continue reading here) Thread the impeller onto the pump shaft. Be sure the impeller hub is tight against the spacer/washers that are tight against the shoulder of the motor shaft. If you leave the impeller loose, when the motor starts up, the impeller will tighten up on the shaft so tightly that you may not be able to remove it later. You will need to hold the motor shaft from the rear of the motor with a large screwdriver, wrench or vise grips while tightening the impeller.
7. If motor is three-phase, and wiring has been reconnected, rotation may have changed. To protect against rotation in the wrong direction at start up, reinstall the left hand threaded impeller locking screw and washer (item 7SC), or for motor horsepowers less than 1 HP, install the impeller with a locking compound such as Loctite.
8. Install the case o-ring (item 500). Replace if brittle, damaged or misshapen.
9. **Model SSPC Only:** Install the suction o-ring (item 510). Replace if brittle, damaged or misshapen.
10. **Model SSPC Only:** Join up the back pull out assembly with the case. Do not force the pump into the case. The suction O-ring (item 510) can be pinched when installing. You may have to back out the pump from the case, center up the O-ring with your finger and slip in the pump assembly again. Before installing the case bolts, check to be sure the impeller is spinning freely.
11. **Model SSP Only:** Join up the back pull out assembly with the case. Install the (8) case bolts (item 7CS), leaving the bottom two bolts loose for attaching the base (not necessary with footed motors). Slip the baseplate under the bottom two bolts. Tighten the case bolts while holding the baseplate in place.
12. **Model SSP Only:** Check the impeller to case clearance per the following instructions and adjust as needed.
13. Install and tighten the motor base hold down bolts.

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Setting Impeller Clearance: Model SSP Only

- ☑ **See *SSP Performance Notes* for impeller shimming discussion.**
- ☑ **Properly setting the impeller to case clearance is the most critical factor in determining the SSP's performance.** You will get maximum performance and efficiency (and maximum amp draw) with near to zero clearance. Factory standard clearance is 8 to 12 mil. Spacer/Washers to adjust clearances are available in 10 mil and 15-mil thickness.
- ☑ You can have more or less than normal flow and head by changing the clearance. To increase clearance, remove impeller spacer/washers. To decrease clearance, add impeller spacer/washers. **Be aware that if you set the impeller at near to zero clearance, and operate near maximum flow rates, you may overload the standard motor. Also be aware that impeller clearances near zero greatly increase the risk of the impeller grinding against the casing.**
- ☑ Standard factory settings for spacers are 30 to 90 mils of spacer/washers to obtain 10-mil clearance. Since the tolerances of the motor shaft and pump parts can stack up, some pumps may need more or less than this standard. Some special OEM assemblies will not have any spacers when the customer elects to accept reduced performance in return for ease of assembly.
- ☑ American Stainless Pumps provides special feeler gauges for impeller shimming. Call and order our feeler gauge set, part number K200. Our standard shim pack set is also available. It contains ten each of the 0.010" and 0.015" shims.

Use the following impeller shimming method when building a new pump:

- ☑ American Stainless Pumps provides special feeler gauges for impeller shimming. Call and order our feeler gauge set, part number K200. Our standard shim pack set is also available. It contains ten each of the 0.010" and 0.015" shims. Use part number 200115.

1. Place the pump (as assembled through step 4 on page 47) on the workbench, positioned vertically.
2. Place 0.050" shims onto the motor shaft (two 0.015" shims and two 0.010" shims).
3. Thread the impeller onto the shaft, compressing the seal and shims. You will need to hold the motor shaft from the rear of the motor with a large screwdriver, wrench or vise grips while tightening the impeller.
4. Place case o-ring (item 500) onto seal plate. Make sure o-ring is laying flat against the seal plate flange.
5. Place case onto pump assembly, and install case screws (item 7CS). Tighten case screws in a cross-bolting fashion.
6. Rotate the impeller from the back of the motor, or with your finger through the suction or discharge nozzles. Listen and feel for any scraping noises from the impeller hitting the casing. If a scraping noise is heard, remove the case and impeller, and then remove either one 10 or one 15 mil shim. Repeat step 5 & 6. If no noise is heard, proceed to step 7.
7. Use the pink feeler gauge (0.015"), and slide it in between the impeller and the casing through the discharge nozzle. If the pink feeler gauge does not fit, go back to step 6 and remove shims as necessary to make pink gauge slide in between impeller and casing. When done correctly, the feeler gauge will become visible through the suction nozzle. Continue pushing the feeler gauge into the casing until it is all the way in, and centered across the face of the impeller. Rotate the feeler gauge using a pair of needle nose pliers, and feel for tight spots. If gauge encounters only a slight pinching resistance, you probably have a good impeller clearance. Remove the pink feeler gauge, and check to see that the brown feeler gauge (0.010") does not bind when used in the same way. If it does not, go to step 9. If it does, remove 0.010 mils of shims from behind impeller and repeat step 7. If the pink feeler gauge is free to rotate 360 degrees across the face of the impeller without binding or resistance, go to step 8.
8. If the pink gauge is capable of rotating 360 degrees without binding, then there is a greater impeller/casing clearance than 0.015". Determine this clearance by repeating step 7 with the thicker gauges. Yellow=0.020", White=0.025", Orange=0.030". If clearance is larger than 0.030", stack the various gauge thickness and repeat procedure until clearance is known. When clearance is determined, add shims behind the impeller to close clearance as desired. Repeat step 7.
9. Proper clearance has been established. Return to step 5 on the previous page.

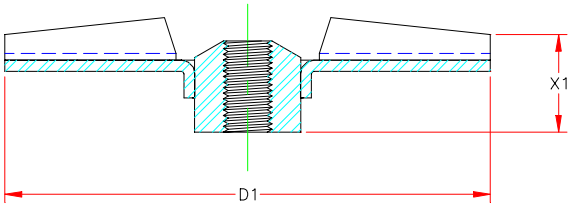
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Model SSP Impeller Shimming Method for Replacement Impellers

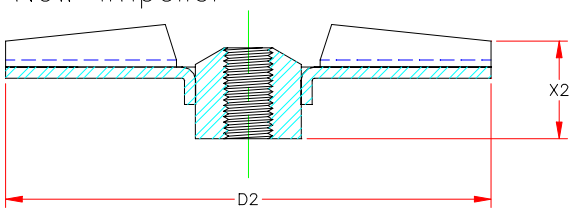
When replacing impellers in a model SSP open impeller pump, the following worksheet will provide a relatively quick method for maintaining the proper impeller/casing clearance. You may also want to read the previous page for an overview of the impeller shimming procedure.

REPLACEMENT IMPELLER SHIMMING PROCEDURE

Old Impeller



New Impeller



1. Measure D1, X1, D2, & X2. (Measure X1 & X2 as accurately as possible)

   D1=____ X1=____ D2=____ X2=____

2. Determin K1 & K2.

Impeller Diamerer D	K
3-3/4	-0.033
4-3/8	0.0
5-1/4	0.046

   K1=____ K2=____

3. Calculate H1 & H2
   H1=X1+(K1) H2=X2+(K2)

   H1=____ H2=____

4. Calculate S.
   S=H1-H2

   Round S to the nearest 0.005 increment.

   If S>0, then add shims equal to S.
   If S<0, subtract shims equal to S.

NO.	REVISION DESCRIPTION	DATE
0	ORIGINAL DRAWING	XX/XX/XX

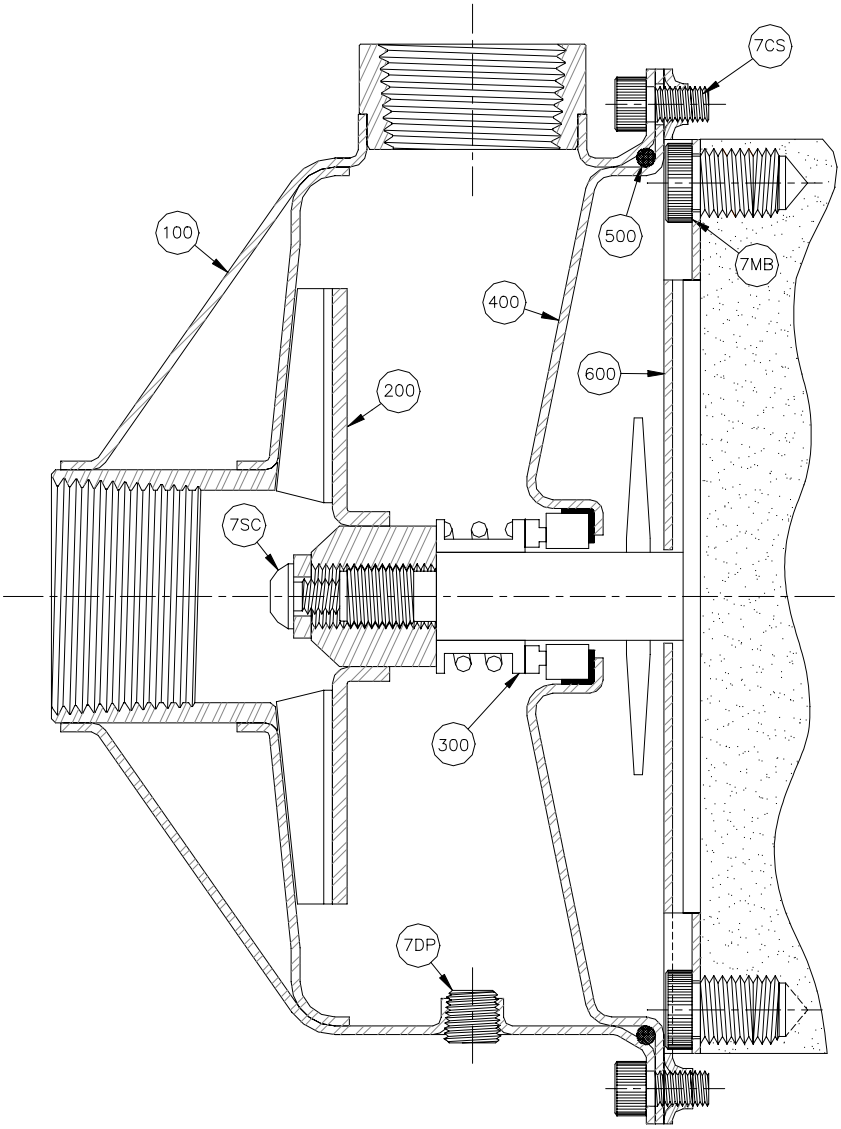
NOTES, & WHEN NOT NOTED OTHERWISE:
NO SHARP EDGES
FILLET ALL CORNERS TO 0.01
RADIAL & DIAMETRICAL DIMENSIONS ARE TO BE HELD TO A ±0.002 SYMMETRICAL TOLERANCE, AND ARE CONCENTRIC WITH PART CENTERLINES.
ALL DIMENSIONS ARE IN INCHES
PLEASE CALL (310) 630-8089 IF THERE ARE ANY QUESTIONS OR COMMENTS RELATED TO THIS DRAWING

STANDARD TOLERANCES	
0.X	±0.01
0.XX	±0.005
0.XXX	±0.002
0.XXXX	±0.0005

DRAWING MAY NOT BE TO SCALE, DO NOT USE FOR CONSTRUCTION UNLESS CERTIFIED.
AMERICAN STAINLESS PUMPS
LOS ANGELES, CALIFORNIA
NAME: SSP IMPELLER SHIM GUIDE | DATE: 12/13/00
SCALE | PUMP MDL. | SIZE | DRAWN BY: MWC | APPR. BY:
ITEM NO. | PART: ...\ASP\SSP\ | DRAWING NO.: XXXXXXXX.DWG | REV.: 0

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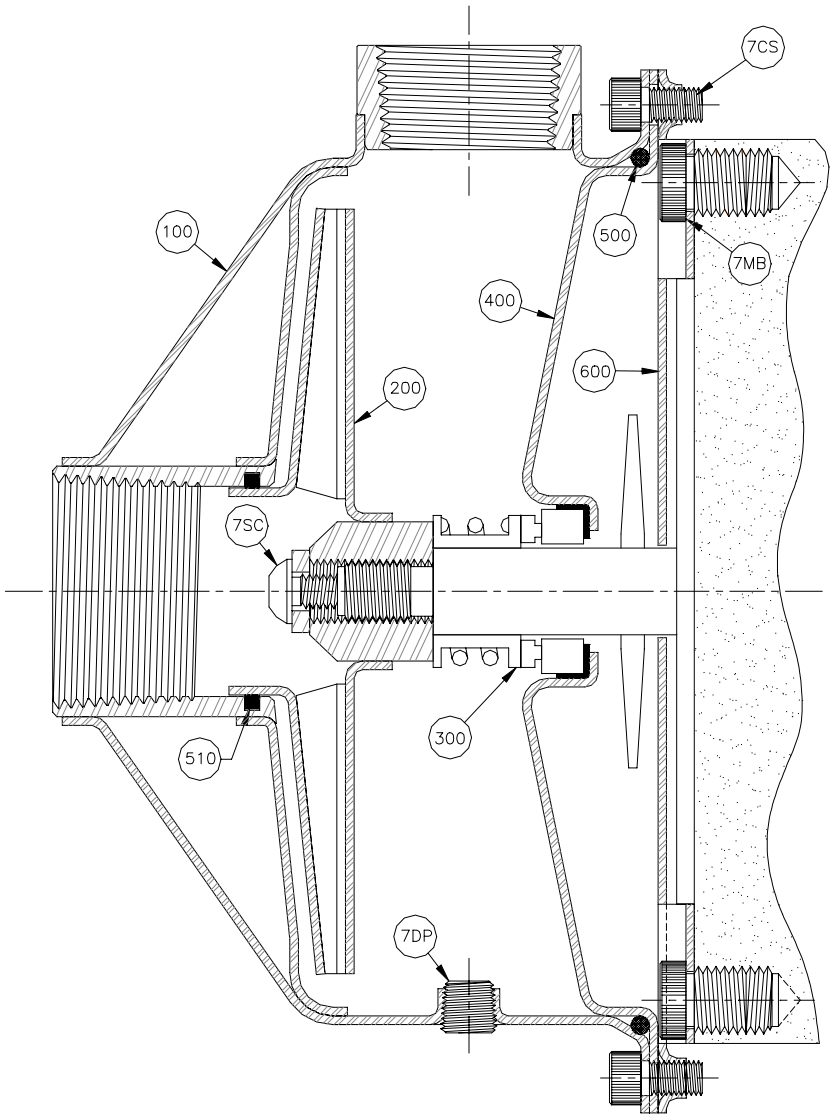
SSP (Open Impeller) Cross Sectional Drawing



Item No.	Part Description	Standard Materials
100	Casing	304 SS
200	Impeller (Open)	304 SS
300	Mechanical Seal - Type 6 (std.) (Other seal types available)	Car/Cer/Buna N/316 SS (Other materials available)
400	Seal Plate	304 SS
500	Casing O-Ring	Buna N (Other materials available)
600	Motor Adapter Plate	304 SS
7CS	Casing Screw - 1/4-20 (3/16 Allen)	Nickle Plated Steel
7DP	Drain Plug - 1/8" NPT	304 SS
7MB	Motor Bolt - 3/8-16 (7/32 Allen)	304 SS
7SC	Impeller Screw - 10-32LH (1/8 Allen) (Standard on 3-Ph motors 1-hp or larger)	304 SS
800 (not shown)	Pump Base (not supplied with footed motors)	304 SS

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SSPC (Enclosed Impeller) Cross Sectional Drawing



Item No.	Part Description	Standard Materials
100	Casing	304 SS
200	Impeller (Enclosed)	304 SS
300	Mechanical Seal - Type 6 (std.) (Other seal types available)	Car/Cer/Buna N/316 SS (Other materials available)
400	Seal Plate	304 SS
500	Casing O-Ring	Buna N (Other materials available)
510	Impeller O-Ring	Buna N (Other materials available)
600	Motor Adapter Plate	304 SS
7CS	Casing Screw - 1/4-20 (3/16 Allen)	Nickle Plated Steel
7DP	Drain Plug - 1/8" NPT	304 SS
7MB	Motor Bolt - 3/8-16 (7/32 Allen)	304 SS
7SC	Impeller Screw - 10-32LH (1/8 Allen) (Standard on 3-Ph motors 1-hp or larger)	304 SS
800 (not shown)	Pump Base (not supplied with footed motors)	304 SS

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