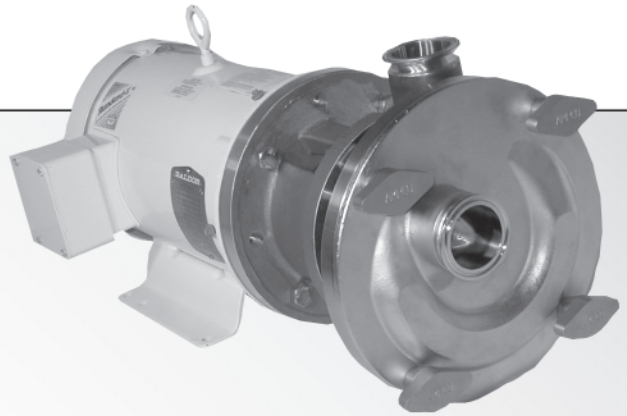
SP Series Pumps



INSTRUCTIONS

Your Ampco centrifugal pump is a rugged unit designed to provide years of low cost pumping service. There is a small amount of necessary care required to ensure you of this expected long service. It is recommended that you carefully review the installation and operating sections in this manual.

Every Ampco pump receives a careful running test at the factory to ensure that the head-capacity rating is met in accordance the Hydraulic Institute Standards and to ensure mechanical soundness. Special instructions and advice for unusual conditions, such as corrosive, abrasive, and other problems are too numerous to be included in this general book, but will be the subject of specific discussion on orders or inquires for special applications..

LOCATION

The immediate environment, in which the unit is located, while usually of prime importance to the pump, may determine the enclosure needed for the motor. Ampco can supply several different motor enclosures to meet specific requirements.

The SP Series pumps series are supplied with totally enclosed motors as standard. They may be installed where dirt, moisture and mild corrosion are present or in outdoor locations. Washdown duty motors, with epoxy paint or paint free stainless steel, are designed for applications where the motor is frequently subject to washdown to maintain a bacteria-free operating environment. Specialty motors may be required for moist, corrosive, or explosive environments. Motor drain plugs (if not equipped with automatic drains) must be removed periodically to drain accumulated condensation.

Pump units should be located where daily visual inspection is possible and no surrounding structure interferes with ventilating air over or through the motor.

Submerged suction is the most economical and convenient method of priming a pump when installed in such a position that the top of the casing is below the surface of the liquid to be pumped. The liquid will flow by gravity into the pump and displace the air (through the discharge if possible or a vent when available).

INSTALLATION

Begin with a suction line as direct and as simple as possible. The suction line is usually the most sensitive part of the entire pumping system being totally dependent on outside forces to provide liquid flow into the center of the impeller.

Locate the pump as close to the supply of liquid as possible, with short and direct suction piping. Use wide radius elbows to help reduce friction loss. Air pockets due to high sections, concentric reducers, valve bonnets, etc. should be eliminated by installing a suction having a continual rise or at very least a straight horizontal run with an air eliminator near the pump suction entry. To prevent air pockets use eccentric pipe reducers that are mounted in a horizontal position across the top of the pipeline and valves that can be positioned in a plane rather than the normal upright position as an air pocket may exist in the upright valve bonnet.

Above all, remember that until the liquid reaches the leading edges of the rotating impeller vane the pump cannot impart its energy to move the liquid.

If possible, try not to connect an elbow directly to the inlet of the pump. This may cause excessive turbulence and hinder pump performance.

STARTING

The pump must be primed before starting, as the mechanical seal depends on the liquid being pumped for lubrication and cooling. Even a short run to determine direction of rotation without first priming may seriously damage the seal. Even though the SP Series are "self-priming" they require fluid inside the pump casing to draw a proper vacuum to initiate the priming.

The correct direction of rotation is counter-clockwise when viewed from the suction end of the pump. It is recommended to turn the pump by hand before starting the first time to ensure the unit is not binding.

MAINTENANCE

Since long-term breakdown cannot be tolerated in most services, maintenance procedures and a contingency plan must be established in advance to minimize any production loss caused by down time.

During building and start-up it is common to use outside personnel. Operating personnel should acquaint themselves with the pump, particularly its running performance. This will aid in establishing a standard for future reference. This manual and other information provided with the pump should be filed for future reference.

All possible performance data should be recorded once the system is functioning properly and stable. Suction and discharge pressure readings, flow rate, seal leakage rate, bearing temperature, noise and vibration levels all provide input to a pump's performance in the system. It is unlikely that all of this data can be measured, but any information gathered can help alert the user of problems with the pump or system.

Operating personnel should know that any changes in the system or the liquid being pumped might have an effect on the pump's performance. It is advisable to also record the fluid temperature, specific gravity, viscosity, liquid concentration, percent of solid concentration, other additives and properties.

Single Mechanical Seal

A proper maintenance procedure should begin with a file for each pump. All known data relative to the pump, fluid handled and system should be included. Complete records of maintenance and repair costs along with a log of the unit's operating hours should be kept.

In addition, complete pump identification- size, type, operating speed, manufacturer, serial number, model number, and material of construction should be noted.

Maintenance Procedures
Daily Check-possibly the most important inspection will be the daily observation.

1. Seal leakage rate
2. Pressure reading and flow indication
3. Change in operating sound
4. Change in bearing temperature
5. Check to make sure flow is going through the double seal flush lines (for Double Seal pumps)

Semi-Annual Inspection-typically made at 6-month intervals with results noted in pump's maintenance file.

1. Check of mechanical seal assembly
2. Check of bearing lubrication

Annual Inspection-includes Semi-Annual inspection plus:

3. Removal of seal for inspection
4. Bearing Check
5. Check of axis/running clearance of impeller

Contingency Plan
For inspection findings and breakdowns, a contingency plan should be developed. To begin, an adequate supply of probable replacement parts should be kept on hand.

The minimum recommended spare parts are as follows:

1. Mechanical seal kit (complete with o-ring set)
2. Casing o-ring
3. Impeller Key

In addition Ampco recommends

4. Impeller
5. Impeller Nut

Where service cannot be interrupted, a complete stand-by pump unit fully assembled (and in a by-pass line) is recommended.

DISMANTLE AND REPLACE PARTS AS FOLLOWS :

Before attempting any service on the pump or motor, disconnect or lock out electrical power to the pump motor. If the pump and motor are to be removed as a unit, note the wiring configuration. Use colored or numbered tape to mark the wire connections of the motor and power source, for reconnection.

These instructions are limited to fluid ends only. See other drawings and literature applicable to motors, pedestals, frames, shafts, etc., if additional repairs are required.

1. Disconnect pump from both suction and discharge piping. Remove the shaft cover guard at this time by taking off the cover guard bolts.

2. Remove cover by taking off casing nuts. A rubber mallet may be necessary to loosen the nuts.

3. Remove the impeller nut using a 15/16" socket and holding the stub shaft with a 3/8" rod in the predrilled hole. Ease the impeller off the shaft. Pinch bars between the impeller and cover may be required. Be careful not to mar the pump's surface finish. Remove the impeller.

4. Use a 3/4" wrench to remove all three bolts between the pump volute and the adapter and gently slide slide the pump volute off the pump shaft.

5. Lay the pump volute down on the casing studs, and remove the stationary seal. The wave springs for the seal should also be removed. In double seal pumps, there is an extra stationary piece and wave spring to remove.

6. Remove the two stationary seal o-rings. This is best down by using a small flat-blade screwdriver.

7. Remove the rotating seal and rotating seal o-ring from the stub shaft.

The Mechanical seal is the only expendable pump part. It is suggested that the complete mechanical seal, both stationary and rotating members, be replaced whenever dripping or leakage occurs at the shaft, or whenever parts are removed to the point of separating the primary sealing surfaces.

The fluid end is now completely dismantled: Additional procedures are dictated by purpose for which unit was dissembled.

Mechanical Seal Replacement and Reassembly
Please see the table on page 5 for proper identification of all pump components. The numbers in parenthesis refer to the diagram on page 5 for mechanical seal components.

1. Begin by installing the rotating assembly onto the stub shaft. Lubricate the rotating o-ring with a food grade lubricant (use de-ionized water if oil is not permitted i.e. EPDM) and fit it into the rotating seal. Slide the assembly onto the shaft and line it up with the notches on the shaft.

2. Set the pump volute down on the casing studs. Lubricate the inner stationary seal o-ring and put it in groove in the seal cavity. For double seal pumps, the outer stationary o-ring fits into the larger groove in the seal cavity.

3. Place the inner (and outer) wave spring into the seal cavity and align it around the pins in the seal cavity. The wave spring should be positioned so that the waves with the notches face downward by the pins.

4. Install the inner stationary seal. The notches in the seal will line up with the pins in the cavity. For a double seal, install the outer rotating seal second.

5. Being careful not to bump the seal on the pump stub shaft, gently slide the volute over the stub shaft and shoulder it against the adapter.

6. Using a 3/4" wrench to alternately tighten all bolts between the volute and the adapter.

7. Place the impeller key onto the shaft keyway in the pump.

8. Lubricate the impeller o-ring and fit it into the groove on the back of the impeller.

9. Slide the impeller onto the pump shaft over the key. Next, lubricate the impeller nut gasket (11) and install it on the impeller along with threading on the impeller nut. Be sure that the gasket fits into the groove in the impeller nut.

10. Tighten the impeller nut. This should be done with a 15/16" six point socket while using a 3/8" rod in the stub shaft hole to keep the pump shaft from rotating. Check the freedom of parts by hand rotating the impeller.

11. Install the cover onto the pump volute with a new cover o-ring. It is best to put the o-ring on the cover as it is placed against the volute. Tighten all cover nuts uniformly. Rotate the shaft again by hand again to check for rubbing.

12. Re-install the shaft cover guard.

13. For double seal pumps, install the flush lines through the back of the casing. Run flush water at about 1-2 gallons per hour. The maximum pressure for the seal is 5 PSI. Flush water should be throttled before the pump, and there should be about 2-5 feet of vertical tubing after the flush water exits the pump to maintain this.

14. Place the pump back into service and inspect for proper rotation and leaks.

Motor / Pump Shaft Disassembly
Before attempting any service on the pump or motor, disconnect or lock out electrical power to the pump motor. If the pump and motor are to be removed as a unit, note the wiring configuration. Use colored or numbered tape to mark the wire connections of the motor and power source, for reconnection.

1. Begin with pump disassembly as noted previously.

2. Loosen the shaft collar with an Allen wrench (3/16" or 1/4": see sizes in table on page 5) so that the stub shaft can be taken off the motor. A rubber mallet may be used to tap the stub shaft if it will not slide off. Be careful not to drop the shaft collar when the stub shaft comes off the motor.

At this time the motor can be replaced by unbolting the adapter from it and separating the two items.

Motor / Pump Shaft Assembly
If the pump stub shaft is being replaced, it is recommended that a new shaft collar also be installed.

1. Begin by bolting the adapter onto the motor. Please note correct tightness of all fastening components in the table on page 5.

2. Slide the shaft collar onto the stub shaft and slide the two together onto the motor shaft, keeping the motor keyway in line with one of the slots in the stub shaft. If the collar has an identification groove in it, this will rest against the step in the stub shaft.

3. Line up the slot in the collar with the stub shaft slot and motor keyway gap. Do not tighten the shaft collar yet.
Since the shaft was disassembled, the impeller clearance in the volute may have changed. The impeller must be repositioned to ensure the impeller will not rub and also for proper pump performance. The critical impeller gap is the gap between the volute and the impeller. This will be measured using the spacer provided with the SP Series pumps. *Please see the table on page 5 within the manual for the correct impeller gaps.*

4. Slide the volute over the pump shaft and shoulder it against the adapter.

5. Using a 3/4" wrench to alternately tighten all bolts between the volute and the adapter.

6. Place the spacer provided with the pump between the casing and the impeller. Install the impeller key, followed by the impeller, impeller nut gasket, and impeller nut. Tighten the impeller nut using a socket wrench and the 3/8" rod to hold the shaft to secure the assembly.

7. With a rubber mallet, gently tap the impeller nut to drive the stub shaft towards the motor while the spacer is between the impeller and volute. This will create the critical impeller gap.

8. When the impeller gap is correct, align the shaft collar slot with the slot in the stub shaft and the motor shaft keyway, and tighten the shaft collar with an Allen wrench, (3/16" or 1/4": see sizes in table on page 5) to secure the shaft position.

9. Remove the impeller nut, gasket, and impeller from the shaft, and spacer. Now finish reassembling the pump.

SP PUMPS
EXTERNAL SEAL
SP Series Pumps

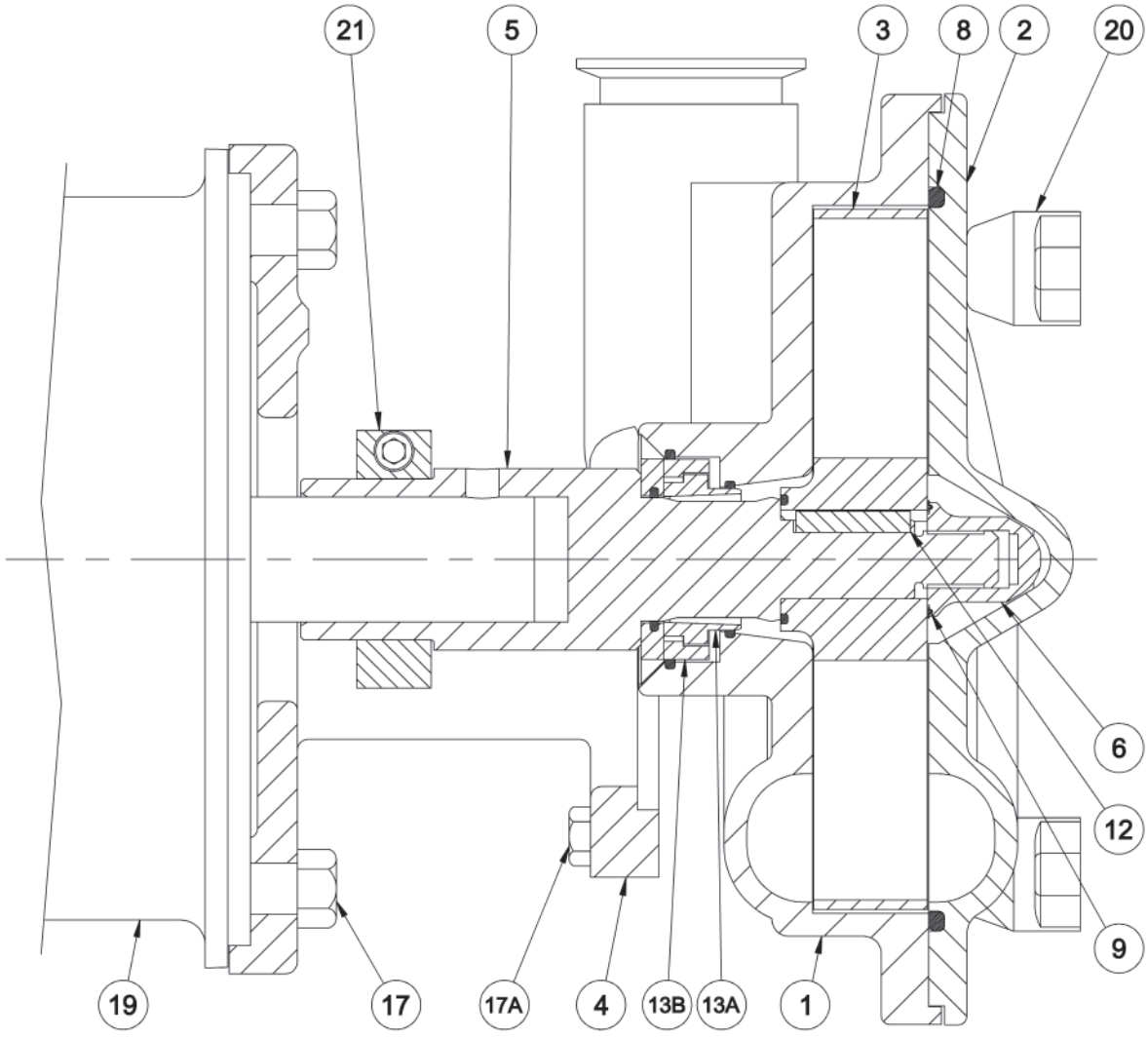
AMPCO PUMPS COMPANY
PARTS BREAKDOWN

DETAIL NO.	REQ. NO.	PART NAME
21	1	SHAFT COLLAR
20	X[2]	STAR NUT
19	1	MOTOR
17A	3	CAP SCREW (CASING/ADAPTER)
17	4	CAP SCREW (MOTOR/ADAPTER)
16[1]	2	DRIVE SCREW
15[1]	1	NAME PLATE
13B	1	DOUBLE MECHANICAL SEALv
13A	1	SINGLE MECHANICAL SEAL
12	1	IMPELLER KEY

DETAIL NO.	REQ. NO.	PART NAME
11B[1]	2	SHAFT GUARD CAP SCREW
11A[1]	1	SHAFT GUARD
9	1	GASKET (IMPELLER SCREW)
8	1	O-RING (CASING/COVER)
6	1	IMPELLER NUT
5	1	STUB SHAFT
4	1	ADAPTER
3	1	IMPELLER
2	1	COVER
1	1	CASING

[1]NOT SHOWN
[2]STAR NUT QUANTITY VARIES WITH PUMP MODEL

NOTE: Please be sure to always include pump type, size, and serial number with any reference to above numbers and names.

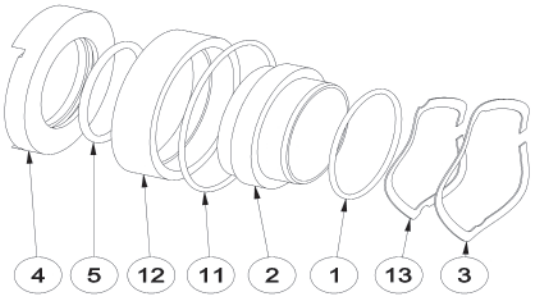


Single Internal Mechanical Seal

Seal Breakdown For SP Series Pumps (Items 11-13 for double seal pumps only)

DETAIL NO.	PART NAME
1	STATIONARY O-RING
2	STATIONARY SEAL
3	SPRING
4	ROTATING SEAL

DETAIL NO.	PART NAME
5	ROTATING O-RING
11*	STATIONARY O-RING
12*	STATIONARY SEAL
13*	SPRING



Proper Torque For Bolts on SP Series Pumps

Item	Torque (ft-lbs)	Pumps Included
Motor Bolts	50	All SP200 Pumps
Adapter / Casing Bolts	50	All SP200 Pumps
Volute Casing Nuts	50	280 + Frame
Shaft Collar Bolt(s)	15	180 Frame
	30	210 - 250 Frame
Impeller Nut	40	SP200 Series

Proper Impeller Gaps For SP Series Pumps

Pump Series	Impeller toVolute
SP200	0.008”

Required Tools

1. Rubber Mallet

2. 15/16" socket - for impeller nut

3. 3/8" diameter steel rod - to hold stub shaft

4. One - 3/4" wrench (frame sizes 280 & larger) - adapter bolts

5. Food grade lubricant

6. 3/16" Allen wrench - shaft collar bolt 180 frames
1/4" Allen wrench - shaft collar bolt 210-280 frames

7. Impeller puller / pinch bars (may be necessary)

8. Shim (see Impeller Gap chart for sizes)

COMMON TROUBLES AND THEIR CAUSES

It is to the user's advantage to be familiar with a systematic procedure to determine reasons and causes for unsatisfactory pump operation. The following list of troubles and causes is intended to assist users in determining the cause of any pumping trouble. Faulty installations can then be corrected and a clear description given the manufacturer if assistance is required. Human judgment should not be relied on to measure operating conditions. Use proper instruments to measure values of pressure, suction lift, speeds, temperature rise of motors, etc. When motor speeds are incorrect, check connections and measure voltage at motor terminals.

1. No liquid delivered
a. Pump and suction line not completely primed
b. Speed too low
c. Required discharge too high
d. Suction lift too high
e. Impeller, piping, or fittings completely plugged up
f. Wrong direction of rotation

2. Not sufficient capacity
a. Air leaks in suction pipe or shaft seal
b. Speed too low
c. Required discharge head too high
d. Suction lift too high or insufficient NPSH available
e. Impeller, piping, or fittings partially plugged
f. Insufficient positive suction head for hot water or other volatile liquids
g. Liquid viscosity too high
h. Mechanical problems - impeller damaged, shaft seal defective
i. Wrong direction of rotation
j. Suction pipe entrance too close to surface of liquid
k. Air pockets in pipe high points

3. Not sufficient pressure
a. Speed too low
b. Mechanical problems - impeller damaged, shaft seal defective
c. Small impeller diameter
d. Air or gas in liquid
e. Wrong direction of rotation
f. Air pockets in pipe high points

4. Pump operates for a while, then quits
a. Leaky suction line
b. Air leaking in through shaft seal
c. Suction lift too high or insufficient NPSH available
d. Air or gas in liquid
e. Suction piping and fittings not completely freed of air during priming
f. Air pockets in pipe high points

5. Pump takes too much power
a. Speed too high
b. Pumping too little water (too much pressure) because required head is higher than anticipated
c. Viscosity and/or specific gravity is higher than specified
d. Mechanical problems - binding inside seal from distortion due to piping strains, shaft bent, impeller rubbing casing
e. Wrong direction of rotation
f. Wrong motor voltage or wiring

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