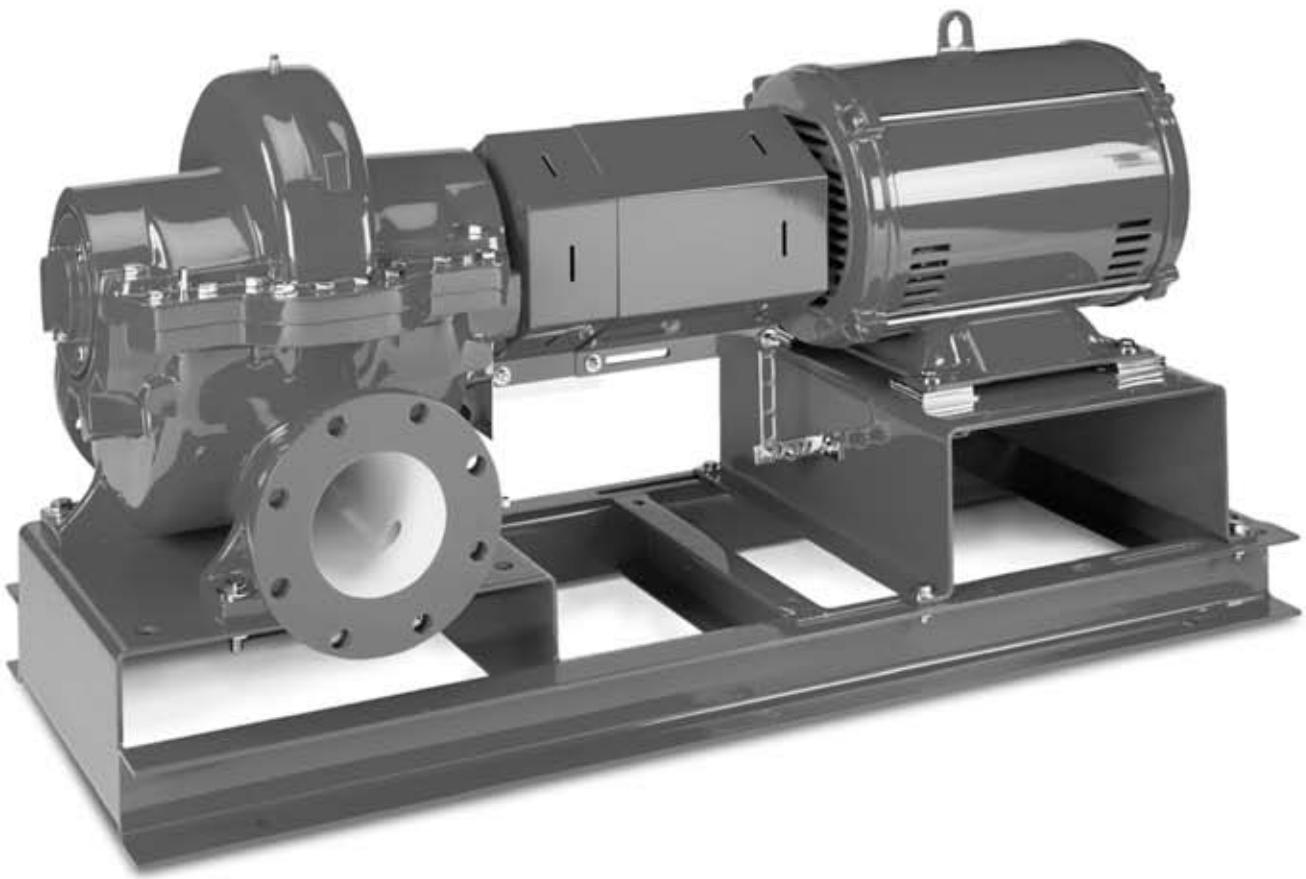
ITT

AC Pump
Instruction Manual
AC8743



AC 8300 Series

Base Mounted Centrifugal Pump

Installation, Operation, Maintenance

INSTALLER: PLEASE LEAVE THIS MANUAL FOR THE OWNER'S USE.

Engineered for life

INTRODUCTION

DESCRIPTION

The Series 8300 centrifugal pumps are frame mounted pumps which feature high efficiency, rugged construction, compact design, foot mounted volute, center drop out coupler, and regreasable bearings. These features, along with the horizontal split case make installation, operation, and service easy to perform.

PUMP APPLICATION

The standard Series 8300 centrifugal pump's bronze fitted construction make it ideal for service with the following liquids: unheated domestic and fresh water, boiler feed water, condensate, hydronic cooling or heating, pressure boosting, general pumping and benign liquids.

For other applications contact your local A-C Pump representative.

OPERATIONAL LIMITS

Unless special provisions have been made for your pump by A-C Pump, the operational limits for Series 8300 Pumps are as follows:

175# Maximum Working Pressure
75# Maximum Suction Pressure
Listed on pump nameplate.

SEAL OPERATING LIMITS

Standard Self Flushing Mechanical Seals

BUNA-PH Limitations 7-9; Temperature Range -20 to +225°F

EPT-PH Limitations 7-11; Temperature Range -20 to +250°F

For use on closed or open systems which are relatively free of dirt and/or other abrasive particles.

PUMP IDENTIFICATION

Pumps are designated by a series of numbers such as Series 8300. The pump nameplate gives identification and rating information as identified in Figure 1.

Permanent records for this pump are kept by serial number and it must be used with all correspondence and spare parts orders.

The frame plate shown in Figure 1A, gives information concerning the bearings and their lubrication. The inboard and outboard bearing numbers refer to the bearing manufacturer's numbers.

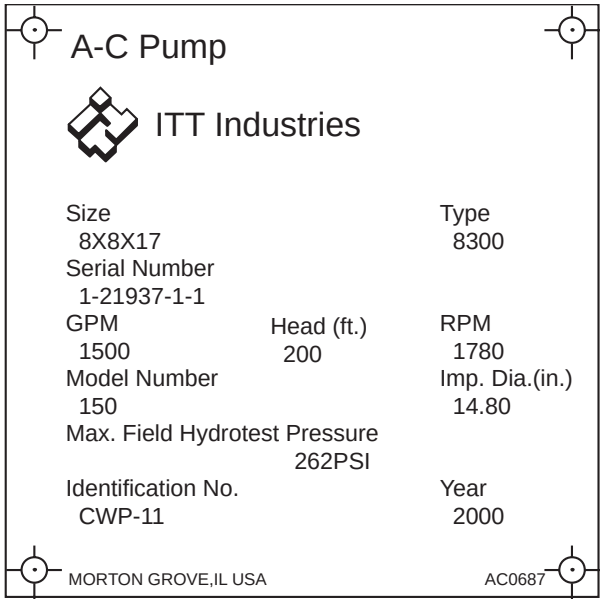


Figure 1: Rating Plate

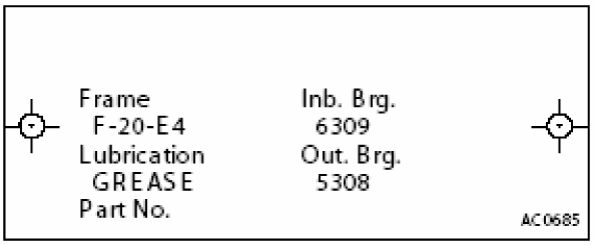


Figure 1A: Frame Plate

SAFETY INSTRUCTIONS

SAFETY INSTRUCTION

This safety alert symbol will be used in this manual and on the pump safety instruction decals to draw attention to safety related instructions. When used the safety alert symbol means ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!

FAILURE TO FOLLOW THE INSTRUCTIONS MAY RESULT IN A SAFETY HAZARD.

Your Series 8300 pump should have the safety instruction decals in Figure 2 displayed. If the decals are missing or illegible, contact your local A-C Pump representative for a replacement.

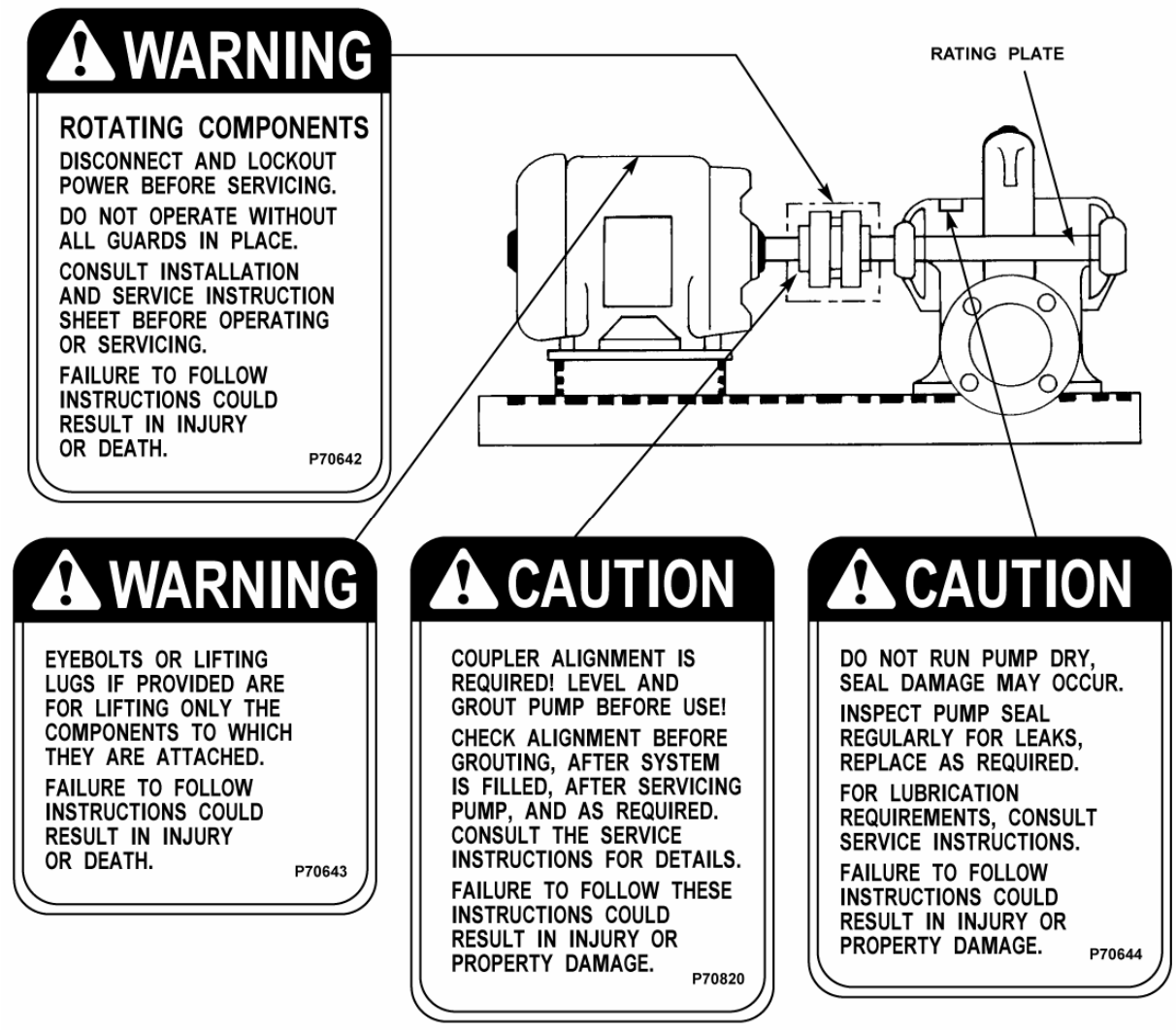


Figure 2: Safety Instruction Decals

ADDITIONAL SAFETY INSTRUCTIONS

1. Electrical connections to be made by qualified electrician in accordance with all national, state, and local codes.
2. Motor must have properly sized starter with properly sized heaters to provide overload and undervoltage protection.
3. If pump, motor, or piping is operating at extremely high or low temperatures, guarding or insulation is required.
4. The maximum working pressure of the pump is listed on the pump nameplate; do not exceed this pressure.

Electrical Safety

WARNING: Electrical Shock Hazard

Electrical connections to be made by a qualified electrician in accordance with all applicable codes, ordinances, and good practices.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

WARNING: Electrical Overload Hazard

Three-phase motors must have properly sized heaters to provide overload and under voltage protection. Single-phase motors have built-in overload protectors.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

Thermal Safety

WARNING: Extreme Temperature Hazard

If pump, motor, or piping is operating at extremely high or low temperatures, guarding or insulation is required.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

Mechanical Safety

WARNING: Unexpected Startup Hazard

Disconnect and lockout power before servicing.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

WARNING: Excessive System Pressure Hazard

The maximum working pressure of the pump is listed on the nameplate. Do not exceed this pressure.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

WARNING: Excessive Pressure Hazard Volumetric Expansion

The heating of water and other fluids causes volumetric expansion. The associated forces may cause failure of system components and release of high temperature fluids. This will be prevented by installing properly sized and located compression tanks and pressure relief valves.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

LOCATION

Locate the pump so there is sufficient room for inspection, maintenance, and service. If the use of a hoist or tackle is needed, allow ample head room.

WARNING: Falling Objects Hazard

Eyebolts or lifting lugs, if provided are for lifting only the components to which they are attached.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

If lifting of the entire pump is required, do so with slings placed under the base rails as shown in Figure 3.

The best pump location for sound and vibration absorption is on a concrete floor with subsoil underneath. If the pump location is overhead, special precautions should be undertaken to reduce possible sound transmission. Consult a sound specialist.

If the pump is not on a closed system, it should be placed as near as possible to the source of the liquid supply and located to permit installation with the fewest number of bends or elbows in the suction pipe.

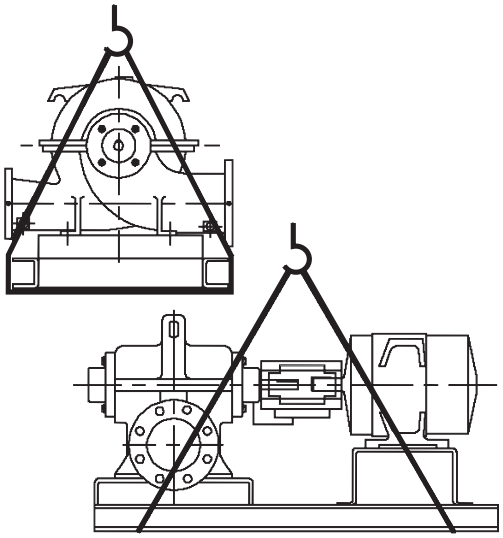


Figure 3: Lifting the Pump

The installation must be evaluated to determine that the Net Positive Suction Head Available (NPSHA) meets or exceeds the Net Positive Suction Head Required (NPSHR), as stated by the pump performance curve. See the section entitled Suction and Discharge Piping for more details regarding proper suction piping installation.

IMPORTANT: Do not install and operate pumps, 3D valves, suction diffusers, etc., in closed systems unless the system is constructed with properly sized safety devices and control devices. Such devices include the use of properly sized and located pressure relief valves, compression tanks, pressure controls, temperature controls, and flow controls as appropriate. If the system does not include these devices, consult the responsible engineer or architect before making pumps operational.

GENERAL INSTRUCTIONS

PURPOSE OF THE MANUAL

This manual is furnished to acquaint you with some of the practical ways to install, operate, and maintain this pump. Read it completely before any installation, operation, or maintenance on your unit and keep it handy for future reference.

Equipment cannot operate well without proper care. To keep this unit at top efficiency, follow the recommended installation and servicing procedures outlined in this manual.

WARRANTY

Refer to your local representative for warranty coverage.

RECEIVING THE PUMP

Check the pump for shortages and damage immediately upon arrival. (An absolute must!) Prompt reporting of any damage to the carrier's agent, with notations made on the freight bill, will expedite satisfactory adjustment by the carrier.

Pumps and drivers are normally shipped from the factory mounted on a base plate and painted with primer and one finish coat. Couplings may either be completely assembled or have the coupling hubs mounted on the shafts and the connecting members removed. When the connecting members are removed, they will be packaged in a separate container and shipped with the pump or attached to the base plate.

Shafts are in alignment when the unit is shipped; however, due to shipping, the pumps may arrive misaligned. Alignment must be established during installation. A-C Pump has determined that proper and correct alignment can only be made by accepted erection practices. (See the **Foundation**, **Baseplate Setting**, and **Coupling Alignment** sections.)

TEMPORARY STORAGE

If the pump is not to be installed and operated soon after arrival, store it in a clean, dry place having slow, moderate changes in ambient temperature. Rotate the shaft periodically to coat the bearings with lubricant, to retard oxidation and corrosion, and to reduce the possibility of false brinelling of the bearings.

LOCATION

The pump should be installed as near the suction supply as possible, but no less than five suction diameters with the shortest and most direct suction pipe practical. See the section entitled Suction and Discharge Piping. The total dynamic suction lift (static lift plus friction losses in suction line) should not exceed the limits for which the pump was sold.

The pump must be primed before starting. Whenever possible, the pump should be located below the fluid level to facilitate priming and assure a steady flow of liquid. This condition provides a positive suction head on the pump. It may also be possible to prime the pump by pressurizing the suction vessel.

When installing the pump, consider its location in relation to the system to assure that sufficient Net Positive Suction Head (NPSH) at pump suction is provided. Available NPSH must always equal or exceed the required NPSH of the pump.

The pump should be installed with sufficient accessibility for inspection and maintenance. A clear space with ample head room should be allowed for the use of an overhead crane or hoist sufficiently strong to lift the unit.

NOTE: Allow sufficient space to be able to dismantle the pump without disturbing the pump inlet and discharge piping.

Select a dry place above the floor level wherever possible. Take care to prevent the pump from freezing during cold weather when not in operation. Should the possibility of freezing exist during a shut-down period, the pump should be completely drained, and all passages and pockets where liquid might collect should be blown out with compressed air.

Make sure there is a suitable power source available for the pump driver. If motor driven, electrical characteristics should be identical to those shown on the motor data plate.

FOUNDATION

A substantial foundation and footing should be built to suit local conditions. It should form a rigid support to maintain alignment. The pump assembly must be mounted to a suitable

foundation having a mass ≥ 1.5 times the weight of the unit.

The foundation should be poured without interruption to within 1/2 to 1-1/2 inches of the finished height. The top surface of the foundation should be well scored and grooved before the concrete sets; this provides a bonding surface for the grout.

Foundation bolts should be set in concrete as shown in Figure 4. An optional 4-inch long tube around the bolts at the top of the concrete will allow some flexibility in bolt alignment to match the holes in the base plate. Allow enough bolt length for grout, shims, lower base plate flange, nuts and washers. The foundation should be allowed to cure for several days before the base plate is shimmed and grouted.

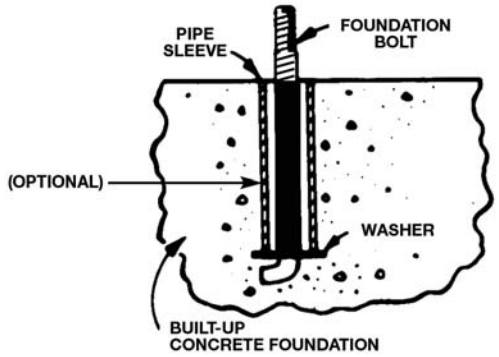


Figure 4: Foundation

BASE PLATE SETTING (BEFORE PIPING)

NOTE: This procedure assumes that a concrete foundation has been prepared with anchor or hold down bolts extending up ready to receive unit. It must be understood that pump and motor have been mounted and rough aligned at the factory. If motor is to be field mounted, consult factory for recommendations. A-C Pump cannot assume responsibility for final alignment.

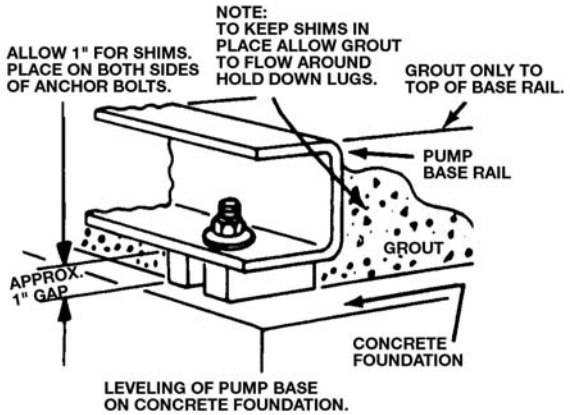


Figure 5: Setting Base Plate and Grouting

a. Use blocks and shims under base for support at anchor bolts and midway between bolts, to position base approximately 1 inch above the concrete foundation, with studs extending through holes in the base plate.

b. By adding or removing shims under the base, level and plumb the pump shaft and flanges.

c. Draw anchor nuts tight against base, and observe pump and motor shafts or coupling hubs for alignment. (Temporarily remove coupling guard for checking alignment.)

d. If alignment needs improvement, add shims or wedges at appropriate positions under base, so that retightening of anchor nuts will shift shafts into closer alignment. Repeat this procedure until a reasonable alignment is reached.

NOTE: Reasonable alignment is defined as that which is mutually agreed upon by pump contractor and the accepting facility (final operator). Final alignment procedures are covered in the section entitled Alignment Procedure.

e. Check to make sure the piping can be aligned to the pump flanges without placing pipe strain on either flange.

f. Grout in base plate completely and allow grout to dry thoroughly before attaching piping to pump. See the section entitled Grouting Procedure. 24 hours is sufficient time with approved grouting procedure.

GROUTING PROCEDURE

Grout compensates for uneven foundation, distributes weight of unit, and prevents shifting. Use an approved, non-shrinking grout, after setting and leveling unit. See Figure 5.

a. Build strong form around the foundation to contain grout.

b. Soak top of concrete foundation thoroughly, then remove surface water.

c. Base plate should be completely filled with grout.

d. After the grout has thoroughly hardened, check the foundation bolts and tighten if necessary.

e. Check the alignment after the foundation bolts are tightened.

f. Approximately 14 days after the grout has been poured or when the grout has thoroughly dried, apply an oil base paint to the exposed edges of the grout to prevent air and moisture from coming in contact with the grout.

ALIGNMENT PROCEDURE

NOTE: A flexible coupling will only compensate for small amounts of misalignment. Permissible misalignment will vary with the make of coupling. Consult coupling manufacturer's data when in doubt.

Allowances are to be made for thermal expansion during cold alignment, so that the coupling will be aligned at operating temperature. In all cases, a coupling must be in alignment for continuous operation. Even though the coupling may be lubricated, misalignment causes excessive wear, vibration, and bearing loads that result in premature bearing failure and ultimate seizing of the pump. Misalignment can be angular, parallel, or a combination of these, and in the horizontal and vertical planes. Final alignment should be made by moving and shimming the motor on the base plate, until the coupling hubs are within the recommended tolerances measured in total run-out. All measurements should be taken with the pump and motor foot bolts tightened. The shaft of sleeve bearing motors should be in the center of its mechanical float.

NOTE: Proper alignment is essential for correct pump operation. This should be performed after base plate has been properly set and grout has dried thoroughly according to instructions. Final alignment should be made by shimming driver only. Alignment should be made at operating temperatures.

WARNING: Unexpected Startup Hazard

Disconnect and lockout power before servicing.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

ANSI/OSHA COUPLER GUARD REMOVAL/INSTALLATION

WARNING: Unexpected Startup Hazard

Disconnect and lockout power before servicing.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

NOTE: Do not spread the inner and outer guards more than necessary for guard removal or installation. Overspreading the guards may alter their fit and appearance.

Removal

a. Remove the two capscrews that hold the outer (motor side) coupler guard to the support bracket(s).

b. Spread the outer guard and pull it off the inner guard.

c. Remove the capscrew that holds the inner guard to the support bracket.

d. Spread the inner guard and pull it over the coupler.

Installation

a. Check coupler alignment before proceeding. Correct if necessary.

b. Spread the inner guard and place it over the coupler.

c. With the inner guard straddling the support bracket, install a capscrew through the hole (or slot) in the support bracket and guard located closest to the pump. Do not tighten the capscrew.

d. Spread the outer guard and place it over the inner guard.

e. Install the outer guard capscrews as required for your pump.

   i. *For pumps with a motor saddle support bracket:* Ensure the outer guard is straddling the support arm, and install but do not tighten the two remaining capscrews.

   ii. *For pumps without a motor saddle support bracket:* Insert the spacer washer between the holes located closest to the motor in the outer

guard, and install, but do not tighten, the two remaining capscrews.

f. Position the outer guard so it is centered around the shaft, and so there is less than a 1/4 inch of the motor shaft exposed. On guards that utilize a slotted support bracket, the inner guard will have to be positioned so there is only a 1/4 inch of the pump shaft exposed.

g. Holding the guard in this position, tighten the three capscrews.

ANSI/OSHA Coupling Guard Exploded View for Typical Series 8300 Pump Installation

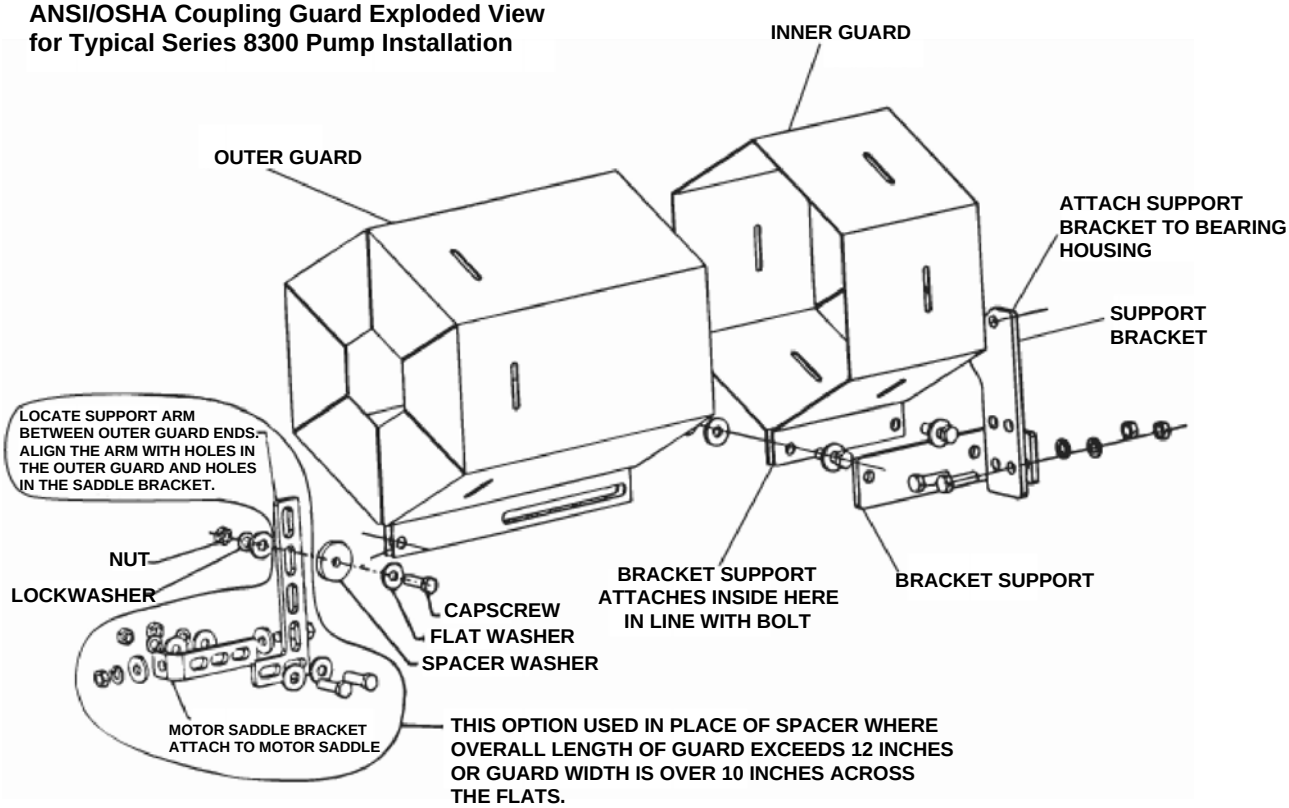


Figure 6: ANSI/OSHA Coupling Guard

Alignment Method 1

Straight Edge Alignment for Standard Sleeve Type Coupler with Black Rubber Insert

See Figure 7.

Before aligning the coupler, make sure there is at least 1/8 inch end clearance between the sleeve and the two coupler halves.

1. Check angular misalignment using a micrometer or caliper. Measure from the outside of one flange to the outside of the opposite flange at four points 90° apart. DO NOT ROTATE COUPLER. Misalignment up to 1/64 inch per inch of coupler radius is permissible.
2. At four points 90° apart (DO NOT ROTATE COUPLER), measure the parallel coupler misalignment by laying a straight edge across one coupler half and measuring the gap between the straight edge and opposite coupler half. Up to a 1/64 inch gap is permissible.

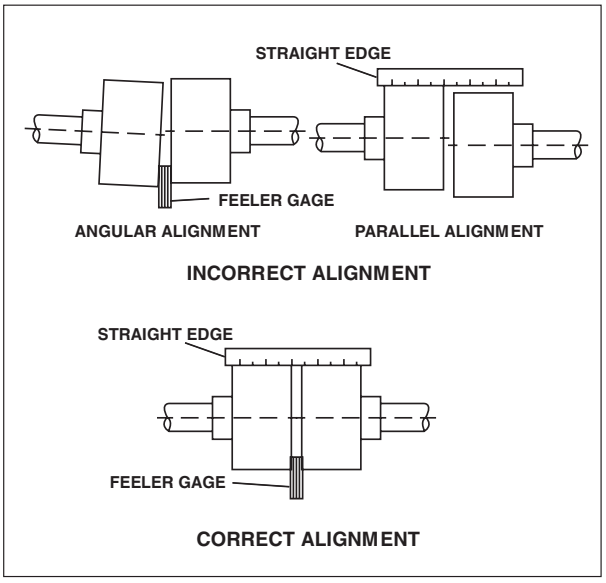


Figure 7: Checking Alignment (Method 1)

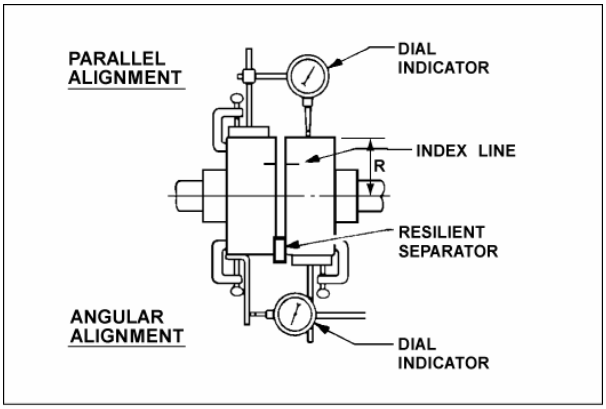


Figure 8: Checking Alignment (Method 2)

Alignment Method 2

For Orange Hytrel Inserts, 3500 RPM Operation, or All Other Coupler Types

See Figure 8.

a. Make sure each hub is secured to its respective shaft and that all connecting and/or spacing elements are removed at this time.

b. The gap between the coupling hubs is set by the manufacturer before the units are shipped. However, this dimension should be checked. Refer to the coupling manufacturer's specifications supplied with the unit.

c. Scribe index lines on coupling halves as shown in Figure 8.

d. Mount dial indicator on one hub as shown for parallel alignment. Set dial to zero.

e. Turn both coupling halves so that index lines remain matched. Observe dial reading to see whether driver needs adjustment. See paragraph i below.

f. Mount dial indicator on one hub as shown for angular alignment. Set dial to zero.

g. Turn both coupling halves so that index lines remain matched. Observe dial reading to see whether driver needs adjustment. See paragraph i below.

h. Assemble coupling. Tighten all bolts and set screw(s). It may be necessary to repeat steps c through f for a final check.

i. For single element couplings, a satisfactory parallel misalignment is .004"

T.I.R., while a satisfactory angular misalignment is .004" T.I.R. per inch of radius R. See Figure 8.

Final Alignment

Final alignment cannot be accomplished until the pump has been operated initially for a sufficient length of time to attain operating temperature. When normal operating temperature has been attained, secure the pump to re-check alignment and compensate for temperature accordingly. See the section entitled Alignment Procedure.

⚠ WARNING: Rotating Components Hazard

Do not operate pump without all guards in place.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

OPTIONAL Alignment Procedure

If desired, the pump and motor feet can be doweled to the base after final alignment is complete. This should not be done until the unit has been run for a sufficient length of time and alignment is within the tolerance. See the section entitled Doweling.

⚠ CAUTION: Extreme Temperature and/or Flying Debris Hazard

Eye protection and gloves required.

Failure to follow these instructions could result in property damage and/or moderate personal injury.

NOTE: Pump may have been doweled to base at factory.

DOWELING

Dowel the pump and driving unit as follows:

a. Drill holes through diagonally opposite feet and into the base. Holes must be of a diameter 1/64 inch less than the diameter of the dowel pins. Clean out the chips.

b. Ream the holes in feet and base to the proper diameter for the pins (light push fit). Clean out the chips.

c. Insert pins to be approximately flush with feet.

SUCTION AND DISCHARGE PIPING

When installing the pump piping, be sure to observe the following precautions:

Piping should always be run to the pump.

Do not move pump to pipe. This could make final alignment impossible.

Both the suction and discharge piping should be supported independently near the pump and properly aligned, so that no strain is transmitted to the pump when the flange bolts are tightened. Use pipe hangers or other supports at necessary intervals to provide support. When expansion joints are used in the piping system, they must be installed beyond the piping supports closest to the pump. Tie bolts should be used with expansion joints to prevent pipe strain. Do not install expansion joints next to the pump or in any way that would cause a strain on the pump resulting from system pressure changes. It is usually advisable to increase the size of both suction and discharge pipes at the pump connections to decrease the loss of head from friction.

Install piping as straight as possible, avoiding unnecessary bends. Where necessary, use 45-degree or long sweep 90-degree fitting to decrease friction losses.

Make sure that all piping joints are air-tight.

Where flanged joints are used, assure that inside diameters match properly.

Remove burrs and sharp edges when making up joints.

Do not “spring” piping when making any connections.

Provide for pipe expansion when hot fluids are to be pumped.

Suction Piping

When installing the suction piping, observe the following precautions. See Figure 9.

The sizing and installation of the suction piping is extremely important. It must be selected and installed so that pressure losses are minimized and sufficient liquid will flow into the pump when started and operated. Many NPSH (Net Positive Suction Head) problems can be attributed directly to improper suction piping systems.

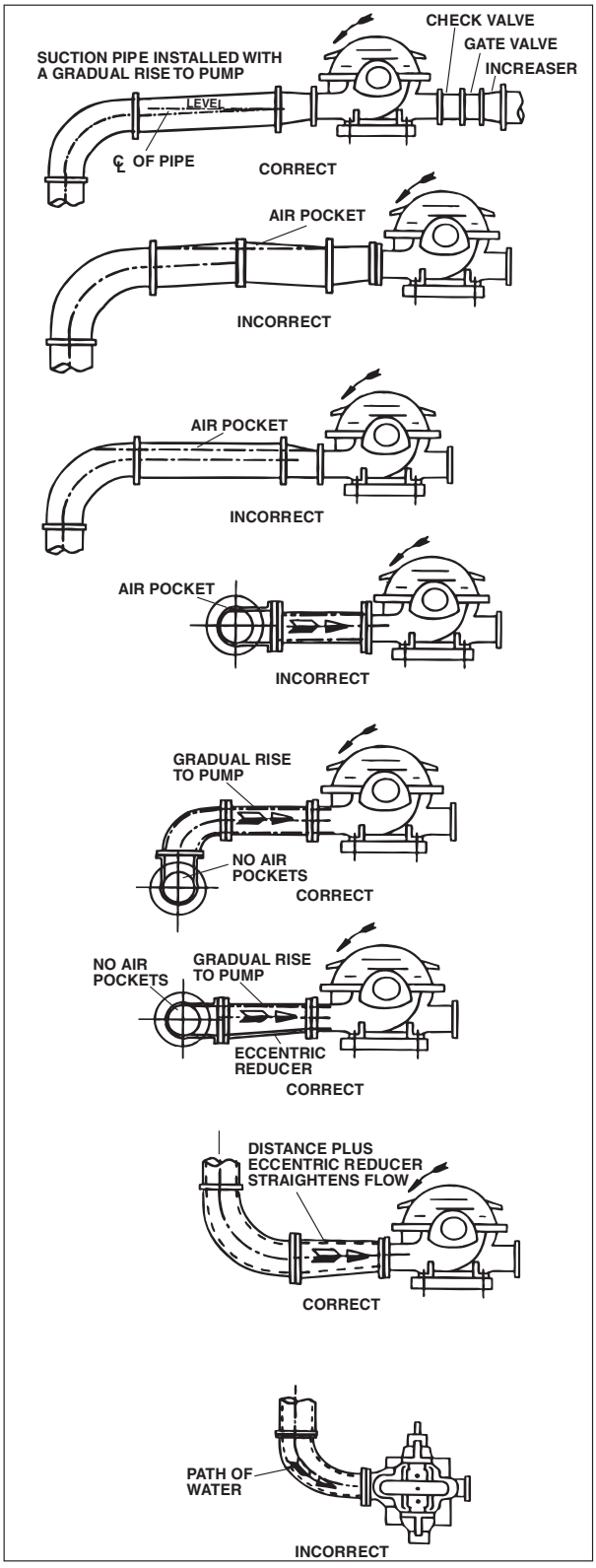


Figure 9: Suction Pipe Installations (Piping supports not shown)

Friction losses caused by undersized suction piping can increase the fluid's velocity into the pump. As recommended by the Hydraulic Institute, Standard ANSI/HI 1.1-1.5-1994, suction pipe velocity should not exceed the velocity in the pump suction nozzle. In some situations pipe velocity may need to be further reduced to satisfy pump NPSH requirements and to control suction line losses. Pipe friction can be reduced by using pipes that are one to two sizes larger than the pump suction nozzle in order to maintain pipe velocities less than 5 feet/second.

Suction piping should be short in length, as direct as possible, and never smaller in diameter than the pump suction opening. If the suction pipe is short, the pipe diameter can be the same size as the suction opening. If longer suction pipe is required, pipes should be one or two sizes larger than the opening, depending on piping length.

Suction piping for horizontal double suction pumps should not be installed with an elbow close to the suction flange of the pump, except when the suction elbow is in the vertical plane. A suction pipe of the same size as the suction nozzle, approaching at any angle other than straight up or straight down, must have the elbow located 10 pipe diameters from the suction flange of the pump. Vertical mounted pumps and other space limitations require special piping.

There is always an uneven turbulent flow around an elbow. When it is in a position other than the vertical it causes more liquid to enter one side of the impeller than the other. See Figure 10. This results in high unequalized thrust loads that will overheat the bearings and cause rapid wear, in addition to affecting hydraulic performance.

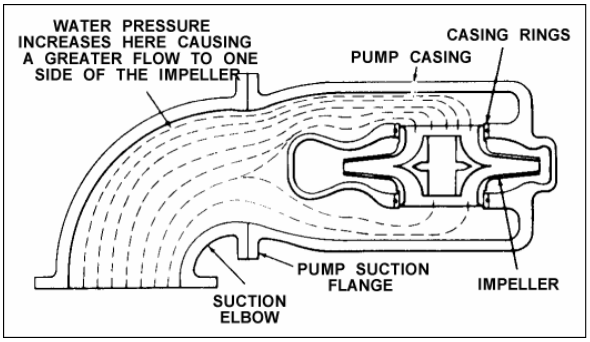


Figure 10: Unbalanced loading of a double suction impeller due to uneven flow around an elbow adjacent to the pump

When operating on a suction lift, the suction pipe should slope upward to the pump nozzle. A horizontal suction line must have a gradual rise to the pump. Any high point in the pipe will become filled with air and thus prevent proper operation on the pump. When reducing the piping to the suction opening diameter, use an eccentric reducer with the eccentric side down to avoid air pockets.

NOTE: When operating on suction lift, never use a straight taper reducer in a horizontal suction line, as it tends to form an air pocket in the top of the reducer and the pipe.

To facilitate cleaning pump liquid passage without dismantling pump, a short section of pipe (Dutchman or spool piece), so designed that it can be readily dropped out of the line, can be installed adjacent to the suction flange. With this arrangement, any matter clogging the impeller is accessible by removing the nozzle or pipe section.

Valves in Suction Piping

When installing valves in the suction piping, observe the following precautions:

a. If the pump is operating under static suction lift conditions, a foot valve may be installed in the suction line to avoid the necessity of priming each time the pump is started. This valve should be of the flapper type, rather than the multiple spring type, sized to avoid excessive friction in the suction line. (Under all other conditions, a check valve, if used, should be installed in the discharge line. See the section entitled Valves in Discharge Piping.

b. When foot valves are used, or where there are other possibilities of “water hammer,” close the discharge valve slowly before shutting down the pump.

c. Where two or more pumps are connected to the same suction line, install gate valves so that any pump can be isolated from the line. Gate valves should be installed on the suction side of all pumps with a positive suction pressure for maintenance purposes. Install gate valves with stems horizontal to avoid air pockets. Globe valves should not be used, particularly where NPSH is critical.

d. The pump must never be throttled by the use of a valve on the suction side of the pump. Suction valves should be used only to isolate the pump for maintenance purposes, and should always be installed in positions to avoid air pockets.

e. A pump drain valve should be installed in the suction piping between the isolation valve and the pump.

Discharge Piping

If the discharge piping is short, the pipe diameter can be the same as the discharge opening. If the piping is long, pipe diameter should be one or two sizes larger than the discharge opening. On long horizontal runs, it is desirable to maintain as even a grade as possible. Avoid high spots, such as loops, which will collect air and throttle the system or lead to erratic pumping.

Valves in Discharge Piping

A triple duty valve should be installed in the discharge. The triple duty valve placed on the pump protects the pump from excessive back pressure, and prevents liquid from running back through the pump in case of power failure.

Pressure Gauges

Properly sized pressure gauges should be installed in both the suction and discharge nozzles in the gauge taps, provided on request. The gauges will enable the operator to easily observe the operation of the pump, and also determine if the pump is operating in conformance with the performance curve. If cavitation, vapor binding, or other unstable operation should occur, widely fluctuating discharge pressure will be noted.

Pump Insulation

On chilled water applications most pumps are insulated. As part of this practice, the pump bearing housings should not be insulated since this would tend to trap heat inside the housing. This could lead to increased bearing temperatures and premature bearing failures.

OPERATION

PRE-START CHECKS

Before initial start of the pump, make the following inspections:

a. Check alignment between pump and motor.

b. Check all connections to motor and starting device with wiring diagram. Check voltage, phase, and frequency on motor nameplate with line circuit.

c. Check suction and discharge piping and pressure gauges for proper operation.

d. Turn rotating element by hand to assure that it rotates freely.

e. Check driver lubrication.

f. Assure that pump bearings are properly lubricated.

g. Assure that coupling is properly lubricated, if required.

h. Assure that pump is full of liquid and that all valves are properly set and operational; the discharge valve must close, and the suction valve must be open. See the section entitled. Priming.

i. Check rotation. Be sure that the drive operates in the direction indicated by the arrow on the pump casing, as serious damage can result if the pump is operated with incorrect rotation. Check rotation each time the motor leads have been disconnected.

WARNING: Rotating Components Hazard

Do not operate pump without all guards in place.

Failure to follow these instructions could result in serious personal injury or death and property damage.

CAUTION: Seal Damage Hazard

Do not run pump dry. Seal damage may occur.

Failure to follow these instructions could result in serious property damage and/or moderate personal injury.

PRIMING

If the pump is installed with a positive head on the suction, it can be primed by opening the suction and vent valve and allowing the liquid to enter the casing.

If the pump is installed with a suction lift, priming must be done by other methods such as foot valves, ejectors, or by manually filling the casing and suction line.

WARNING: Rotating Components Hazard

Do not operate pump without all guards in place.

Failure to follow these instructions could result in serious personal injury or death and property damage.

STARTING

a. Close drain valves and valve in discharge line.

b. Open fully all valves in the suction line.

c. Prime the pump.

NOTE: If the pump does not prime properly, or loses prime during start-up, it should be shutdown and the condition corrected before the procedure is repeated.

d. When the pump is operating at full speed, open the discharge valve slowly. This should be done promptly after start-up to prevent damage to pump by operating at zero flow.

OPERATING CHECKS

a. Check the pump and piping to assure that there are no leaks.

b. Check and record pressure gauge readings for future reference.

c. Check and record voltage, amperage per phase, and kW if an indicating wattmeter is available.

d. Check bearings for lubrication and temperature. Normal temperature is 180° maximum.

e. Make all pump output adjustments with the discharge line.

CAUTION: Cavitation Damage Hazard

Do not throttle the suction line to adjust the pump output.

Failure to follow these instructions could result in property damage and/or moderate personal injury.

FREEZE PROTECTION

Pumps that are shut down during freezing conditions should be protected by one of the following methods.

a. Drain the pump; remove all liquids from the casing.

b. Keep fluid moving in the pump and insulate or heat the pump to prevent freezing.

CAUTION: Bearing/Seal Damage Hazard

Do not let heated pump temperature rise above 150°F.

Failure to follow these instructions could result in property damage and/or moderate personal injury

CHANGING ROTATION

Series 8300 centrifugal pumps can be operated clockwise or counterclockwise when viewed from the coupling end of the pump. If you wish to reverse the suction and discharge nozzles, this can be accomplished with the same pump as follows:

IMPORTANT: Refer to the disassembly and assembly procedures section of this manual for proper disassembly and assembly techniques:

1. Remove the impeller from the shaft, turn it 180° and replace it on the shaft.

NOTE: The impeller can only come off from the outboard end.

2. With the rotating element out of the casing, remove the casing from the bedplate and turn 180°.

3. Set the rotating element back in the casing and reassemble the pump.

NOTE: The impeller and casing are in the same relationship to each other as they were originally. The shaft and motor are also in the same relationship to each other as they were originally.

4. Reassemble pump and realign the coupling as called for in the alignment instructions.

WARNING: Rotating Components Hazard

Do not operate pump without all guards in place.

Failure to follow these instructions could result in serious personal injury or death and property damage.

5. The rotation of the motor must be changed by switching the motor leads.

NOTE: Unless the motor rotation is reversed, the impeller will run backward.

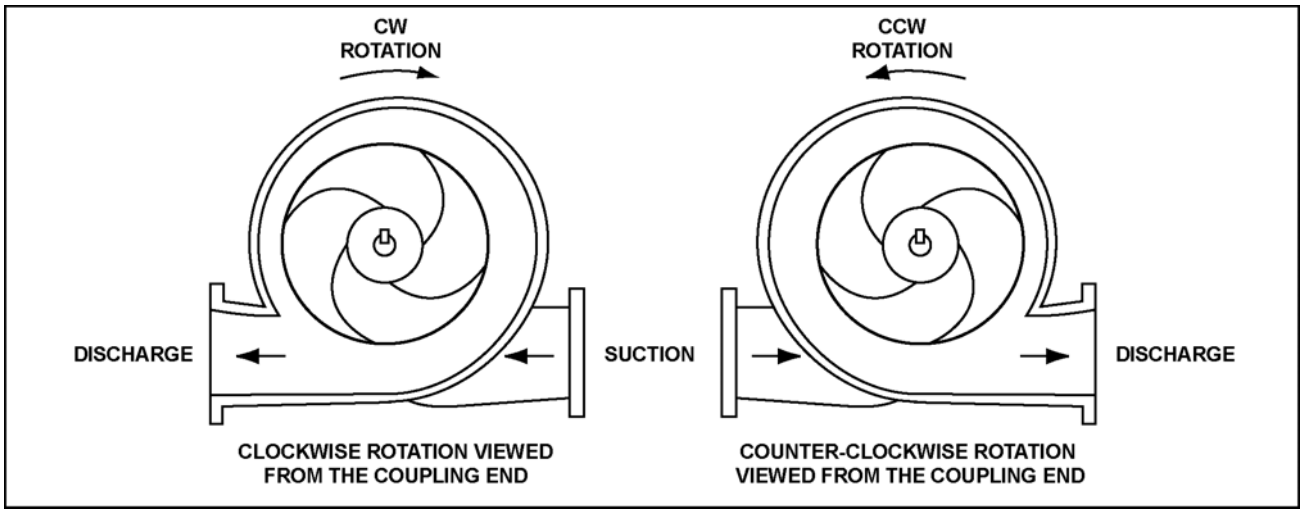


Figure 11: Correct Relationship of Impeller and Casing

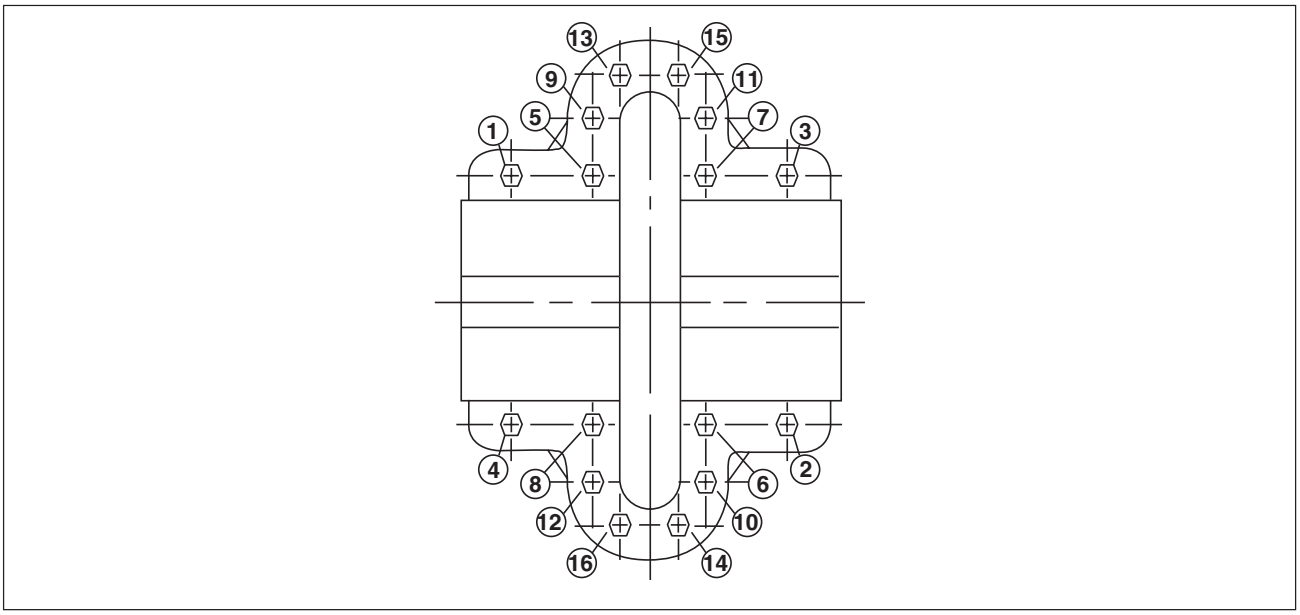


Figure 12: Main Joint Bolts

TROUBLESHOOTING

Between regular maintenance inspections, be alert for signs of motor or pump trouble. Common symptoms are listed below. Correct any trouble immediately and AVOID COSTLY REPAIR AND SHUTDOWN.

CAUSES	CURES
No Liquid Delivered	
1. Lack of prime	Fill pump and suction pipe completely with liquid.
2. Loss of prime	Check for leaks in suction pipe joints and fittings; vent casing to remove accumulated air.
3. Suction lift too high	If no obstruction at inlet, check for pipe friction losses. However, static lift may be too great. Measure with mercury column or vacuum gauge while pump operates. If static lift is too high, liquid to be pumped must be raised or pump lowered.
4. Discharge head too high	Check pipe friction losses. Large piping may correct condition. Check that valves are wide open.
5. Speed too low	Check whether motor is directly across-the-line and receiving full voltage. Or frequency may be too low; motor may have an open phase.
6. Wrong direction of rotation	Check motor rotation with directional arrow on pump casing.
7. Impeller completely plugged	Dismantle pump and clean impeller.
Not Enough Liquid Delivered	
8. Air leaks in suction piping	If liquid pumped is water or other non-explosive, and explosive gas or dust is not present, test flanges for leakage with flame or match, or by plugging inlet and putting line under pressure. A gauge will indicate a leak with a drop of pressure.
9. Speed too low	See item 5.
10. Discharge head too high	See item 4.
11. Suction lift too high	See item 3.
12. Impeller partially plugged	See item 7.
13. Cavitation; insufficient NPSH (depending on installation)	a. Increase positive suction head on pump by lowering pump. b. Sub-cool suction piping at inlet to lower entering liquid temperature. c. Pressurization suction vessel.
14. Defective impeller	Inspect impeller, bearings and shaft. Replace if damaged or vane sections badly eroded.
15. Foot valve too small or partially obstructed	Area through ports of valve should be at least as large as area of suction pipe – preferably 1-1/2 times. If strainer is used, net clear area should be 3 to 4 times area of suction pipe.
16. Suction inlet not immersed deeply enough	If inlet cannot be lowered, or if eddies through which air is sucked persist when it is lowered, chain a board to suction pipe. It will be drawn into eddies, smothering the vortex.
17. Wrong direction of rotation	Symptoms are an overloaded drive and about 1/3 rated capacity from pump. Compare the rotation of the motor with the directional arrow on the pump casing.
18. Too small impeller diameter (probable cause if none of the above)	Check with the factory to see if a larger impeller can be used; otherwise, cut the pipe losses or increase the speed, or both as needed. Be careful not to overload the driver.
19. Air leaks in suction piping	See item 8.

CAUSES	CURES
Not Enough Pressure	
20. Mechanical defects	See items 14 and 15.
21. Obstruction in liquid passages	Dismantle pump and inspect passages of impeller and casing. Remove obstruction.
22. Air or gases in liquid (Test in laboratory, reducing pressure on liquid to pressure in suction line. Watch for bubble formation.)	May be possible to overrate pump to the point where it will provide adequate pressure despite condition. Better to provide gas separation chamber on suction line near pump, and periodically exhaust accumulated gas. See item 13.
23. Too small impeller diameter (Probable cause if none above)	See item 18.
24. Speed too low	See item 5.
Pump Operates For Short Time, Then Stops	
25. Incomplete priming	Free pump, piping and valves of all air. If high points in suction line prevent this, they need correcting. See the section entitled Suction Piping.
26. Suction lift too high	See item 3.
27. Air leaks in suction piping	See item 8.
28. Air or gases in liquid	See item 22.
Pump Takes Too Much Power	
29. Head lower than rating; thereby pumping too much liquid	Machine impeller's OD to size advised by factory.
30. Cavitation	See item 13.
31. Mechanical defects.	See items 14 and 15.
32. Suction inlet not immersed enough	See item 16.
33. Liquid heavier (in either viscosity or specific gravity) than allowed for	Use larger driver. Consult factory for recommended size. Test liquid for viscosity and specific gravity.
34. Wrong direction of rotation	See item 6.
35. Casing distorted by excessive strains from suction or discharge piping	Check alignment. Examine pump for friction between impeller and casing. Replace damaged parts.
36. Shaft bent due to damage – through shipment, operation, or overhaul	Check deflection of rotor by turning on bearing journals. Total indicator run-out should not exceed 0.002" on shaft and 0.004" on impeller wearing surface.
37. Mechanical failure of critical pump parts	Check bearings and impeller for damage. Any irregularity in these parts will cause a drag on shaft.
38. Misalignment	Realign pump and driver.
39. Speed may be too high (brake hp of pump varies as the cube of the speed; therefore, any increase in speed means considerable increase in power demand.)	Check voltage on motor.
40. Electrical defects	The voltage and frequency of the electrical current may be lower than that for which the motor was built; or there may be defects in motor. The motor may not be ventilated properly due to a poor location.
41. Mechanical defects in turbine, engine or other type of drive exclusive of motor	If trouble cannot be located, consult factory.

MAINTENANCE

GENERAL MAINTENANCE

Operating conditions vary so widely that to recommend one schedule of preventative maintenance for all centrifugal pumps is not possible. Yet some sort of regular inspection must be planned and followed. We suggest a permanent record be kept of the periodic inspections and maintenance performed on your pump. This recognition of maintenance procedure will keep your pump in good working condition, and prevent costly breakdown.

One of the best rules to follow in the proper maintenance of your centrifugal pump is to keep a record of actual operating hours. Then, after a predetermined period of operation has elapsed, the pump should be given a thorough inspection. The length of this operating period will vary with different applications, and can only be determined from experience. New equipment, however, should be examined after a relatively short period of operation. The next inspection period can be lengthened somewhat. This system can be followed until a maximum period of operation is reached which should be considered the operating schedule between inspections.

MAINTENANCE OF PUMP DUE TO FLOOD DAMAGE

The servicing of centrifugal pumps after a flooded condition is a comparatively simple matter under normal conditions.

Bearings are a primary concern on pumping units. First, dismantle the bearings; clean and inspect them for any rusted or badly worn surfaces. If bearings are free from rust and wear, reassemble and relubricate them with one of the recommended pump lubricants. Depending on the length of time the pump has remained in the flooded area, it is unlikely that bearing replacement is necessary; however, in the event that rust or worn surfaces appear, it may be necessary to replace the bearings.

Next, inspect the stuffing box, and clean out any foreign matter that might clog the box. Mechanical seals should be cleaned and thoroughly flushed.

Couplings should be dismantled and thoroughly cleaned.

Any pump that is properly sealed at all joints and connected to both the suction and discharge should exclude outside liquid. Therefore, it should not be necessary to go beyond the bearings, stuffing box, and coupling when servicing the pump.

BEARING LUBRICATION – GREASE

Grease lubricated ball bearings are packed with grease at the factory and ordinarily will require no attention before starting, provided the pump has been stored in a clean, dry place prior to its first operation. The bearings should be watched the first hour or so after the pump has been started to see that they are operating properly.

The importance of proper lubrication cannot be over emphasized. It is difficult to say how often a bearing should be greased, since that depends on the conditions of operation. It is well advised to add one ounce of grease at regular intervals, but it is equally important to avoid adding too much grease. For average operating conditions, it is recommended that 1 oz. of grease be added at intervals of three to six months, and only clean grease be used. It is always best if unit can be stopped while grease is added to avoid overloading.

The grease relief plug should be removed from the outboard bearing housing before adding new grease to the bearing. The plug should then be left out until the pump is run for a minimum of 2 hours and the system has reached its normal operating temperature.

NOTE: Excess grease is the most common cause of overheating.

A lithium-based NLGI-2 grade grease should be used for lubricating bearings where the ambient temperature is above -20°F. Grease lubricated bearings are packed at the factory with Shell Alvania No. 2. Other recommended greases are Texaco Multifak No. 2 and Mobilux No. 2 grease.

Greases made from animal or vegetable oils are not recommended due to the danger of deterioration and forming of acid. Do not use graphite. Use of an ISO VG 100 mineral base oil with rust and oxidation inhibitors is recommended.

The maximum desirable operating temperature for ball bearings is 180°F. Should the temperature of the bearing frame rise above 180°F, the pump should be shut down to determine the cause.

MECHANICAL SEALS

a. Mechanical seals are precision products and should be treated with care. Use special care

when handling seals. Clean parts are essential to prevent scratching the finely lapped sealing faces. Even light scratches on these faces could result in leaky seals.

b. Normally, mechanical seals require no adjustment or maintenance, except routine replacement of worn or broken parts.

c. A mechanical seal which has been used should not be put back into service until the sealing faces have been replaced or relapped. (Relapping is generally economical only in seals two inches in size and above.)

CLEANING WITHOUT DISMANTLING PUMP

A short section of pipe, so designed that it can be readily dropped out of the line, can be installed adjacent to the suction flange. With this arrangement, any matter clogging the impeller is accessible by removing the pipe section.

If the pump cannot be freed of clogging after the above methods have been tried, dismantle the unit as previously described to locate the trouble.

SERVICE

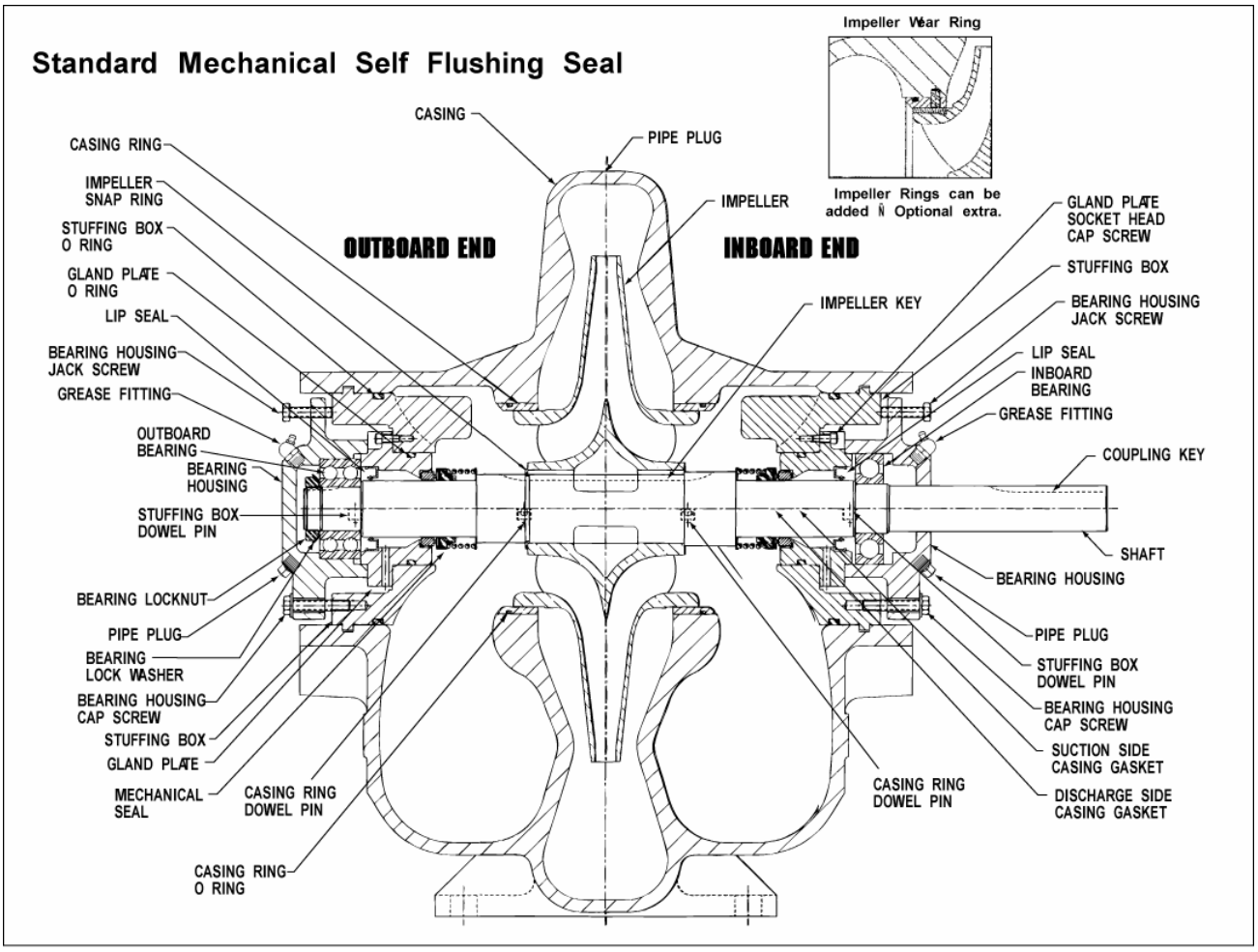


Figure 13: Mechanical View

REPLACING MECHANICAL SEALS AND BEARINGS

(without removing the upper half of the casing)

NOTE: In order to replace the mechanical seal and bearing housing on the coupler end, you *must* use a spacer type coupler.

⚠ WARNING: Unexpected Startup Hazard

Disconnect and lockout power before servicing.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

⚠ CAUTION: Extreme Temperature Hazard

Allow pump temperatures to reach acceptable levels before proceeding. Open the drain valve. Do not proceed until liquid stops coming out of the drain valve. If liquid does not stop flowing from the drain valve, isolation valves are not sealing and should be repaired before proceeding. After liquid stops flowing from drain valve, leave the valve open and continue. Remove the drain plug located on the bottom of the pump housing. Do not reinstall the plug or close the drain valve until reassembly is completed.

Failure to follow these instructions could result in moderate personal injury or property damage.

1. Close valves on suction and discharge sides of pump. If no valves have been installed, it will be necessary to drain the system.
2. Remove the coupler guard. For spacer coupler, loosen the capscrews which secure the coupler flanges to the coupler hubs. Remove the coupler flanges and sleeve by compressing the flanges and pulling out from beneath the hubs or by loosening the Allen set screws and sliding the hubs back on the shafts. Remove the coupler hubs from the pump shaft. For non-spacer couplers, loosen set screws and slide flanges back on shafts and remove rubber element.
3. Remove the capscrews from each of the bearing housings and remove the bearing housings by placing two 2.0" long full-threaded capscrews or Allen set screws in the jackscrew holes provided.
4. Bend back the lockwasher tab and remove both the lockwasher and locknut from the outboard end of the shaft (the opposite side of the coupling).
5. Remove the socket-head capscrews holding the gland plates to the stuffing boxes.
6. Insert threaded rods into the tapped holes in the gland plate and install a fixture on the threaded rods to use a puller. See Figure 14 for Dimensions of Universal Fixture (PN: AC2394). Using the puller, tighten the bolt in the center of the fixture to remove the bearing and gland plate from the shaft. See Figures 15 and 16.

⚠ CAUTION: Pump Damage Hazard

Failure to remove the socket-head capscrews before trying to pull the bearings off could cause damage to the pump.

Failure to follow these instructions could result in moderate personal injury or property damage.

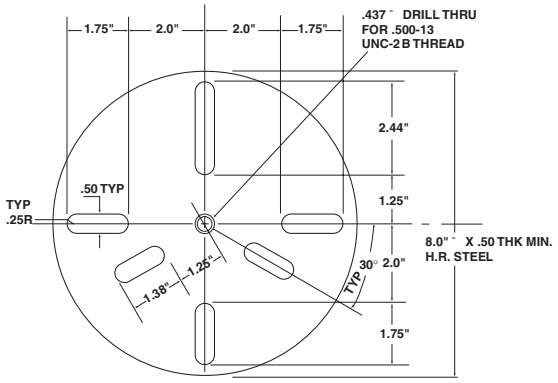


Figure 14: Dimensions for Universal Fixture (PN: AC2394)

7. Remove the inboard bearing and gland plate in the same manner.

NOTE: The locknut and lockwasher are not used on the inboard bearing.

⚠ CAUTION: Do not reuse the ball bearings

Figure 15: Removing bearing and gland plate using universal fixture

Figure 16: Gland plate and bearing removed from stuffing box

8. Remove the mechanical seal head from the pump shaft.

NOTE: To ease in the removal of the mechanical seal heads, you may want to use 2 Allen wrenches as hooks or form hooks from wire.

9. Drive the lip-seals, the mechanical seal seats, from each of the gland plates by tapping on them from the rear.

10. Remove the O-rings from each of the gland plates.

ASSEMBLING MECHANICAL SEALS AND BEARINGS

(without removing the upper half of the casing)

NOTE: All bearings, O-rings, and lip-seals should be replaced with new parts during assembly. All usable parts should be cleaned of foreign matter before reassembly.

NOTE: Reassemble the pump by starting on the outboard end (the end opposite the coupling). This end locks the rotating element into position in the casing.

1. Press the stationary mechanical seal seat into the gland plate until it bottoms out against the bore. Lightly lubricate the bore to ease assembly. See Figure 17.

Figure 17: Assembling mechanical seal seat into gland plate

2. Press a new lip seal into the gland plate. Before installing the lip seal, lubricate the lip-seal with lightweight oil.

NOTE: Lip seals should sit against machined shoulder in the gland plate. The lip seal should face away from the mechanical seal seat. See Figure 18.

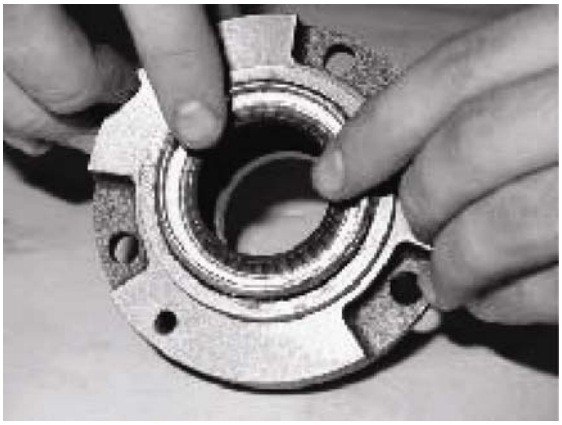


Figure 18: Assembling lip seal into the gland plate

3. Lubricate and roll the O-ring into the groove in the gland plate.

IMPORTANT: Steps 4 and 5 must be completed within 10 to 12 minutes to assure proper placement of the mechanical seals.

4. Lightly coat the outboard end of the pump shaft with P-80 Rubber Lubricant Emulsion,

vegetable oil, or equal and slide the mechanical seal head onto the shaft. Do not compress the seal spring at this time.

CAUTION

Use a flashlight and make sure the mechanical seal spring is seated properly into the spring holder and around the bellows of the mechanical seal before continuing.

5. Slide the gland plate, over the shaft, being very careful that the head and the seat of the mechanical seal do not get damaged. Then press the gland plate with the O-ring into the stuffing box and tighten the socket-head capscrews.

NOTE: Because of the compression of the O-ring, it may be difficult to press the O-ring into the stuffing box. Use longer socket-head capscrews to start the gland plate into the stuffing box. Draw-up the bolts evenly until the gland plate is secure in the stuffing box. To prevent the mechanical seal spring from pushing the gland plate back out of the stuffing box, remove one long socket-head capscrew at a time and replace with a regular sockethead capscrew.

6. Heat the ball bearings using dry heat or 10% – 15% soluble oil and water, or an induction heater.

CAUTION: Do not exceed a temperature of 275°F.

7. Fill up the lip seal cavity with approximately .50 ounces of grease.

8. Using gloves, slide the heated bearing onto the shaft against the shaft shoulder. See Figure 19.

Figure 19: Installing Bearing

9. Install the locknut and lockwasher on the outboard end of the shaft. Make certain that the locknut is secure and bend over the tabs on the lockwasher. See Figure 20.

10. Allow the bearing to cool to room temperature. Coat the exposed sides of the bearing with two or three ounces of recommended grease. Drive as much grease as possible into the bearing using a putty knife or similar tool.

11. Remove the grease relief plug; coat the inside of the bearing housing with grease, and then slide the housing into place over the bearing. Alternately tighten the bearing housing capscrews so as not to “cock” the bearing housing causing bearing to bind. Leave the grease relief plug out of the outboard housing until the pump is run for a minimum of two hours and the system has reached its normal operating temperature.

NOTE: A locknut and lockwasher are not installed on the inboard end of the pump shaft. It is acceptable to leave the grease relief plug installed on the inboard side for Step 11.

12. Repeat steps 1 through 11 for the inboard.

13. Reinstall the coupler, check for alignment, and install the coupler guard. See the sections entitled Alignment Procedure and ANSI/OSHA Coupler Guard Removal/Installation.

Figure 20: Installing Lockwasher and Locknut

DISMANTLING THE PUMP

(when removing the rotating element of the pump is required)

⚠ WARNING: Unexpected Startup Hazard

Disconnect and lockout power before servicing.

Failure to follow these instructions could result in serious personal injury or death, or property damage.

⚠ CAUTION: Extreme Temperature Hazard

Allow pump temperatures to reach acceptable levels before proceeding. Open the drain valve. Do not proceed until liquid stops coming out of the drain valve. If liquid does not stop flowing from the drain valve, isolation valves are not sealing and should be repaired before proceeding. After liquid stops flowing from drain valve, leave the valve open and continue. Remove the drain plug located on the bottom of the pump housing. Do not reinstall the plug or close the drain valve until reassembly is completed.

Failure to follow these instructions could result in moderate personal injury or property damage.

1. Close valves on suction and discharge sides of pump. If no valves have been installed, it will be necessary to drain the system.
2. Remove the coupler guard. For spacer couplers, loosen the capscrews which secure the coupler flanges to the coupler hubs. Remove the coupler flanges and sleeve by compressing the flanges and pulling out from beneath the hubs or by loosening the Allen set screws and sliding the hubs back on the shafts. Remove the coupler hub from the pump shaft. For non-spacer couplers, loosen Allen set screws and slide flanges back on shafts and remove rubber element.
3. Remove all casing main joint capscrews and dowel pins.
4. Tighten the jacking screws in the upper half of the casing to separate the upper and lower casing halves. Then lift off the upper half of the casing.
5. Tap the stuffing boxes with a soft-headed hammer to break the seal between the stuffing box and lower casing half, and lift the rotating element out of the lower casing. Rotating element may be removed to a suitable location for repair.

NOTE: A spare rotating element can be installed at this point. See Figure 21.

6. Remove the capscrews from each of the bearing housings and remove the bearing housings by placing two capscrews in the jackscrew holes provided.
7. Bend back the lockwasher tab and remove both the lockwasher and locknut from the outboard end of the shaft (the opposite side of the coupling).
8. Remove the capscrews holding gland plate to the stuffing box.
9. Insert threaded rods into the tapped holes in the gland plate and install a fixture on the threaded rods to use as a puller. See Figure 14 for dimensions of Universal Fixture. Using the puller, tighten the bolt in the center of the fixture to remove the bearing and gland plate from the shaft. If the bearing does not come off the shaft, insert a spacer between the center bolt and the shaft, and retighten the bolt. Remove the inboard bearing and gland plate in the same manner. See Figures 15 and 16.

NOTE: The locknut and lockwasher are not used on the inboard bearing.

10. Remove the gland plates from the stuffing boxes and remove the O-rings from the stuffing boxes.

⚠ CAUTION: Do not reuse the ball bearings.

11. Remove the mechanical seal head from the pump shaft.
12. Drive the lip-seals, the mechanical seal seats, from each of the gland plates by tapping on them from the rear.
13. Remove the O-rings from each of the gland plates.
14. Remove the two casing rings from the impeller and remove the O-rings from each of the casing rings.
15. Remove the impeller-retaining ring with retaining pliers. See Figure 22. Heat the impeller hub on both ends to 350°F maximum, and pull or push the impeller from the shaft.

(Instead of heating the impeller, you may press impeller off the shaft, if press is available.)

NOTE: Press away from the coupling end.

NOTE: For impellers with replaceable rings; remove the rings, if necessary, by cutting with a cold chisel.

16. Remove the impeller key from the shaft.

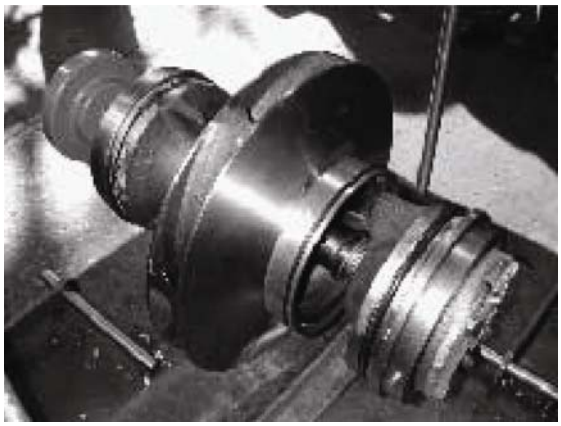


Figure 21: Rotating Element

Figure 22: Removing Impeller Retaining Ring

Figure 23: Trimming Casing Gasket

REASSEMBLING THE PUMP

(when removing the rotating element of the pump is required)

NOTE: All bearings, O-rings, lip-seals, mechanical seals, gaskets, impeller rings, and casing rings should be replaced with the new parts during assembly. All reusable parts should be cleaned of all foreign matter before reassembling. The main casing joint gasket can be made using the upper and lower half as a template. Lay the gasket material on the casing joint. Trim the gasket by lightly tapping with a ball peen hammer so that it is flush with the inside edges of the casing. See Figure 23. Do not hit casing edge with hammer hard enough to round edge.

NOTE: Precut-casing gaskets can be ordered to minimize the amount of trimming.

1. Before assembling the rotating element prepare the casing and install the casing gaskets to the parting line.
2. Clean the gasket surfaces of the casing. Apply Scotch 3M-77 spray adhesive or equivalent to the lower half of the casing.
3. Within one minute of spraying, set the untrimmed gaskets in place on the lower half of the casing, align the holes in the gaskets with the holes in the casing, and press the gaskets firmly against the lower half of the casing face in the area coated by the adhesive.
4. Trim the gaskets *flush* with the lower casing bores. See Figure 23.

⚠ CAUTION

Machined-casing bores must remain sharp at the casing parting line. Gaskets must be flush with the bore in order to contact O-rings. Leakage can result around the stuffing box O-ring if this step is not properly followed.

5. Assemble the impeller key in the shaft key slot.

NOTE: For impeller with replaceable rings, heat each new ring (approximately 300°F-400°F for bronze) and slide onto the impeller. Using gloves, hold rings against the impeller shoulder until cool.

6. Check the impeller and casing to determine the correct relationship. Heat the impeller evenly to 300°F maximum to expand the bore.

Impeller may be pressed onto the shaft instead of heating if a suitable press is available. See Figure 24.

7. Using gloves, from the outboard end, slide the impeller on the shaft against the shaft shoulder, and install the retaining ring.

8. Lubricate and roll an O-ring into the groove in each of the casing rings. Then slide the casing rings over the impeller.

9. Thoroughly clean the gland plates and stuffing boxes to prevent dirt from entering the seal during startup.

Press the stationary mechanical seal seats into both of the gland plates. Lightly lubricate the gland plates to ease assembly. See Figure 17.

IMPORTANT: Steps 11 through 21 must be completed, on the outboard end, within 10 to 12 minutes to assure proper placement of the mechanical seals

11. Press new lip seals into the gland plates. Before installing the lip seals, lubricate the lip seals with lightweight oil.

NOTE: Lip seals should sit against the machined shoulder in the gland plates. The lip seals should face away from the mechanical seal seats. See Figure 18.

12. Lubricate and roll the O-rings into the grooves in each gland plate.

13. Press the gland plates into the stuffing boxes and secure using the socket-head capscrews.

NOTE: Because of the compression of the O-ring, it may be difficult to press the O-ring into the stuffing box. Use longer socket-head capscrews to start the gland plate into the stuffing box. To prevent the mechanical seal spring from pushing the gland plate back out of the stuffing box, remove one long socket-head capscrew at a time and replace with a regular socket-head capscrew.

Figure 24: Pressing Impeller on Shaft

Figure 25: Installing Mechanical Seal Head

Figure 26: Installing Stuffing Box

14. Lubricate and roll the O-rings into the groove in each stuffing box.

NOTE: At this point reassemble the rotating element by starting on the outboard end first (the end opposite the coupling) as this end locates the settings of the mechanical seal.

15. Lightly coat the outboard end of the pump shaft with P-80 Rubber Lubricant Emulsion, vegetable oil, or equal and slide the

mechanical seal head onto the shaft. See Figure 25.

16. Slide the stuffing box, with the gland plate, fully on the shaft, being very careful that the head and seat of the mechanical seal do not get damaged. COMPRESS THE SEAL SPRING ONLY AS FAR AS REQUIRED TO INSTALL THE BEARINGS. See Figure 26.

17. Fill lip seal cavity with approximately .50 ounces of grease.

18. Heat the ball bearings using dry heat to 10% – 15% soluble oil and water, or an induction heater.

⚠ CAUTION: Do not exceed a temperature of 275°F.

19. Using gloves, slide the heated bearing onto the shaft against the shaft shoulder. See Figure 19.

20. Install the locknut and lockwasher on the outboard end of the shaft. Make certain that the locknut is secure and bend over the tabs on the lockwasher. See Figure 20.

21. Allow the bearing to cool to room temperature. Coat the exposed sides of the bearing with two or three ounces of recommended grease. Drive as much grease as possible into the bearing using a putty knife or similar tool.

22. Remove the grease relief plug; coat the inside of the bearing housing with grease and then slide the housing into place over the bearing. Attach the bearing housing to the stuffing box with the capscrews. Leave the grease relief plug out of the outboard housing until the pump is run for a minimum of two hours and the system has reached its normal operating temperature.

NOTE: A locknut and lockwasher are not installed on the inboard end of the pump shaft. It is acceptable to leave the grease relief plug installed on the inboard side for Step 22.

23. Repeat steps 15 through 22 for the inboard end.

IMPORTANT: Steps 15 through 25 and must be completed within 10 to 12 minutes to assure proper placement of the mechanical seal.

24. Reinstall the coupler on the end of the shaft.

25. Set the rotating element in the pump casing, assuring correct rotation. Locate both stuffing box tongues in their respective casing grooves. Locate the pins in the stuffing box and the casing wear rings in their respective slots at the casing parting surface. Correct any O-ring bulging. See Figure 27.

CAUTION: DO NOT CUT OR DAMAGE THE O-RINGS WHEN LOWERING THE ROTATING ELEMENT INTO POSITION. WHEN ALL FOUR ANTI-ROTATION PINS ARE LOCATED CORRECTLY, THERE WILL BE SOME CASING RING LOOSENESS.

26. Apply a small bead of Dow Corning RTV silicone sealant or equal at the parting line on top of gasket at the stuffing box O-rings. See Figure 28.

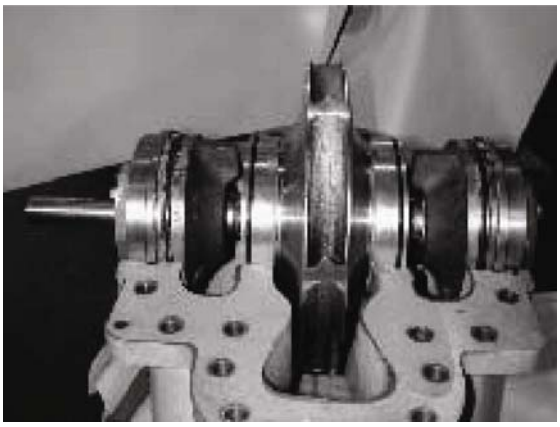


Figure 27: Rotating element inside casing

Figure 28: Adding Sealant

Figure 29: Casing Main Joint

27. Locate the upper half of the casing into place using the tapered dowel pins and install the casing main joint bolts. See Figure 29. The casing joints should be tightened to the following torques: 140 ft.-lb. minimum for 5/8"-11 hex head cap screws (Grade 5); 350ft.-lb. minimum for 7/8"-9 Ferry Cap Counterbore screws (Grade 8). Bolt torquing pattern is shown in Figure 12.

NOTE: Torque values are essential in obtaining proper gasket compression so no leakage can occur at the main joint.

28. Rotate the shaft by hand to assure that it turns smoothly and it is free from rubbing or binding.

29. Reinstall the coupler, check for alignment, and install the coupler guard. See the sections entitled Alignment Procedure and ANSI/OSHA Coupler Guard Removal/Installation.

ORDERING PARTS

The pumps covered by this manual have been designed and built with certain replaceable wearing parts. The recommended inventory of spare parts depends upon the installation and the importance of continued operation.

For critical service requiring a minimum of down-time, a complete or quick-change rotating element is recommended.

For normal service, with repairs to be made in the field, the following parts are recommended for stock.

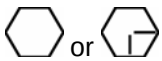
- 1 set of bearings
- 1 set of wearing rings
- 1 set of casing gaskets, O-rings and lip seals
- 2 mechanical seals (complete)

Parts should be ordered as far in advance of their use as possible since circumstances beyond the control of the company may reduce existing stock. Not all parts are stocked and must be manufactured for each order.

To facilitate rapid handling of your order for spare parts, be sure to include the following information:

1. Serial number of the pump. (See the pump nameplate.)
2. Name of the part.
3. Quantity of each part.
4. Material desired. (Parts will be furnished in original materials unless specified as a material change. All material substitutions should be discussed with the factory.)

Table 1: Capscrew Torque

Capscrew Type	Head Marking	Capscrew Torque (Foot-Pound)								
		Capscrew Diameter								
		1/4	5/16	3/8	7/16	1/2	5/8	3/4	7/8	1
SAE Grade 2		6	13	25	38	60	120	190	210	300
Brass Stainless Steel		4	10	17	27	42	83	130	200	300
SAE Grade 5		10	20	35	60	90	180	325	525	800
SAE Grade 8		13	28	46	75	115	225	370	590	895

DEALER SERVICING

If trouble occurs that cannot be rectified, contact your local A-C Pump representative. The representative will need the following information in order to provide assistance:

1. Complete nameplate data of the pump and motor.
2. Suction and discharge pipe pressure gauge readings.
3. Ampere draw of the motor.
4. A sketch of the pumping hook-up and piping.

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