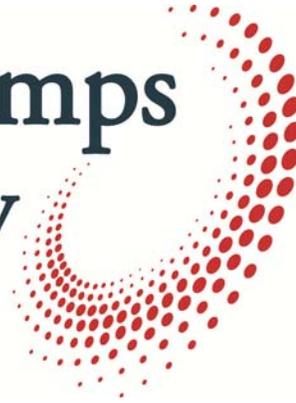


Ampco Pumps Company



Ampco XP Series

Model 420

Installation and Maintenance Manual

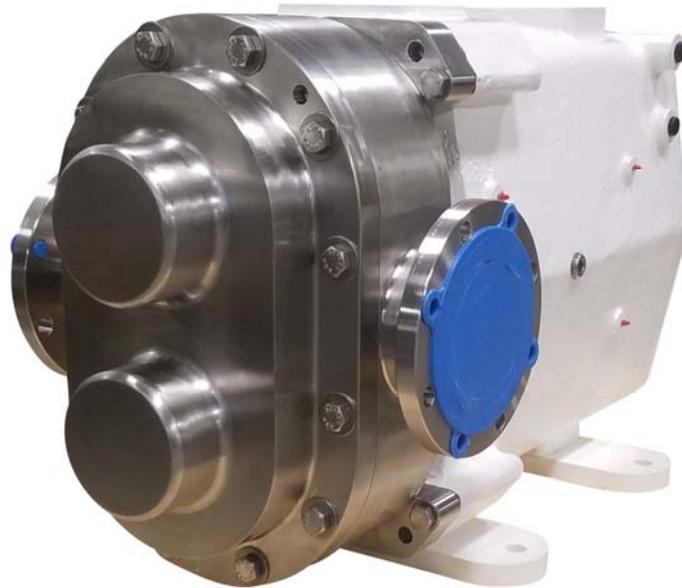


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Introduction

To ensure the best results and service, please read and fully understand this manual prior to putting this pump into service. For any questions regarding operation, maintenance, or installation, please contact your local distributor or Ampco Pumps Company:

*Ampco Pumps Company
2045 W. Mill Road
Glendale, WI 53209
Phone: (800) 737-8671 or (414) 643-1852
Fax: (414) 643-4452
Email: ampcocs@ampcopumps.com*

General Information

Each Ampco XP pump is fully assembled, lubricated, and tested at the factory and shipped ready for use. Standard maintenance practices are outlined in this manual. For more information, please refer to the Maintenance section. Following these guidelines will provide long-lasting, trouble-free service when the pump(s) is incorporated in a properly designed system.

Shipping Damage or Loss

Upon receiving equipment that is damaged or if your shipment is lost in transit, immediately file a claim with the carrier. At time of pick-up, the carrier signed the bill of lading, acknowledging that they have received the product from Ampco in good condition.

Pump Receiving

Ampco covers the pump inlet and discharge ports prior to shipping, ensuring that foreign matter does not enter the pump during shipment. If the protective covers are missing upon arrival, remove the pump cover and inspect to ensure it is free from contaminate before turning the shafts. Please make note of the pump serial number; this will assist in the process of ordering replacement parts and/or a warranty claim. For more information regarding shipment damage or warranty, please refer to Terms and Conditions.

Safety

IMPORTANT: Read and understand this manual **BEFORE** installation, operation or maintenance of the pump. Improper installation, operation, or maintenance may result in severe injury or death. Equipment damage caused by user neglect will invalidate the pump warranty.

There are safety symbols used throughout this manual identifying safety concerns.



WARNING: Hazards or unsafe practices that COULD result in severe personal injury or death, and how to avoid them.

CAUTION: Hazards or unsafe practices that COULD result in minor personal injury or damage to product or property.

Pump Information

The XP 420 provides accurate high-volume pumping capabilities. The XP 420 pumps over 1.5 gallons per revolution.

Sanitary Features

- ◆ No Dead zones in the pump
- ◆ Vertical or horizontal mounting capabilities.
- ◆ 316L stainless steel body standard
- ◆ Aseptic version available
- ◆ Alloy 88 rotors standard for the tightest clearance and highest efficiencies available
- ◆ Single or double mechanical seals offered

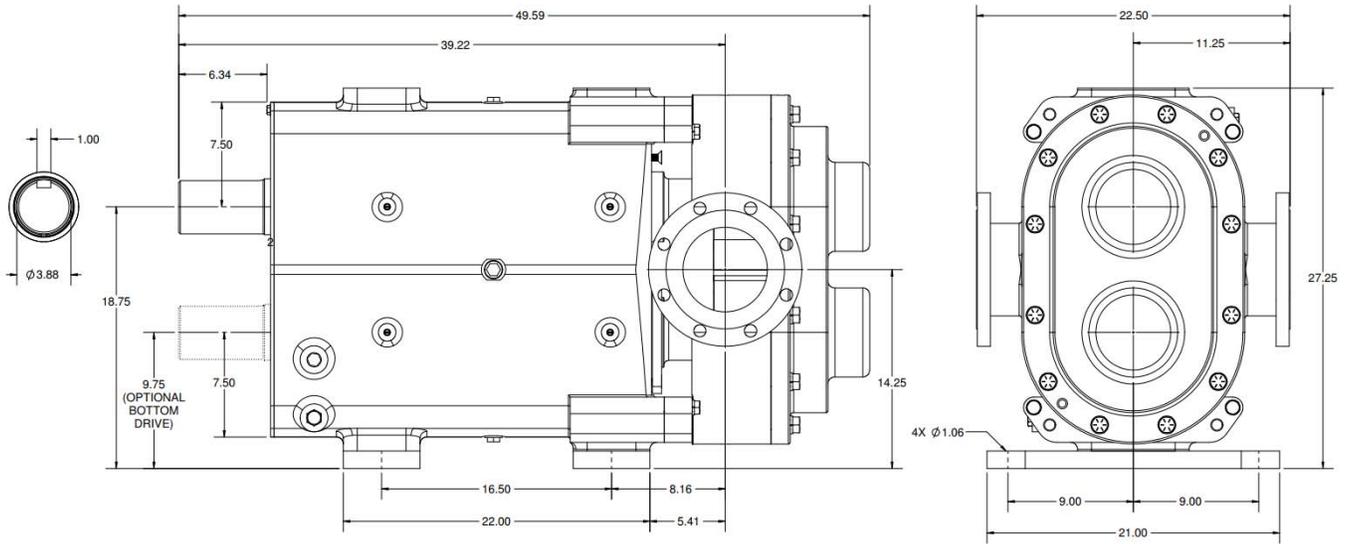
Durability

- ◆ Durable 1 piece shaft design for unmatched strength and stability.
- ◆ Cast iron gearcase
- ◆ Tapered roller bearings for improved efficiency and longer seal life.
- ◆ No bearing in product zone - capable of difficult duty conditions.
- ◆ Higher flow than standard high-volume positive displacement pumps.
- ◆ Pressures up to 200 psi (13.7 bar).
- ◆ Multiple seal options, assuring application flexibility.
- ◆ Alloy 88 non-galling rotors for the best efficiency and tightest tolerances available today.
- ◆ Seal options; Carbon / Ceramic / Silicon Carbide

Additional Features

- ◆ Bi-directional.
- ◆ 4-way gearcase mounting, vertical port alignment, stainless inspection ports.
- ◆ Optional rotor styles are available—contact factory for options.
- ◆ Simplified shaft height adjustments with external shimming; reduced maintenance downtime.
- ◆ Upper or lower shaft options available
- ◆ Manufactured in a state of the art factory in Glendale, WI

Pump Information



Model	Maximum Nominal Capacity		Displacement		Maximum Differential Pressure		Temperature Range		Standard Connection Size		Optional Connection Size		Maximum Speed
	GPM	M ³ /hr	Gal. / 100 rev	Liters / rev	PSI	Bar	° F	° C	in.	mm	in.	mm	Rev/min
XP 420	650	147	162	613	200	14	-40°/ 300°	-40°/ 149°	6"	152	-	-	400

Label Information



WARNING: Labels are installed on the pump at the factory to ensure proper warning to users. Do not remove these labels; doing so may result in injury.

The pump is installed with simple, but effective labels to help the customer better understand the XP pump. An identification plate is applied at the factory to help track the life of the pump. The customer should be aware of the pump's serial number and model number prior to contacting Ampco Pumps with any concerns. These labels can be seen below in Figure 3:

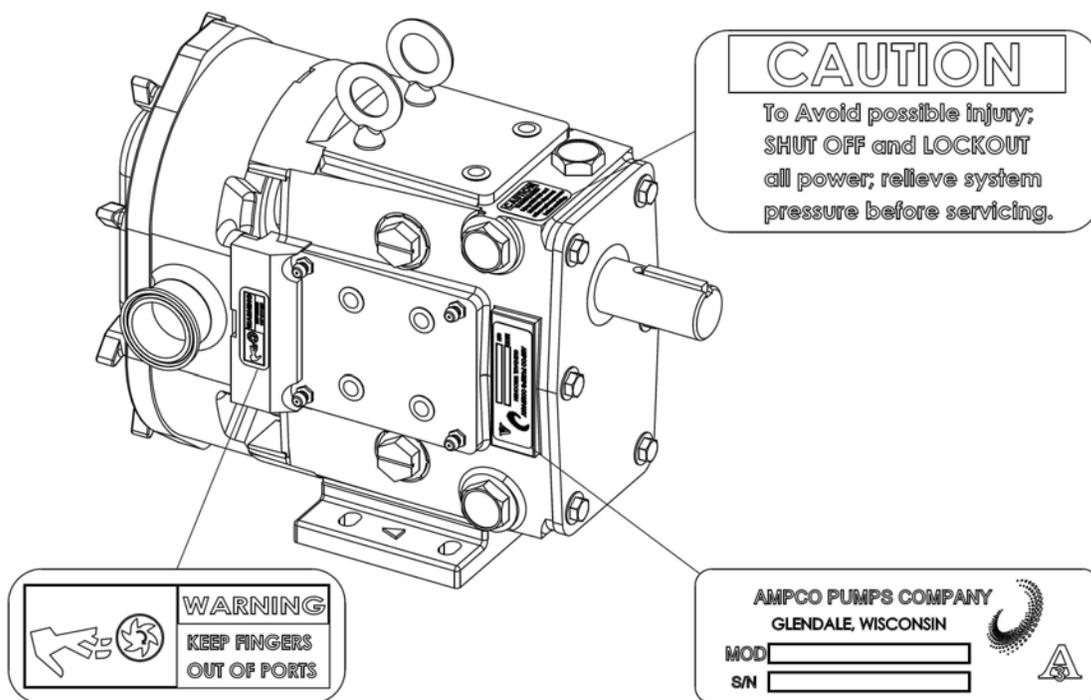


Figure 3: Important Label Information

Installation

Follow local codes and restrictions when installing the pump and piping system. The practices outlined in this manual are intended to ensure the most optimal performance of the pump.

Base Arrangement

The standard installation arrangement for a pump of this type consists of both the pump and drive unit mounted on the same base plate. Typical base plate arrangements consist of permanently fixed bases, bases with leveling and/or vibration isolation pads, bases with attached adjustable legs, or portable/wheeled bases. All base arrangements must be level during operation. Standard base configurations (base, pump, coupling, coupling guard, gear reducer, and motor) can be seen below in Figure 4.

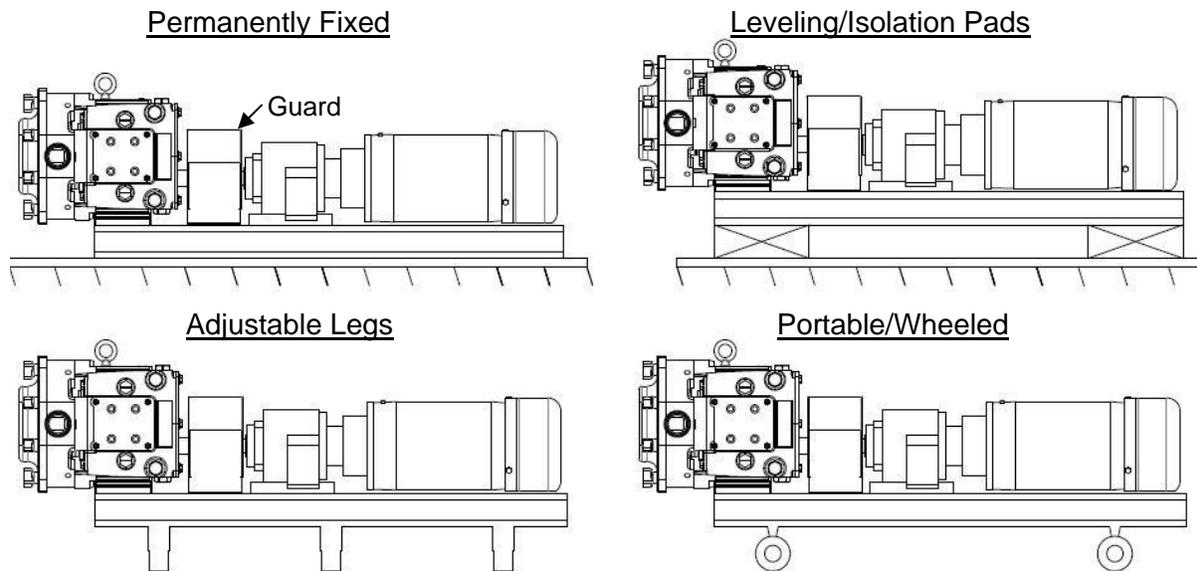


Figure 4: Base Layout Examples



WARNING: To ensure safety, protective guards must be properly installed over all external rotating parts and components. Failure to do so may result in injury. Ampco Pumps provides protective guards for complete base packages (pump and drive unit).

Piping and Connections

It is important to minimize forces imposed on the pump. This can be done by independently supporting the piping going to and from the pump. Excessive force applied to the pump can cause misalignment of internal parts which leads to the premature wear of rotors, bearings, and shafts. The use of hangers and pedestals on connecting pipes will help avoid such misalignment. Examples of such supports can be seen in Figure 5.

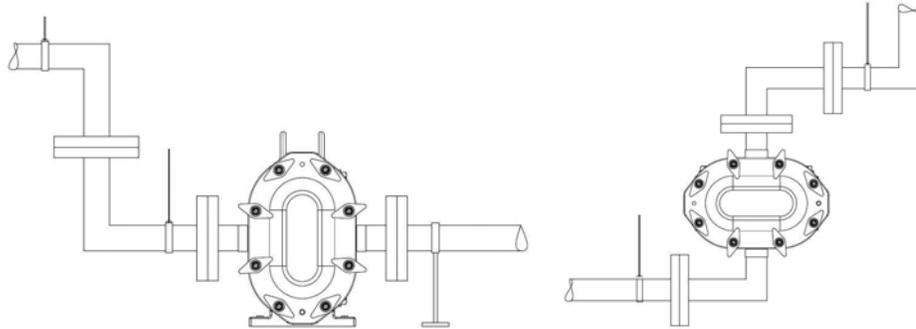


Figure 5: Piping Support Example

It is not recommended to weld custom fittings outside the factory. Shrinkage and warpage can occur to the pump housing which will affect the life and performance of the pump.

To prevent air pockets from entering the pump from the inlet, install the pump below the supply (Figure 6). This will create a constant supply of product on the suction side, and reduce the chance for air to enter the pump. Sloping the piping on the inlet side away from the pump will prevent air pockets if the pump is installed above the supply (Figure 7).

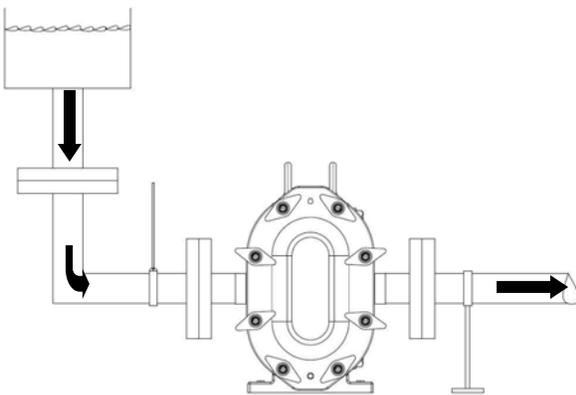


Figure 6: Correct Piping (Supply Above)

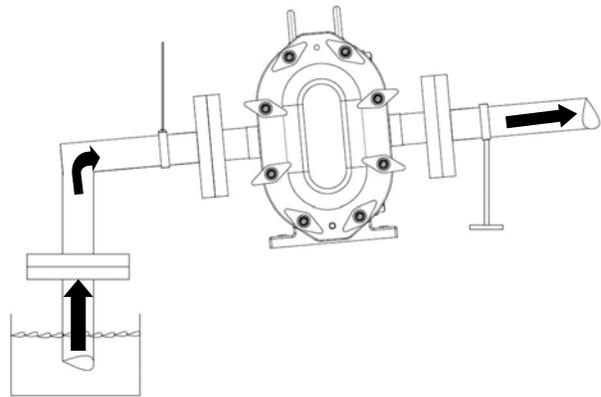


Figure 7: Correct Piping (Supply Below)

Check/ Isolation/ Relief Valves

Check valves should be used on the inlet side for any application when the product is lifted (Figure 8). This is to ensure a full inlet and is especially important with low-viscosity fluids. If the system has liquid under a vacuum, such as closed tank applications, it is important to have a check valve on the discharge side to prevent backflow during initial start-up (Figure 9).

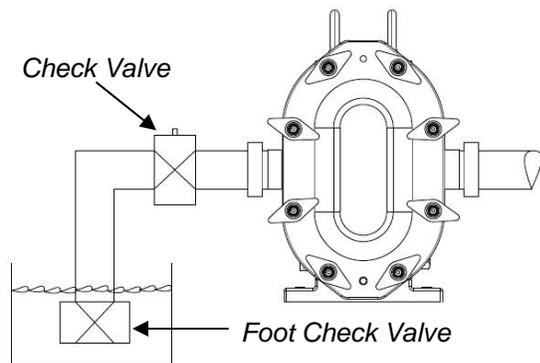


Figure 8: Check Valve (Inlet Side)

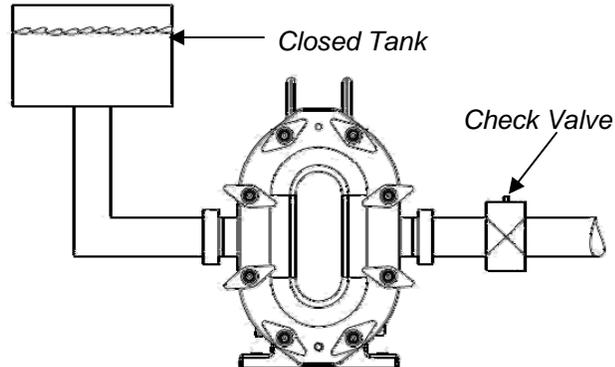


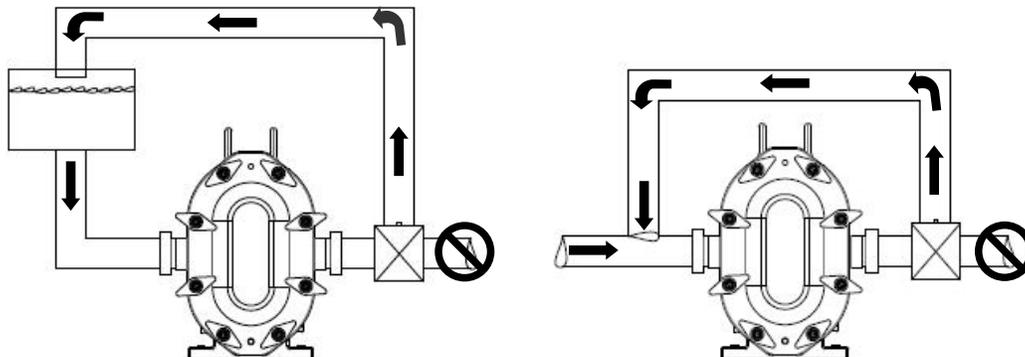
Figure 9: Check Valve (Discharge Side)

When shut down time is not possible, a bypass system may be installed with a backup pump in parallel series to allow production to continue while maintenance is performed on the down pump. Isolation valves may also be used on both the inlet and discharge sides of the pump to shut down the flow of product to the pump. This will allow for maintenance and removal of the pump without draining the entire system and risking the loss of product.



CAUTION: Ampco's XP positive displacement pumps are designed with extremely tight tolerances allowing only low slip internally between rotors and pump housing. DAMAGE will occur if the pump is operated with discharge or inlet lines closed. **DO NOT** operate pump with lines closed.

In order to prevent damage to the pump, it is recommended a relief valve be installed on the pump's discharge side. The relief valve can either divert flow into a drain or back to the inlet side (Figure 10).



10: Relief Valve Examples

Figure

Strainers and Gauges

Strainers and magnetic traps should be used to prevent foreign matter from entering the pump. It is essential to service strainers and traps regularly to prevent restriction of flow. To determine the performance of the pump, install pressure and vacuum gauges on the inlet and discharge piping (Figure 11).

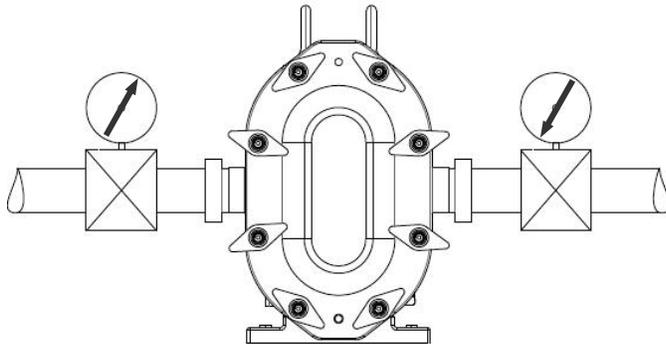


Figure 11: Proper Gauging

Proper Gauging Shows:

- Unusual pressure variations
- Indicates flow
- Changes in pump performance
- Variations in the system
- Differences in fluid viscosities

Base Alignment

Pump and base assemblies sent directly from Ampco's factory are aligned prior to shipment. Assemblies must be checked once they are installed and prior to operation. Misalignment may cause unnecessary wear and shorten the life of the pump. If couplings are not specified, Ampco will use a flexible coupling which permits minor compensation for alignment and endplay.

To check the coupling alignment, start with checking the angular alignment by measuring the gaps between the couplings on both the pump and motor side (Figure 12, Angular Alignment). Shim the assembly accordingly so the gap is equal distance at all points. Next, using a straight edge, check the horizontal and vertical alignment of the coupling. Place the straight edge along the coupling to ensure that both sides are concentric (Figure 12, Parallel Alignment).

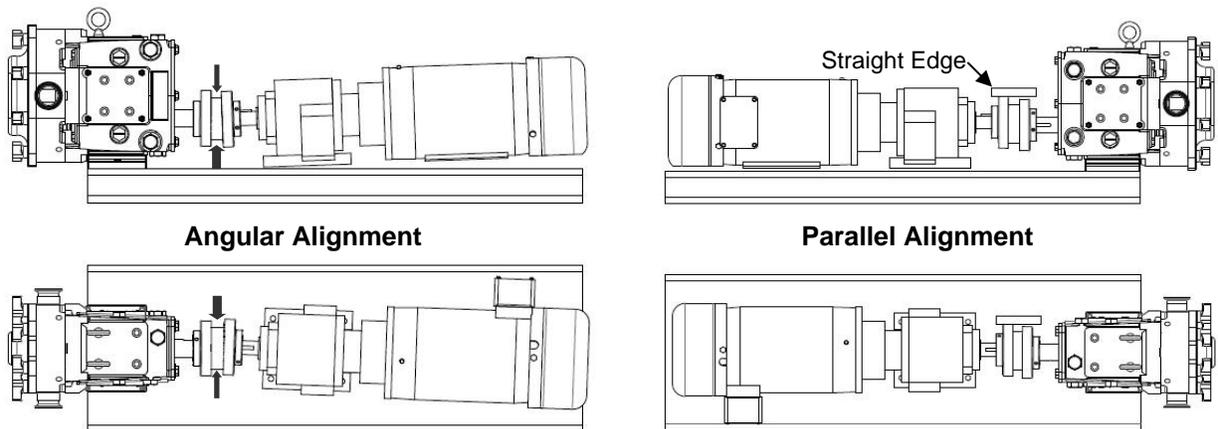


Figure 12: Check Alignment

Pump Rotation

Check the direction of rotation (both on drive unit and pump) prior to connecting the pump to the drive. This will ensure correct product flow at start-up (Figure 13 and Figure 14). Also check that the pump turns freely and is free of any foreign contaminants. Connect the pump and check to make certain all guards are in place.

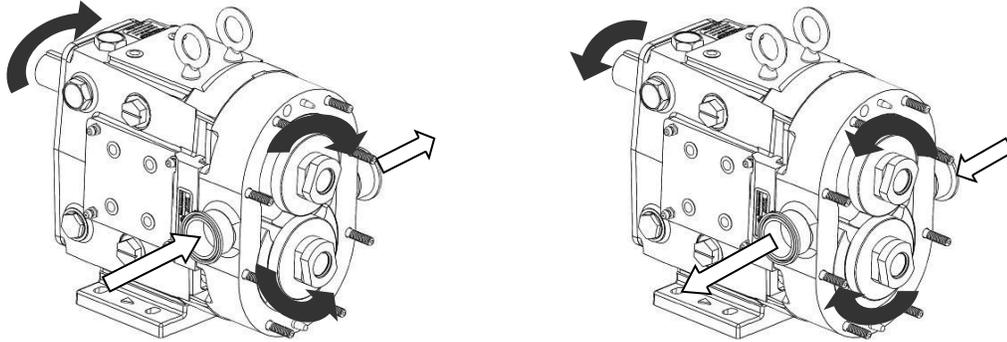


Figure 13: Top Drive Shaft

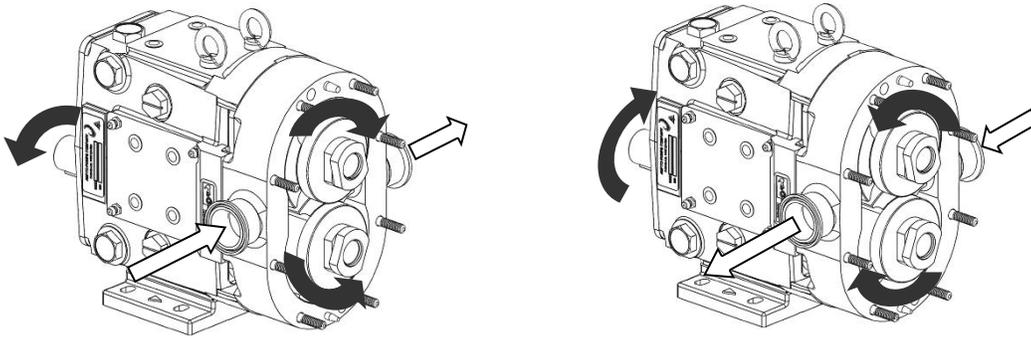


Figure 14: Bottom Drive Shaft

Final Installation

For pumps with double seals, connect seal flushing before operation. Operation of the pump without proper flushing will **damage** seal faces. Flushing connections are typically 1/8" female NPT with one side being the inlet and the other the discharge. Flush both top and bottom seals simultaneously (Figure 15). Flush flow rate should be 1/4 GPM. For high temperature applications flush flow may be increased to remove excess heat.

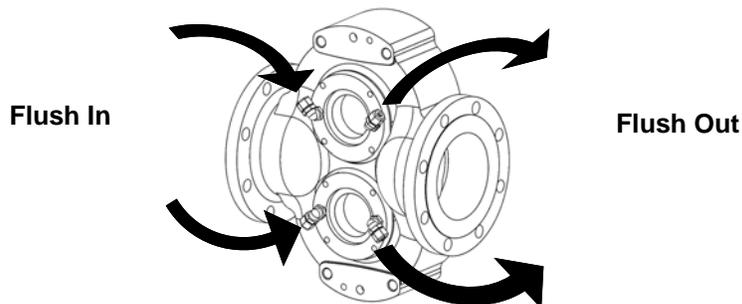


Figure 15: Proper Flushing for XP Double Seal

Maintenance

WARNING: Before attempting service on the pump or motor, DISCONNECT the energy source to the pump. This will help prevent accidental start-up and serious injury.

The Ampco XP pump is designed to be easily disassembled for cleaning and maintenance purposes. When performing maintenance on the pump it is important to inspect all wetted parts for standard wear and damage (see page 14). For rebuild information, see PD Pump Remanufacturing Program details on page 39. Prior to disconnecting pump, shut off all inlet and discharge valves, drain the pump (rinse if necessary), and turn off all electrical supply to the pump (follow standard lock out procedures).

Pump Lubrication

Proper lubrication of gears and bearings is vital to the life of the pump. For pumps assembled on bases with a gear reducer and motor, please refer to the proper manufacturer manual for lubrication requirements. These manuals are sent with the pump from the factory. Important lubrication points can be seen in Figure 16.

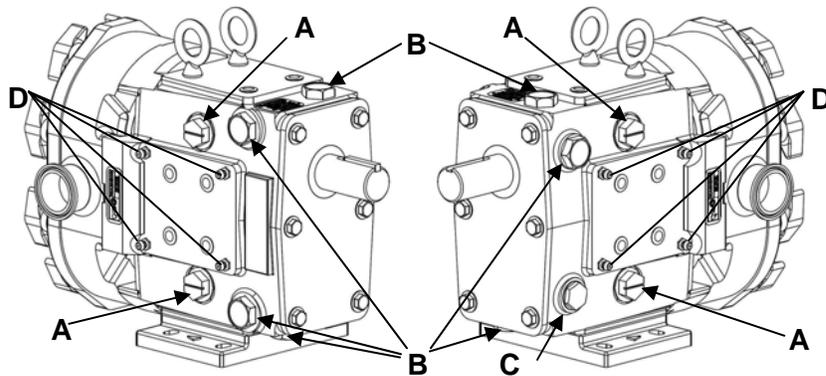


Figure 16: Lubrication Points

Both gears and bearings are shipped factory-lubricated with grease and oil. The oil used to lubricate the gears should be changed every 500 hours with the quantities shown in Table 3. The bearings should be re-greased every 250 hours. Excessive grease may build up inside the gear case and should be cleaned out through the clean-out plugs shown in Figure 16, A.

Oil Specifications:

ISO Grade 320, SAE 140 or AGMA
Number 6EP

Grease Specifications:

Halo-Guard FG-2, NSF H1 FOOD-
GRADE, NLGI Grade No. 2

*Replacement oil and grease is available from
Ampco

Pre Start Up Inspection

**BEFORE STARTING YOUR PUMP
FOLLOW THIS CHECK LIST**

Please review the following prior to operating your new XP Pump:

Be sure that the pump and piping are clear of any foreign matter.

Confirm all piping is properly connected and leak free.

Be sure the pump and drive are properly lubricated. See specifications on page 15

Secure all required guards.

Check flush; double seals require an adequate supply and flow of clean flushing fluids.

Be sure all valves are open on discharge system.

See that all valves are open on inlet side, and that fluid can reach pump, **DO NOT RUN DRY.**

Check drive rotation. (see page 12)

Start pump drive at slow speed or jog when possible.

Be sure that liquid is reaching the pump within several minutes. If pumping does not begin or have a stable flow, see trouble shooting "No Flow" or "Insufficient Flow" on page 35

GEAR & BEARING INSPECTION

Normal operation refers to 0-600 RPM and of 0-200 PSI. Temperature range with standard rotors is -40° to 200° F / with hot clearance rotors, 180° to 300° F. (For operation at higher temperatures, consult factory)

See **CHECK LIST** (page 14) and **TROUBLESHOOTING** (page 35-38) for additional operation information.

CAUTION: SHUT OFF and LOCK OUT all power; relieve system pressure before servicing.

LUBRICATION

The gears are assembled and lubricated with Magna-Plate 460FG oil per factory specifications. Be sure to check oil level if pump is mounted other than top or bottom shaft drive.

The bearings are greased with Halo-Guard FG-2 grease at the factory during assembly.

Replace oil every 500 hours. Requirements may be more frequent based on moisture and condensation conditions.

Grease bearings every 250 hours. Requirements may be more frequent based on moisture and condensation conditions.

NOTE: For extreme temperatures use appropriate lubricant as recommended in the table below.

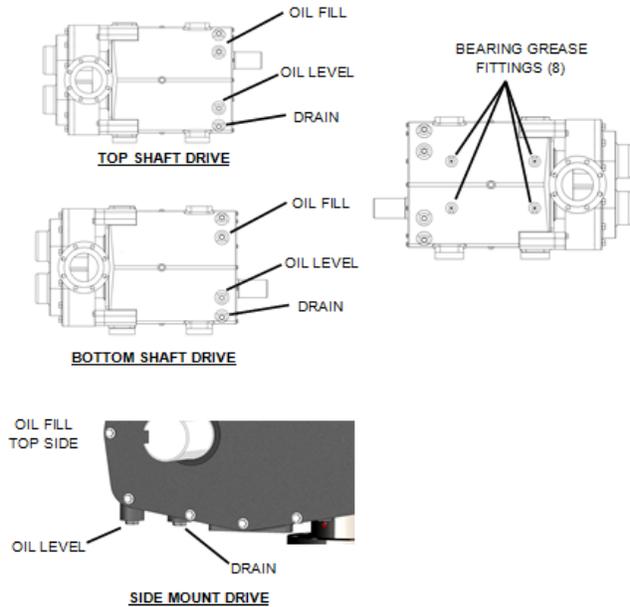
<p>OIL: SAE 140 -10° to 350° F. (-23° to 177° C.)</p>
<p>GREASE: Silicone -20° to 5° F. (-29° to 15° C.) NLGI Grade 2 (5° to 350° F. (-15° to 177° C.))</p>

CLEANING

The XP pump without CIP properties, is designed for complete disassembly for simple and thorough COP procedures.

Clean pump daily or at the end of a process. Disassemble the fluid head as recommended. Remove the cover O-ring, pump seals and rotor nuts to clean. **Inspect and replace O-rings as necessary.**

MOUNTING POSITIONS



Oil Capacity (GEARS)		
MODEL	TOP OR BOTTOM	SIDE MOUNT
420	3.0 Quart (3.4 Liter)	4.7 Quart (4.5 liter)

ALWAYS FILL TO OIL LEVEL PLUG

NOTE: Flush with solvent or disassemble fluid head and manually cleaning out of place when it is possible for material to set up when pump is not in operation.

SAFETY & TOOLS

RECOMMENDED SAFETY PRECAUTIONS:

Flush all media and cleaning solutions from the pump before any disassembly is started.
Lock out all power sources to the pump drive motor prior to beginning any work.
Close and drain all inlet and discharge piping before disconnecting piping from fluid head.

WARNING

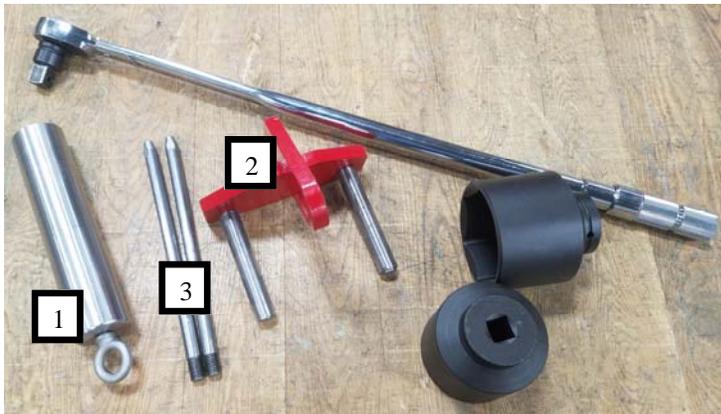
DO NOT OPERATE WITHOUT GUARD IN PLACE
APPROPRIATE LIFTING EQUIPMENT IS REQUIRED, ALL PUMP PARTS ARE EXTREMELY HEAVY
SHUT OFF AND DRAIN PRODUCT FROM PUMP PRIOR TO DISCONNECTING PIPING.

TOOLS-

Special tools are required for disassembly and reassembly of the fluid end.

XP 420 TOOL REQUIRMENTS

Item	Description	Qty
1	Shaft Extension Tool	1
2	Rotor Lifting Tool	1
3	Guide Bolts	2
4	Seal Preload Tool	1



DISASSEMBLY - FLUID HEAD COVER REMOVAL

WARNING
THE FLUID HEAD COVER WEIGHS APPROXIMATELY 200 POUNDS. LIFTING EQUIPMENT IS REQUIRED.

- 1) Using the tapped hole at the top of the cover (or at both ends if the pump is side mounted) Install eye bolt(s).
- 2) Use a hoist above the fluid head, attach it to the eye bolt(s) on the cover. Apply a light lift to the cover.
- 3) Remove the cover bolts
- 4) If desired for ease of disassembly, insert guide bolts two (2) using holes near the eye bolt locations.
- 5) To assist in removing the cover from the body install two (2) 1/2-13 bolts in the tapped holes above the cover dowel pins. Loosen the cover off the dowel pins by alternately tightening the 1/2" bolts.
- 6) While supporting the cover with the hoist remove it from the pump body.
- 7) Remove the 1/2" bolts from the cover.
- 8) Remove the guide bolts (if used).
- 9) Inspect and clean the cover, o-ring, and all bolts for signs of wear or damage. Repair or replace any damaged or worn components.



ROTOR REMOVAL PROCESS - FLUID END DISASSEMBLY

WARNING

ROTORS FOR THE 420 MODEL WEIGH APPROXIMATELY 80 POUNDS. LIFTING EQUIPMENT IS RECOMMENDED.

As described previously, remove the cover from the fluid end of the pump.

1. Use a nylon bar or block to limit rotor rotation during rotor nut removal. Be sure to use a material that will not damage the rotor surface.
2. Using a torque wrench and socket remove the outer jam nut and the inner rotor retaining nut from both
3. Use the shaft extension tool on the shaft whose rotor is to be removed. Slide the rotor out of the body onto the shaft extension.
4. Connect the rotor lifting device to a hoist and carefully remove the rotor from the extension. Follow the same procedure on the second shaft.
5. Mark all components so that all parts can be reinstalled in the same location from which they were removed.
6. Remove the drive keys from the shafts
7. Inspect and thoroughly clean all components. Check for wear or damage. Repair or replace any components showing wear.

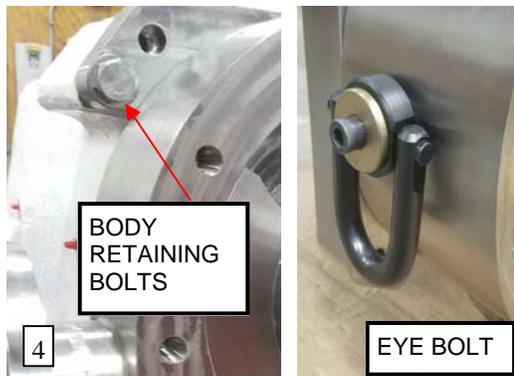
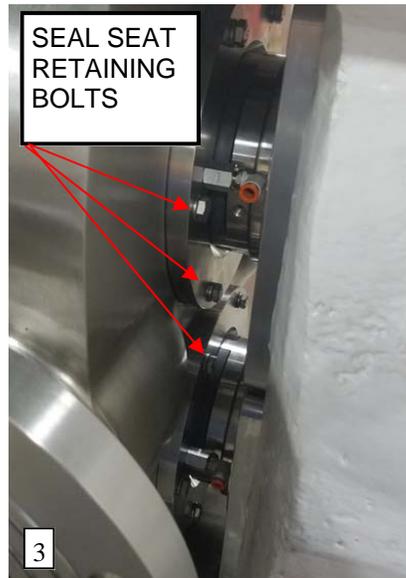


BODY REMOVAL PROCESS- FLUID HEAD DISASSEMBLY

WARNING

LIFTING EQUIPMENT IS REQUIRED, THE 420
BODY WEIGHS
APPROXIMATELY 650 POUNDS.

1. As described previously remove the fluid head cover and rotors.
2. Disconnect piping from the pump body.
3. Remove the retaining bolts from the seal seat on the back of the pump body. (12) 5/16"
4. Loosen, do not remove, the body mounting plate retaining bolts. (4) 3/4"
5. Secure the hoist to the fluid end above the pump body and apply lifting tension to the body. Two holes are tapped on top and bottom (depending on mounting position) for eye bolt installation to aid in lifting.
6. Remove the body retaining bolts and loosely install them into the tapped holes in the fluid head mounting plate. (4) 3/4"
7. Install guide bolts into the two retaining bolt holes. (2) 3/4-10 x 11"
8. If needed use the body retaining bolts to disengage the body dowel pins from the gearcase. **Use extreme caution** when sliding the body away from the shaft mounted mechanical seals.
9. Use the hoist, carefully avoiding the mechanical seals to remove the body from the gearcase.
10. Inspect components for wear or damage. Clean and repair or replace any worn parts.

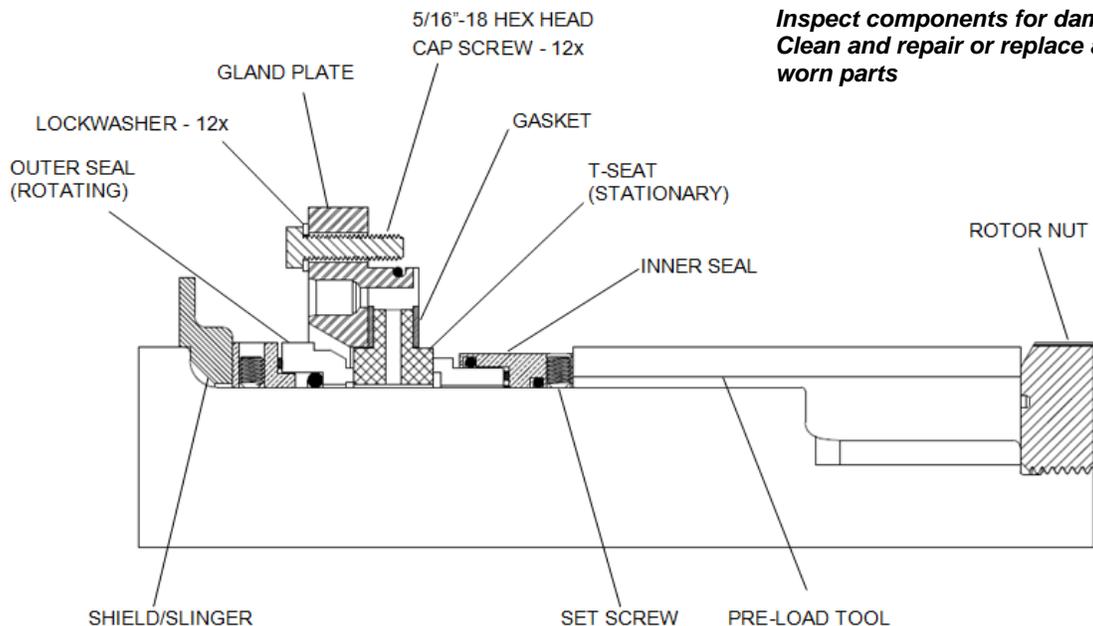


MECHANICAL SEAL REMOVAL - FLUID HEAD DISASSEMBLY

WARNING

MECHANICAL SEALS ARE VERY FRAGILE,
HANDLE WITH EXTREME CARE

1. As described previously remove the cover, rotors, and body.
 2. If not already removed, disconnect the flush tubes from the seal seat gland plate.
 3. Install the seal preload tool over the end of the shaft.
 4. Secure the preload tool by hand tightening the rotor retaining nut onto the shaft.
 5. Remove setscrews from the inner seal seat retainer.
 6. Unscrew the rotor retaining nut and remove preload tool.
 7. Remove the inner seal seat retainer.
 8. **CAUTION** - Remove any burrs caused by the setscrews to avoid causing damage to either component **before** removing the inner seal and o-ring.
 9. Remove the gland plate and T Seal.
 10. Remove the inner seal.
- For Double Mechanical Seal Only:**
11. Remove the outer seal setscrews and slide the outer seal assembly off the shaft.



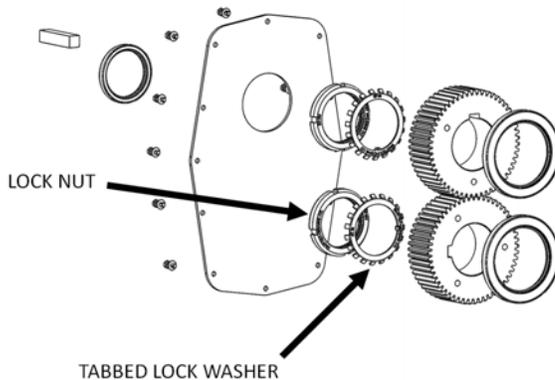
GEARCASE DISASSEMBLY

WARNING

COMPONENTS ARE VERY HEAVY, AND MAY REQUIRE SPECIAL TOOLS AND LIFTING EQUIPMENT. IT IS RECCOMENDED TO USE A PROPERLY EQUIPPED SERVICE FACILITY.

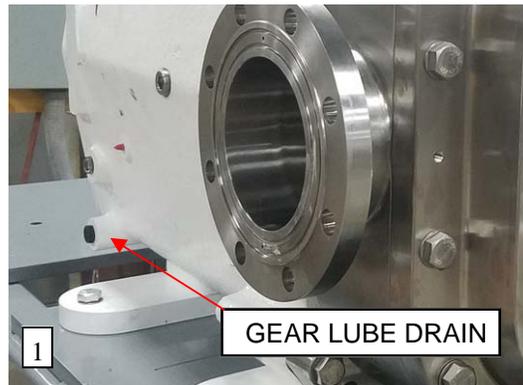
TIMING GEARS

1. Drain the lubricant from the drive end of the gearcase.
2. Remove the timing gear cover by removing the twelve (12) hex head cap screws.
3. Use a hammer and a punch to disengage the locking tabs from the locknuts.
4. The locknuts and lock washers may now be removed



NOTE- Locknuts are installed with a minimum of 600 foot-pounds of torque using spanner type socket. A shaft locking device is used to stop shaft rotation when tightening.

5. Remove the timing gears and the timing gear keys. The gears should slide off the shafts. If a gear puller is required, three tapped holes are provided in each gear for that purpose.
6. With the gears removed, install a spacer (same length as the gear width (3")) and reinstall the bearing nut. The nut needs to be only hand tight, but, fully engaged on the shaft threads. This prevents the shaft assembly from prematurely disassembling during the removal from the gearcase.



GEARCASE DISASSEMBLY BEARING REMOVAL

(Note: If the shaft is defective, the entire operation should be avoided since the bearings will be destroyed during removal)

Position gearcase with shafts facing up if possible, it is the optimal position.

BEARING RETAINER -

7. Remove the four front bearing retainer screws from each front bearing retainer, and remove the front bearing retainers.

SHAFT ASSEMBLIES -

8. Install the shaft lifting extension tool onto threaded end of the shaft. Use proper size hoist to lift. Remove the shafts from the gearcase.



WARNING

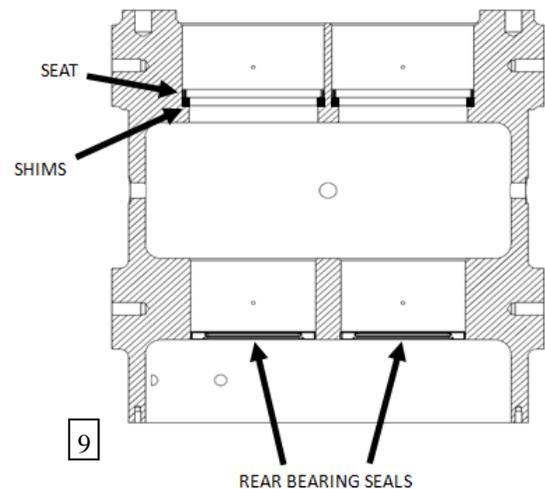
Shaft assemblies weigh more than 300 lbs

BEARING SEATS, SHIMS AND SEALS -

9. Remove the front bearing seats and shims from the front bearing bores.

10. Remove the bearing seals from the rear bearing bores of the gearcase.

11. Inspect components for wear or damage. Clean, repair or replace any worn parts.



WARNING

Bearing removal from the shafts will require a large bearing press and an experienced technician

The bearings are fitted with a .0015"/.0025" interference fit on the shaft, and must be pressed off. This is only required if the bearings are defective and the shaft is to be reused.

GEARCASE ASSEMBLY - SHAFT SUB ASSEMBLY

1. Place shaft in a fixture with the drive end facing down.
2. Heat the front and rear bearings to 200° F with bearing heater (Do not exceed 300 degrees)
3. Install front bearing on the shaft. Be sure that the bearing is fully seated against the shaft shoulder.
4. Install front bearing rear seal on the shaft. This component can be installed in either direction as it is completely symmetrical.
5. Install bearing spacer. This component can be installed in either direction as it is completely symmetrical.
6. Install rear bearing inner seal on the shaft. Be sure the turned hub on the inner seal fully engages the bearing spacer.
7. Install rear bearing (14) on the shaft.
8. Install gear spacer on the shaft.
9. Use a timing gear, seat all the components, and allow the bearings to cool.
10. Remove timing gear, install a spacer and the bearing nut. This assures that all components stay in place during assembly into the gearcase. (Multiple spacers may be used if a specific gear spacer is not available.)
11. For second shaft repeat steps 1 through 9.

GERACASE ASSEMBLY - SHAFT INSTALLATION

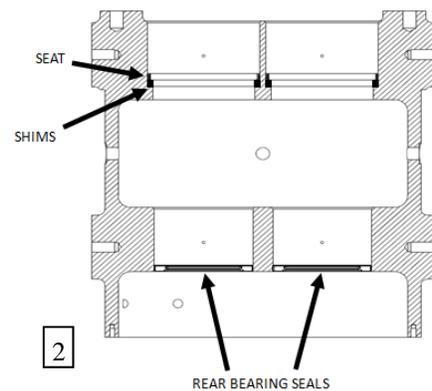
1. In a vertical orientation mount the gearcase with the fluid head surface up.
2. Install front bearing seat in each of the front bearing bores.
3. Install the shaft lifting extension tool onto threaded end of the shaft. Use proper size hoist to lift the shaft and carefully slide it into the gearcase.
4. Repeat this step for the second shaft. Locate drive shaft per the drive specifications.



5. **NOTE** - Before moving forward, critical measurements must be made to determine the need for a bearing shims.

For both shafts, measure the distance between the fluid end mounting surface and the rotor seat surface on the corresponding shaft. If both dimensions are the same no shims are required. If there is a difference, add shims to the shaft with the shortest dimension. The shim thickness is equal to the difference between the two measurements.

6. If shimming is required, it must be added at this time. Remove the appropriate shaft and the front bearing seat, and insert the required shim(s) thickness in the front bearing bore. Now, reinstall the front bearing seat and shaft assembly.



7. Repeat step 5.

**** Allowable differences between the two shafts is $\pm .001$ ”.**



GERACASE ASSEMBLY - SHAFT INSTALLATION

8. Use bearing lubricant on the shafts where the front seal is located for ease of seal installation. Add a bead of silicone sealant to the front bearing retainers and seals. Install the front bearing retainers and seals.



TIMING GEARS

9. Rotate the gearcase to expose the timing gear side and remove the temporary spacers and locknuts from the shafts.

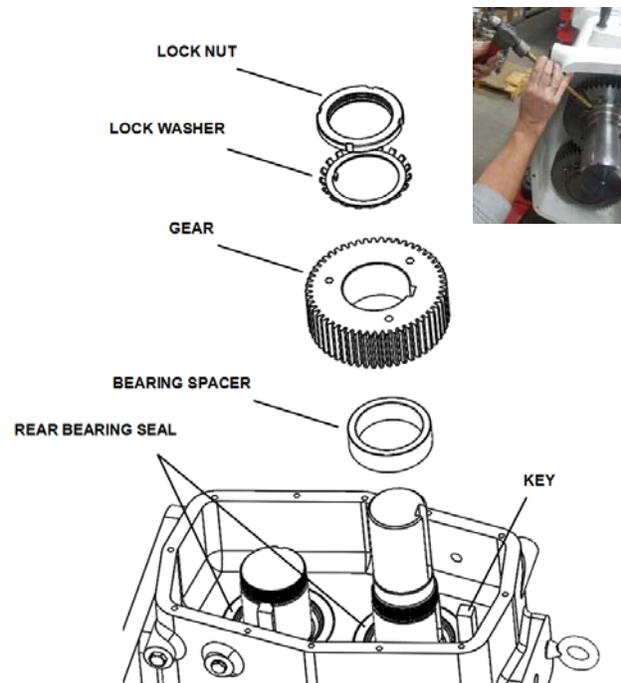
10. Install gear spacers on the shafts.

11. Install the rear bearing seals in the gearcase.

12. Install the timing gear keys on the shafts.

13. Line up and install the timing gears on the shafts.

14. Install the lock washers and locknuts on the shaft and torque the nuts to 600 ft-lbs.

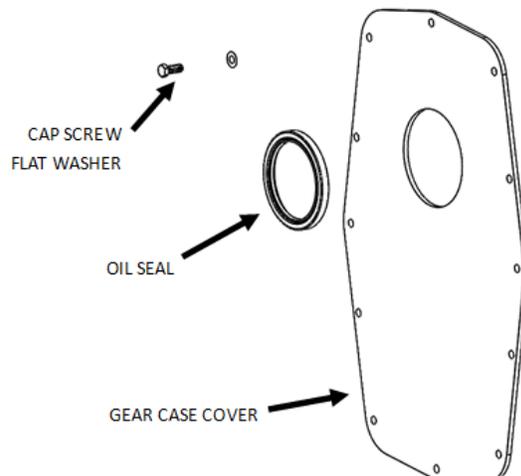


TIMING GEAR COVER

15. Install new gearcase oil seal in the timing gear cover.

16. Apply a bead of silicone to the gearcase including areas around all of the tapped cover bolt holes and install the timing gear cover.

17. Use Magna-Plate 460FG gear lubricant to refill gear housing and grease all bearings with Halo-Guard FG-2 bearing grease.



GERACASE ASSEMBLY - ROTOR TO BODY BACKFACE

The fluid head will likely need to be re-shimmed to achieve the proper rotor to body back face clearance; regardless of shafts and bearings or just shafts alone being replaced. The XP420 pumps are designed to accomplish this without removing the shafts from the gearcase. The shimming is accomplished between the body and the fluid head mounting plate.

1. Install the fluid end on the gearcase. Be sure that the mating surface of the mounting plate and the gearcase are clean and free of burrs. It is easier to install the fluid end when the shaft seals are not installed. The shaft seals do not need to be installed at this time.

2. Measure the difference in height (if any) between the rotor seat surface on the shaft and the end of the body shaft hub. The rotor seat surface on the shaft should be above the hub by .009" ±.001". Measure both of the shafts and record each.

3. If the measurement outside the parameters in step two, add or remove shims between the fluid head and the mounting plate. If the measurement is OK, then go to step 8.

4. Remove the fluid head from the gearcase.

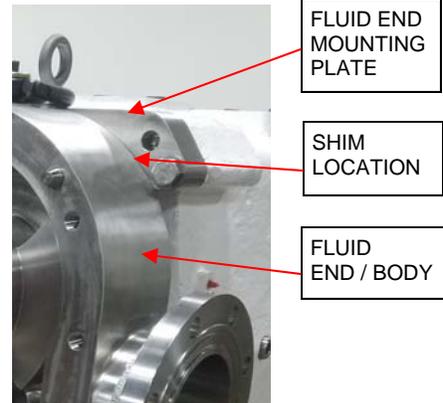
5. Remove the retaining bolts (4) from each fluid end mounting plate. Individually remove each mounting plate and add or subtract shims until the desired height is reached.

6. Now reinstall the mounting plates over the new shim stack using the socket head retaining bolts. Torque @ 70 ft-lbs.

7. Repeat steps 1,2 and 3.

8. Remove the fluid end from the gearcase.

Refer to the section on fluid head assembly for the complete the reassembly process.



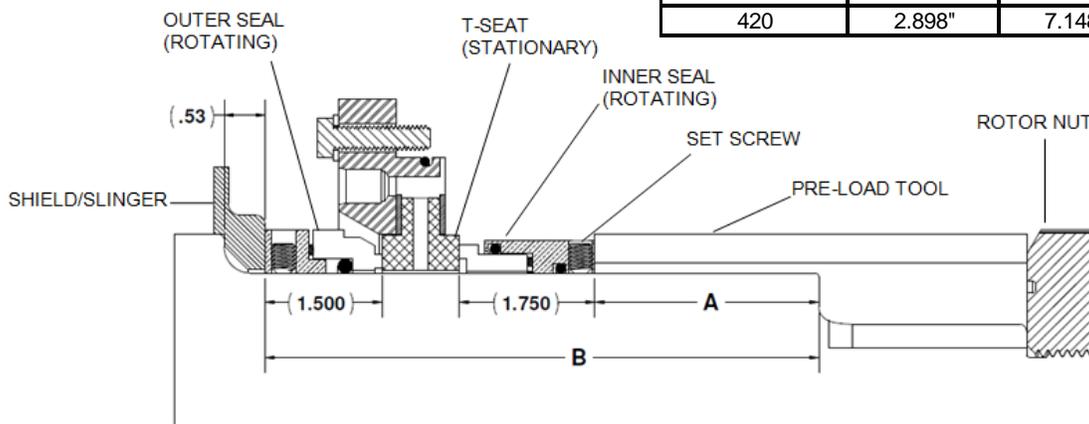
FLUID HEAD ASSEMBLY - MECHANICAL SEAL INSTALLATION

1. Install slinger onto shaft.
2. Install outer seal assembly onto the shaft. **CAUTION-** Be sure all compression springs are fully seated in the retainer when assembling the outer seal / outer seal retainer. The notches in the outer seal must properly align with the seal drive pins in the outer seal retainer.
3. The leading edge of the outer seal should be positioned .53" from the shaft shoulder. Use set screws (2) to fasten seal in place.
4. Install gland plate.
5. Install gaskets on each side of the T-seat. Use food grade lubricant on the faces on the T-seat with and install.
6. Pre-assemble the inner seal. Be sure that all springs are properly seated and that the seal face drive pins are aligned with the notches in the inner seal face. Lubricate all o-rings with food grade lubricant during the seal assembly process.
7. Install inner seal.
8. Slide the seal preload tool over the end of the shaft. Fasten the rotor retaining nut, hand tight, against the preload tool and shaft shoulder.
9. Tighten all setscrews on the inner seal seat retainer. (replace set screws each time seal is removed)
10. Remove rotor retaining nut and preload tool.



MECHANICAL SEAL

PUMP MODEL	A	B
420	2.898"	7.148"



FLUID HEAD ASSEMBLY

BODY INSTALLATION

1. Being careful not to damage the seals use the guide bolts to guide the body onto the gearcase.
2. After body installation connect the seal flush lines. Open the flush lines and establishing a flow thru the seal to test for leaks.

NOTE Omit step 2 if unit has a single mechanical seal

(Reference fluid end removal procedures beginning page 21 for additional details)



ROTOR INSTALLATION

1. Install rotors using new rotor and rotor nut elastomers/ o-rings.
2. Install rotor drive keys after the rotor is fully seated against the shaft shoulder.
3. Check shaft threads for damage or wear, apply anti-seize liberally on the retaining and jam nut threads. If nuts do not rotate easily clean or repair threads as needed.
4. Torque rotor nuts to 600 foot- pounds
5. Verify proper rotor to cover clearance. Minimum is .010"

(Reference rotor removal procedures be-



COVER INSTALLATION

1. Use food grade lubricant for cover o-ring.
2. Apply anti-seize compound to all cover bolt threads.

(Reference fluid end removal procedures beginning page 21 for additional details)



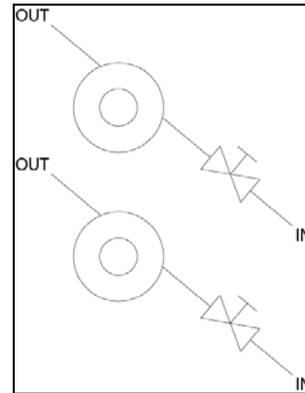
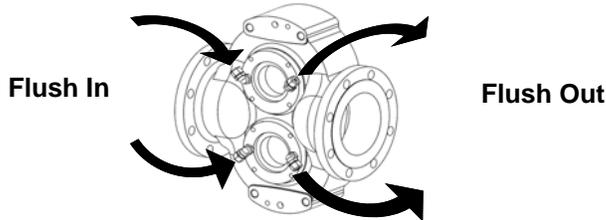
ASEPTIC MODEL – FLUSHING CONNECTIONS

Flush assembly aseptic pumps can be installed for vertical or horizontal product flow. Both cover and ports are designed to provide optimal flow regardless of pump orientation. Any unused ports must be plugged prior to putting the pump in service. (Contact factory for details)

The seal flush media can flow into either side for both shaft seals and discharge on the opposite side. Both inlets may be designed to simplify system piping. Be sure the flush media is flowing from both discharge lines. Reference local codes for specific steam piping regulations.

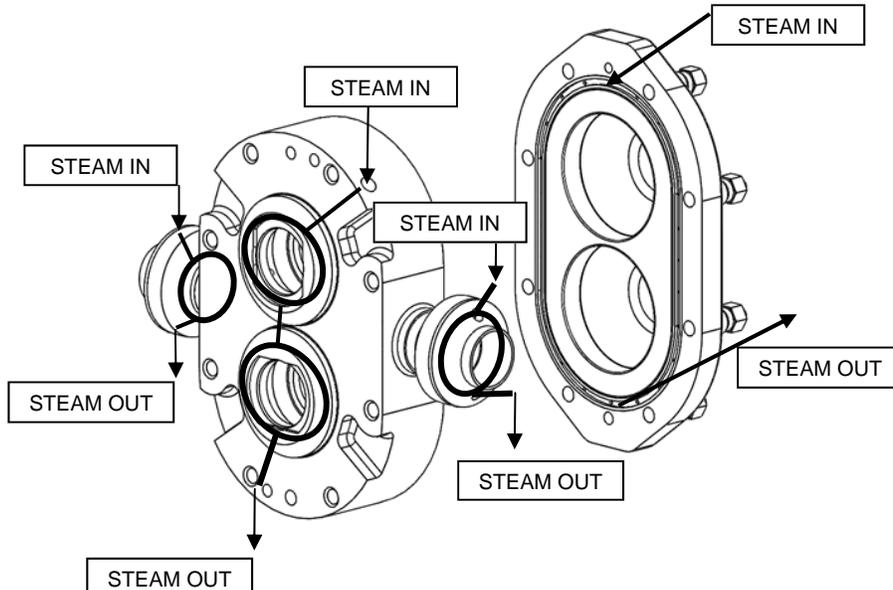
Low Pressure Flush

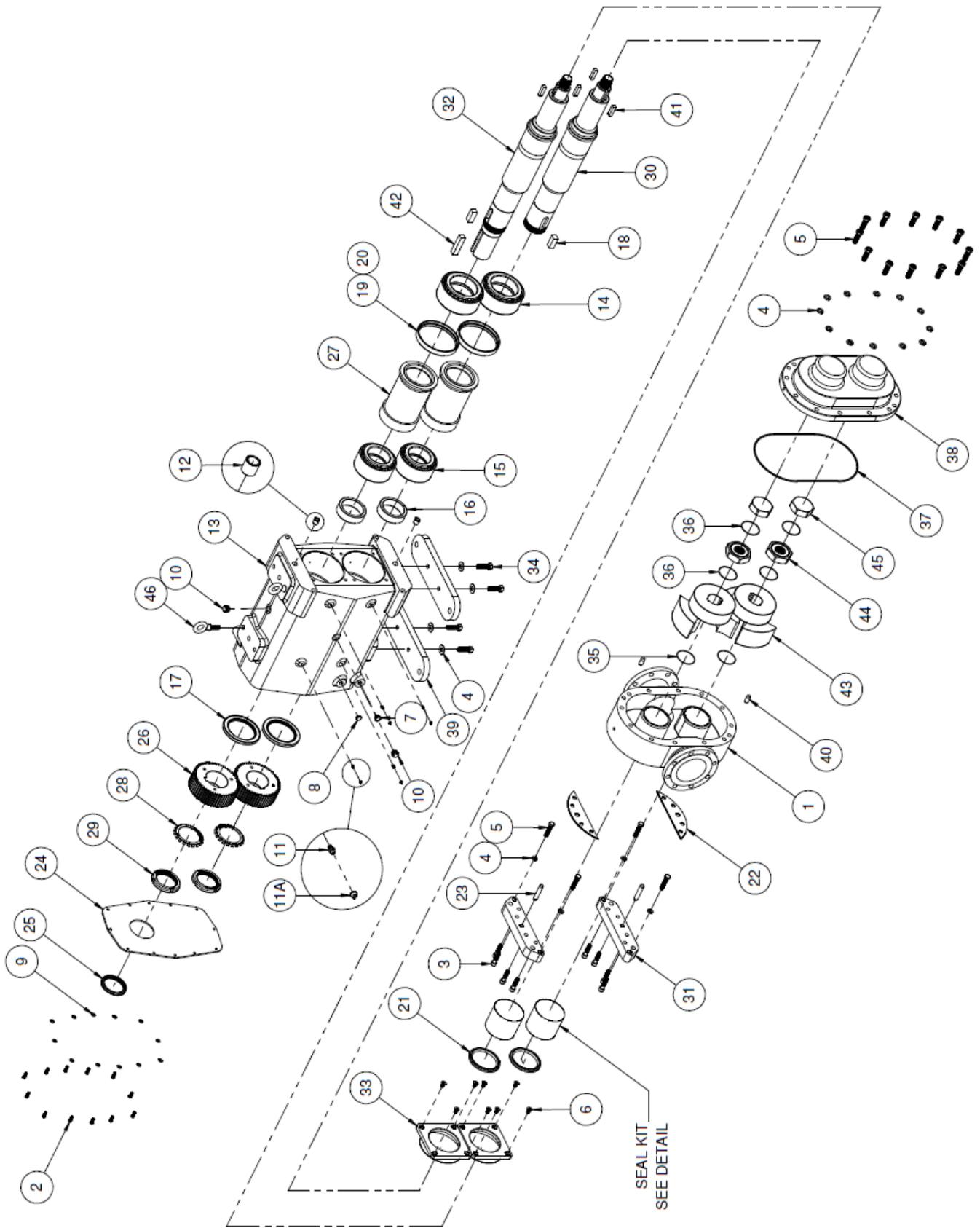
- 1. Approximate flow rate of 1/4 GPM for most applications.
- 2. High temperature applications require increased flow. The flowrate supplied must be adequate to purge the system.
- 3. The flush media is restricted on the inlet side but flows freely on the outlet side.
- 4. Connections typically are 1/8" NPT female pipe.



Aseptic Flushing Connection

All aseptic flush connections are 1/8" female pipe taps. Ampco aseptic pumps have double seals at every opening to the pump chamber. The design provides steam or a sterile fluid circulation between the double seals at the ports, in the cover and at the shaft seals.

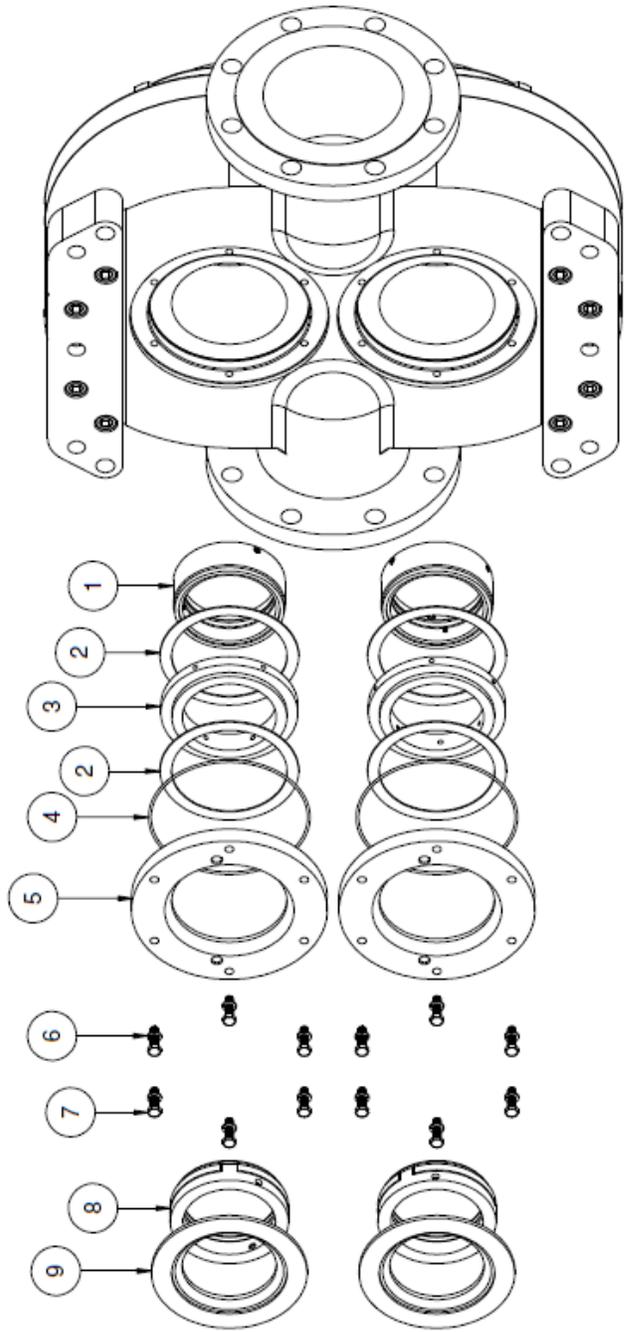
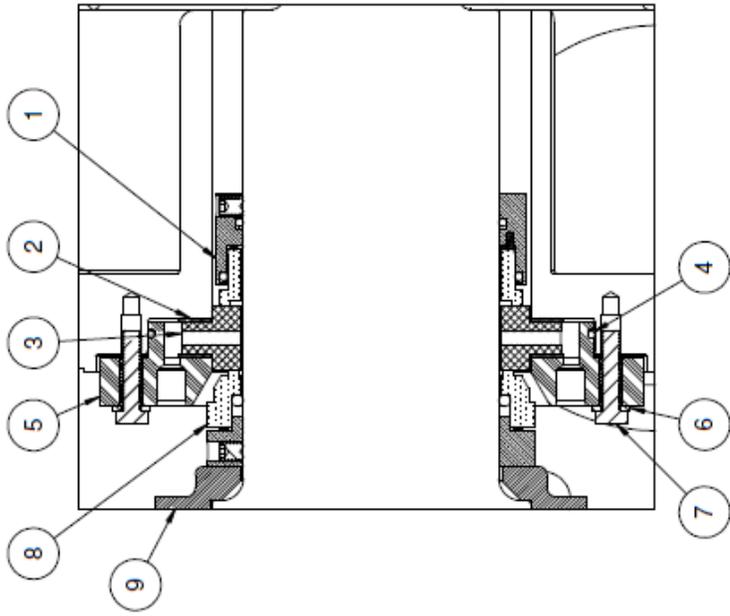




AMPCO PUMPS COMPANY**PARTS BREAKDOWN****XP420-523 SERIES**

ITEM NO.	QTY.	DESCRIPTION	ITEM NO.	QTY.	DESCRIPTION
1	1	ROTOR BODY, STD.	24	1	GEAR CASE COVER
2	6	GEAR CASE COVER BOLT	25	1	GEAR CASE COVER OIL SEAL
3	1	MOUNT PAD BOLT	26	1	TIMING GEAR
4	1	COVER WASHERS	27	2	SPACER, REAR / FRONT BEARING
5	8	COVER BOLTS	28	2	GEAR LOCK WASHER
6	8	BEARING RETAINER BOLT	29	2	GEAR LOCKNUT
7	5	PLUG, OIL DRAIN/FILL	30	1	IDLE SHAFT
8	1	PLUG, OIL LEVEL SIGHT	31	1	BODY MOUNT PAD
9	6	GEAR CASE COVER FLAT WASHER	32	1	DRIVE SHAFT
10	4	PLUG, CLEANOUT	33	2	BEARING RETAINER
11	8	GREASE FITTING	34	4	FOOT PAD BOLT
11A	8	GREASE FITTING COVER	35	2	O-RING, ROTOR SEAL FACE
12	1	DOWEL BUSHING	36	2	O-RING, ROTOR NUT
13	1	GEAR CASE	37	1	O-RING, COVER
14	2	BEARING, FRONT	38	1	ROTOR BODY COVER
15	2	BEARING, REAR	39	1	FOOT PAD
16	2	SPACER, GEAR / REAR BEARING	40	1	COVER DOWEL PIN
17	2	OIL SEAL, REAR	41	2	ROTOR KEY
18	2	GEAR KEY	42	1	DRIVE KEY
19	1	FRONT BEARING SPACER	43	2	ROTOR
20	2	SHAFT SHIM KIT	44	2	ROTOR NUT, INNER
21	2	BEARING RETAINER OIL SEAL	45	2	ROTOR NUT, OUTER
22	1	ROTOR BODY SHIM KIT	46	2	EYEBOLT
23	1	DOWEL PIN, GEAR CASE/BODY			

AMPCO PUMPS COMPANY	
PARTS BREAKDOWN	
XP420-523 MECHANICAL SEAL ASSEMBLY	
ITEM NO.	DESCRIPTION
1	INBOARD SEAL
2	GASKET
3	T-SEAT
4	SEAL RETAINER O-RING
5	SEAL RETAINER GLAND
6	LOCK WASHER
7	RETAINER BOLT
8*	OUTBOARD SEAL
9*	SLINGER
* DOUBLE MECHANICAL SEAL ONLY	



Troubleshooting hints are to help identify and solve problems if they occur. After a pump is selected and installed in a system, typical operation is trouble free. However, with existing systems, or as conditions change, problems may develop.

WARNING

DO NOT INSTALL OR SERVICE PUMP UNLESS ALL POWER IS OFF AND LOCKED OUT.

WARNING

SHUT OFF AND DRAIN PRODUCT FROM PUMP PRIOR TO DISCONNECTING PIPING.

Problem	Probable Cause	Solutions
Pump not running, no flow	Motor failure	Inspect and replace bad fuses, breakers, resets
	Drive key damaged or missing	Replace
	Belt failure, slipping or broken transmission components	Repair or replace
	Pump shaft gears are sheared or keys are damaged	Repair or replace
Pump not priming, no flow	Closed valve inlet side	Open inlet valve
	Clogged or restricted inlet	Inspect and repair
	Bad seals or connections, air leak	Inspect for line leaks, broken seals. Repair or replace
	Pump running below minimum speed	Manually prime inlet, increase speed. Possible foot valve installation required for start up
	Liquid loss in line during shut down	Check valves, repair or replace

Problem	Probable Cause	Solutions
Pump not priming, no flow	Media may be causing gas off or air lock. Vapor release from product	Bleed air from pump lines (manual / automatic)
	Inefficient rotors, worn fluid end or rotors	Increase speed, install foot valve
	NIPA too low	Confirm NIPA NIPR, update inlet system as needed
	Vacuum inlet situation: atmospheric pressure from discharge line may prevent pump from priming	Install a check valve in the discharge line
Low flow	Speed is too low for desired flow	Confirm curve data, flow/ speed
	Damaged seals or bad pipe connections causing air leaks	Replace damaged seals, check inlet fittings and connections
Starved pump	Clogged inlet fittings, foot valves, strainer or lines	Remove clog. Inlet system may require changes if problem persists
	Improperly sized inlet valve, inlet line size issues (diameter length), too many valves or fittings	Make necessary adjustments to size and length, increase inlet size, reduce the number of fittings
	Low NIPA	Increase liquid level in supply tank
	Low NIPA	Increase by raising or pressurizing supply tank

Problem	Probable Cause	Solutions
Starved pump	Low NIPA	Install larger pump with lower NIPR
	Viscosity levels greater than expected	Reduce pump speed expecting lower flow, or revise system to reduce line loss.
	Higher than expected fluid temperature. (higher vapor pressure)	Reduce speed and temperature, accept reduced flow or revise system to increase NIPA
Fluid bypass, insufficient flow	Open valve or flow diverted in line	Review system and controls
Slip, insufficient flow	Improperly sized rotors installed and/or lower viscosity fluid than expected	Replace with proper clearance rotors
	Pump is worn	Increase pump speed if possible. Replace rotors, remanufacture
	High pressure	Adjust system to reduce pressure
Noisy , chattering	Pump cavitation	
	Increased / high vapor pressure, viscosity, or media temperature	Adjust system, slow pump speed, reduce temperature
	NIPR exceeds NIPA	Increase NIPA or reduce NIPR
	Air or gas in media	
	Leaking pump, fittings or piping	Diagnose and correct leaks
	Dissolved gas / aerated products	Minimize pressure on discharge side.
	Mechanical noises rotor to body contact	
	Assembly issues	Check rotor clearance see page 26

Problem	Probable Cause	Solutions
Noisy pump operation	Improper piping installation possible rotor to body contact	Review and reinstall piping to assure efficient running
	Excessive pressure	Reduce pressure
	Worn/ damaged bearings	Review and replace bearings. Lubricate on a regular maintenance schedule
	Worn/ damaged gears	Review and replace gears. Lubricate on a regular maintenance schedule
	Rotor to rotor contact	
	Damaged gears, worn or sheared keys, damaged shaft, mis-timed	Replace worn parts
	Drive train component failure, chains, couplings, bearings. gear	Repair or replace drive train
Excessive power requirements (overheating, stalls, high current draw, breakers trip)	Viscosity losses higher than expected	Increase drive size if needed
	Pressure higher than expected	Reduce pump speed, if possible increase line sizes
	Media characteristics	
	High viscosity media colder than expected	Use pump with higher running clearance. Heat the media
	During shut down, media sets up in lines	Flush line. Add heat trace line. Install VFD or soft start drive. Install bypass system for recirculation
	Media buildup on pump surfaces (ie, chocolate clearance)	Use pump or rotors with greater clearances
	Below expected service life	Corrosion on pump surface
Abrasive media		Larger pumps at slower speeds, can help
Higher than rated pressures / speeds		Reduce speeds and pressures within the system
Unlubricated gears and bearings causing premature wear		Follow regular maintenance and lubrication schedule
Drive coupling and piping misalignment, excessive overhung load		Check alignment

PD Pump Remanufacturing Program

With the purchase of each new XP pump, Ampco guarantees two full remanufactures. Depending on wear, the XP pumps (and equivalents) can be remanufactured up to four times. This process returns a used pump to new pump performance and appearance. Each fully remanufactured pump includes a one year warranty. The following upgrades are included when remanufacturing a competitor's pump: 17-4 shafts, stainless steel bearing retainers, helical gears, and sealed clean out plugs. These upgrades are standard to Ampco positive displacement new and remanufactured pumps.

Contact your local distributor or the factory (414) 643-1852 for more information.

ATEX Certification Information

- 1) Ampco pumps DOC (declaration of conformity) must be included with the pump's installation and maintenance manual.
- 2) ATEX certified pumps will be sent with black plugs on all drain and level ports at the rear of the gear case.
- 3) ATEX approval becomes void if non-Ampco replacement parts are used in the pump.

For additional support regarding ATEX certification, please contact the Engineering Department at Ampco Pumps Company, (414) 643-1852.

AMPCO PUMPS

Made of SELECTED corrosion-resistant alloys

TERMS AND CONDITIONS OF SALE

1. ENTIRE AGREEMENT. This document contains all of the terms and conditions of the agreement (“the agreement”) between Ampco Pumps Company, Inc. (“Seller”) and the purchaser (“Purchaser”) of the Products (“Products”) to be sold to Purchaser, to the exclusion of any other statements and agreements, and to the exclusion of any terms and conditions incorporated in Purchaser’s order or other documents of Purchaser. Seller’s acceptance of Purchaser’s order is expressly conditioned on Purchaser’s acceptance of the terms and conditions contained herein, and Purchaser, upon placing an order, is presumed to have accepted all the terms and conditions without modification. No alteration, waiver, modification of or addition to the terms and conditions herein shall be binding on Seller unless set forth in writing and specifically agreed to by an officer of Seller. No course of dealing, usage of trade or course of performance will be relevant to supplement or explain any terms used in the agreement. All offers to purchase, quotations and contracts of sale are subject to final acceptance by Seller at its home office at Milwaukee, Wisconsin.

2. PRICES. Prices for Products manufactured by Seller pursuant to written accepted orders will remain firm for thirty (30) days from the date of any subsequent price change.

3. TERMS OF PAYMENT. Standard terms are ½% 10 days, 30 days net, from date of invoice unless otherwise stated. If, in the judgment of Seller, the financial condition of Purchaser at any time does not justify continuance of production or shipment on the terms of payment specified, Seller may require full or partial payment in advance. In cases of delays in payment, Seller reserves the right to charge interest on delinquent balances at the rate of 1 ½% per month.

4. DELIVERY. Except as otherwise provided expressly stated in the agreement, Products are sold F.O.B. Milwaukee. Seller will use reasonable commercial efforts to fill orders within the time stated, but the stated delivery date is approximate only, and Seller reserves the right to readjust shipment schedules without liability. Acceptance by Purchaser of the Products waives any claim for loss or damage resulting from a delay, regardless of the cause of the delay. Except as otherwise provided herein, Seller will not be responsible for freight, transportation, insurance, shipping, storage, handling, demurrage or similar charges. Claims by Purchaser for shortages in the Products must be made to Seller in writing within ten (10) days after date of receipt of the Products. No such shortage shall entitle Purchaser to withhold payment for Products which were received by Purchaser. Each such claim shall set forth in detail the basis and amount of such claim.

5. TAXES AND FEES. Seller shall pay all present and future sales, excise, privilege, use or other taxes, customs duties, and all other fees or other costs, imposed by any federal, state, foreign, or local authorities arising from the sale, purchase, transportation, delivery, storage, use or consumption of the Products or will, if applicable, provide Seller with an appropriate exemption certificate. Seller shall be under no obligation to contest the validity of any such taxes or to prosecute any claims for refunds or returns.

6. INSTALLATION. The Products shall be installed by and at the expense of Purchaser.

7. LOSS, DAMAGE OR DELAY. Seller will not be liable for loss, damage or delay resulting from causes beyond its reasonable control, including, without limitation, strikes or labor difficulties, lockouts, acts or omissions of any governmental authority or Seller, insurrection or riot, war, fires, floods, Acts of God, breakdown of essential machinery, accidents, embargoes, cargo or material shortages, delays in transportation, lack of production capacity or inability to obtain labor, materials or parts from usual sources. In the event of any such delay, performance will be postponed by such length of time as may be reasonably necessary to compensate for the delay. In the event performance by Seller under the agreement cannot be accomplished by Seller due to any of the foregoing causes within a reasonable period of time, Seller may, at its option, terminate the agreement without liability.

8. RETURNS. No Products or parts may be returned by Purchaser without the prior written consent of Seller.

9. WARRANTY. Seller warrants that the Products manufactured by Seller will be free from defects, material and workmanship under normal use and service for a period of one (1) year from date of shipment. In addition, the specified rating of each pump is warranted; however, the characteristic shape of the performance curves may vary from the published standards, and the capacity, head and efficiency guarantees are based on actual shop tests using clear cold water, and therefore the rating is specified in equivalent units of clear cold water. The sole obligation of Seller and the exclusive remedy of Purchaser for breach of this warranty shall be the repair (at Seller’s facility) or replacement by Seller (F.O.B. Milwaukee, Wisconsin), at Seller’s option, of any parts found to be defective, without charge and shall be conditioned upon Seller receiving written notice of any alleged breach of this warranty within a reasonable time after discovery of the defects, but in no event later than the end of the warranty period. The parts alleged to be defective shall be returned to Seller upon its request, freight prepaid. This warranty does not cover ordinary wear and tear, abuse, misuse, overloading, alteration or Products or parts which have not been installed, operated or maintained in accordance with Seller’s written instructions. Seller shall not be liable for any expenses for repairs, additions or modifications to the Products outside of Seller’s factory without its prior written consent, and any such repairs without such consent shall void this warranty. THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Seller may from time to time provide its facilities, personnel and experience to assist customers in the selection of materials, design, installation and operation of Products for maximum resistance to corrosion and abrasion with due consideration to the economy of the installation. This service is provided in an advisory capacity only and the final selection and operation of the Products and ancillary equipment shall be the sole responsibility of Purchaser or any user thereof. Accessories and parts manufactured by third parties are warranted only to the extent of such third party’s warranty. IN NO EVENT SHALL SELLER BE LIABLE UNDER ANY CIRCUMSTANCES FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, ANY LOST PROFITS OR LABOR COSTS) ARISING FROM THE BREACH OF THIS WARRANTY OR OTHERWISE ARISING FROM OR RELATING TO THE PRODUCTS OR THEIR SALE, USE OR INSTALLATION.

10. CHANGES. Changes in any work to be performed hereunder may be made only upon Purchaser's written instructions and acceptance by Seller in its discretion. Any change in drawings, materials or design of the Products, or to tools, fixtures or other items used to produce the Products, which affects Seller's cost to produce the Products will entitle Seller to adjust the price to take into account any additional costs. If work has been started, Seller shall be properly reimbursed for work already performed; if Products already produced are not accepted by Purchaser, Seller has the right to adjust the price to take into account any additional costs caused by an increase or decrease in quantities or in the time required for performance under the agreement.

11. TERMINATION. After Seller has commenced work, ordered any materials or made any other commitments pursuant to the agreement, it may be terminated only with the prior written agreement of Seller providing for equitable cancellation charges. Such charges shall reimburse Seller for any completed items at the contract price, and for any work-in-process items at the contract price less the cost to complete. Termination on any other basis must be specifically agreed on in writing in advance between Purchaser and Seller.

12. DEFERRED DELIVERIES. Orders or deliveries will be deferred only upon the prior written agreement of Seller in its discretion, and then only upon the following conditions:

(a) The deferral period may not exceed sixty (60) days. At the end of the deferral period, if no release is provided by Purchaser, Seller reserves the right to render an invoice for and ship the completed portion of the order to the destination specified in Purchaser's order, or to store such material at Purchaser's expense at Seller's standard storage charges then in effect.

(b) For the portion of the order that is not completed, if no release is provided by Purchaser at the expiration of the deferral period, Seller reserves the right to render an invoice for any completed items at the contract price, and for any work-in-process items at the contract price less the cost to complete.

(c) Purchaser shall bear the risk of loss or damage to materials held at Purchaser's request.

13. LIMITATION OF LIABILITY. IN NO EVENT SHALL SELLER BE LIABLE UNDER ANY CIRCUMSTANCES: (a) FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES (INCLUDING, WITHOUT LIMITATION, ANY LOST PROFITS OR LABOR COSTS) ARISING FROM OR RELATING TO THE PRODUCTS OR THEIR SALE, USE OR INSTALLATION; (b) FOR DAMAGES TO PROPERTY (OTHER THAN THE PRODUCTS PURCHASED FROM SELLER); (c) FROM ANY BREACH OF ITS WARRANTY OR ANY OTHER OBLIGATIONS TO BUYER; OR (d) FOR ANY OTHER CAUSE WHATSOEVER, WHETHER BASED ON WARRANTY (EXPRESSED OR IMPLIED) OR OTHERWISE BASED ON CONTRACT, OR ON TORT OR OTHER THEORY OF LIABILITY, AND REGARDLESS OF ANY ADVICE OR REPRESENTATIONS (WHETHER OR NOT IN WRITING) THAT MAY HAVE BEEN RENDERED BY SELLER CONCERNING THE DESIGN, MANUFACTURE, SALE, USE OR INSTALLATION OF THE PRODUCTS.

14. INFRINGEMENT. Seller at its expense will defend and hold Purchaser harmless from and against all damages, costs and expenses arising from any valid claim of infringement by a third party with respect to any patent or other intellectual property rights (collectively, the "Intellectual Property Rights") caused by Products originally manufactured by Seller, provided Purchaser (a) has not modified such Products, (b) gives Seller immediate notice in writing of any claim or commencement or threat of suit, and (c) permits Seller to defend or settle the same, and gives all immediate information, assistance and authority to enable Seller to do so. In the event any such originally manufactured Products are held to infringe an Intellectual Property Right and if Purchaser's use thereof is enjoined, Seller will, at its expense and option: (1) obtain for Purchaser the right to continue using the Products, (2) supply non-infringing Products, (3) modify the Products so that they become non-infringing, or (4) refund the then market value of such Products. In no event shall Seller's liability exceed the sale price of the infringing Products. THE FOREGOING REPRESENTS SELLER'S ENTIRE AND EXCLUSIVE OBLIGATION WITH RESPECT TO ANY CHARGE OF INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHT AND IS IN LIEU OF ANY STATUTORY WARRANTY RELATING TO INFRINGEMENT. Notwithstanding the foregoing, Seller shall have no liability as to any Products or parts thereof that are manufactured or modified by Purchaser or a third party, or that are manufactured or modified by Seller in accordance with Purchaser's specifications. Purchaser will defend and hold Seller harmless from and against all damages, costs and expenses whatsoever arising from any claim for infringement of any Intellectual Property Rights relating to Products that have been manufactured or modified by Seller according to specifications provided by Purchaser.

15. CERTAIN LAWS. Seller will comply with the applicable requirements of the Fair Labor Standards Act of 1938, as amended, Executive Order 11246, and THE rules, regulations and orders of the Secretary of Labor relating thereto.

16. PERIOD FOR ACCEPTING QUOTATIONS. Unless accepted without modification within thirty (30) days of issuance, or prior to withdrawal by Seller if earlier, all quotations automatically expire at the end of such thirty (30) day period.

Terms and Conditions

Ampco Pumps Company

17. PROVISIONS FOR INTERNATIONAL TRANSACTIONS. The following provisions shall apply if the Products are to be shipped to Purchaser at a location outside the United States, and apply regardless of other provisions set forth in these Terms and Conditions:

(a) The 1980 United Nations Convention on Contracts for the International Sale of Products shall not apply.

(b) Except as otherwise provided expressly stated in the agreement, terms of delivery are Ex-Works (within the meaning of INCOTERMS 2000) and all customs fees, import duties, cargo insurance, taxes and other charges imposed on or relating to the purchase or sale of the Products shall be paid by Purchaser in addition to the stated price.

(c) Except as otherwise provided expressly stated elsewhere in the agreement, payment shall be made by issuance to Seller of an irrevocable letter of credit which (i) is issued and confirmed by a U.S. bank acceptable to Seller, (ii) is governed by the Uniform Customs and Practice for Documentary Credits (UCP 600) and otherwise acceptable in form and substance to Seller, and (iii) provides for payment to Seller of the purchase price in U.S. dollars upon presentation by Seller of Seller's certification and/or such other documents as shall be required by the letter of credit. All banking and other charges for such letter of credit shall be for the account of Purchaser.

(d) Prices include Seller's standard commercial export packaging which may vary depending on whether shipment is made by air, land or sea. Except as otherwise provided expressly stated in the agreement, Purchaser will bear any additional expenses required to satisfy Purchaser's packaging requirements. Packages will be marked in accordance with Purchaser's instructions, if any. Seller shall furnish packing lists and such other information as may be necessary to enable Purchaser's agent to prepare documents required for export shipment.

(e) All shipments hereunder are subject to compliance with the U.S. Export Administration Act, as amended, regulations thereunder and all other U.S. laws and regulations concerning exports. Purchaser shall comply with all such laws and regulations concerning the use, disposition, re-export and sale of the Products provided hereunder.

18. GENERAL. No modification or waiver of the agreement or any of its provisions is valid unless expressly agreed to by Seller in writing, and no waiver by Seller of any default under the agreement is a waiver of any other or subsequent default. The unenforceability or invalidity of one or more of the provisions of the agreement will not affect the enforceability or validity of any other provision of the agreement. Purchaser may not assign any of its rights, duties or obligations under the agreement without Seller's prior written consent and any attempted assignment without such consent, even if by operation of law, will be void. The agreement is governed by and shall be construed in accordance with the laws of the State of Wisconsin, including the Uniform Commercial Code as enacted by such state, without giving effect to its conflict of laws principles.

Return Policy

Ampco Pumps Company

This policy is intended for returns that are not covered by product warranty, i.e. wrong pump or part was ordered, customer canceled order, etc. Before returning any product, contact us for a Returned Material Authorization Number (RMA#). This will eliminate confusion when the parts are received and facilitate processing the return. No action will be taken on returned parts without an RMA.

<u>Type of Return</u>	<u>Restocking Charge</u>
Standard pump with a replacement order	10%
Standard pump without a replacement order	15%
Standard parts with a replacement order	5%
Standard parts without a replacement order	10%

Additional restocking charges may be assessed for any of the following circumstances.

1. Special order motors and seals are not returnable unless we have a use for them. Credit will be determined on a case-by-case basis.
2. Impellers that are trimmed to a diameter that we don't regularly use are not returnable. Credit will be determined on a case-by-case basis.
3. Used seals and motors are not returnable.

Credits

Credit will be issued only after parts are returned and inspected. Customer is responsible for packaging parts so they are returned in "as new" condition. Any labor required by Ampco to return the parts to "as new" condition will be deducted from the credit.

NOTES



Ampco Pumps Company
2045 W. Mill Road
Glendale, WI 53209
Phone: (800) 737-8671 or (414) 643-1852
Fax: (414) 643-4452
Email: ampcocs@ampcopumps.com

For additional information on the XP series and other Ampco Pumps products, please visit our website: www.ampcopumps.com