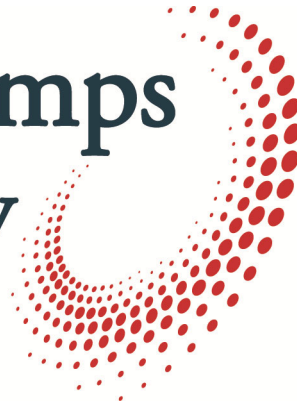


Ampco Pumps Company



Ampco SHEAR-max

High Shear Mixer

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: ampcoocs@ampcopumps.com*

General Information

Each Ampco SHEAR-max 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 starting on page 11. 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 (page 28).

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.

TECHNICAL DATA

SPECIFICATIONS

MAXIMUM INLET PRESSURE.....150 PSI / 10.3 BAR

MATERIALS OF CONSTRUCTION

Housing.....AISI 316L Stainless Steel
CoverAISI 316L Stainless Steel
Rotor.....AISI 316L Stainless Steel
Seal Driver.....AISI 316L Stainless Steel
Adapter.....AISI 304 Stainless Steel
PRODUCT CONTACT SURFACE FINISH.....32Ra (standard)
Optional Finishes.....25Ra, 20Ra, 15Ra, Electro Polish
O-RINGS & GASKETS.....Viton (standard)
Optional Materials.....EPDM, Buna (others per request)

SEAL

Type.....Internal Single Mechanical
Optional.....External Double Mechanical
 Pressure (flush for double seal)..... 4-5 PSI / 0.27-0.34 BAR
 Water Consumption (flush for double seal)..... 4-8 GPH /15-19 LPH
Stationary Seal Material.....Silicon Carbide
Rotating Seal Material.....Carbon
*Other seal materials optional per request

MOTOR - refer to the motor owners manual

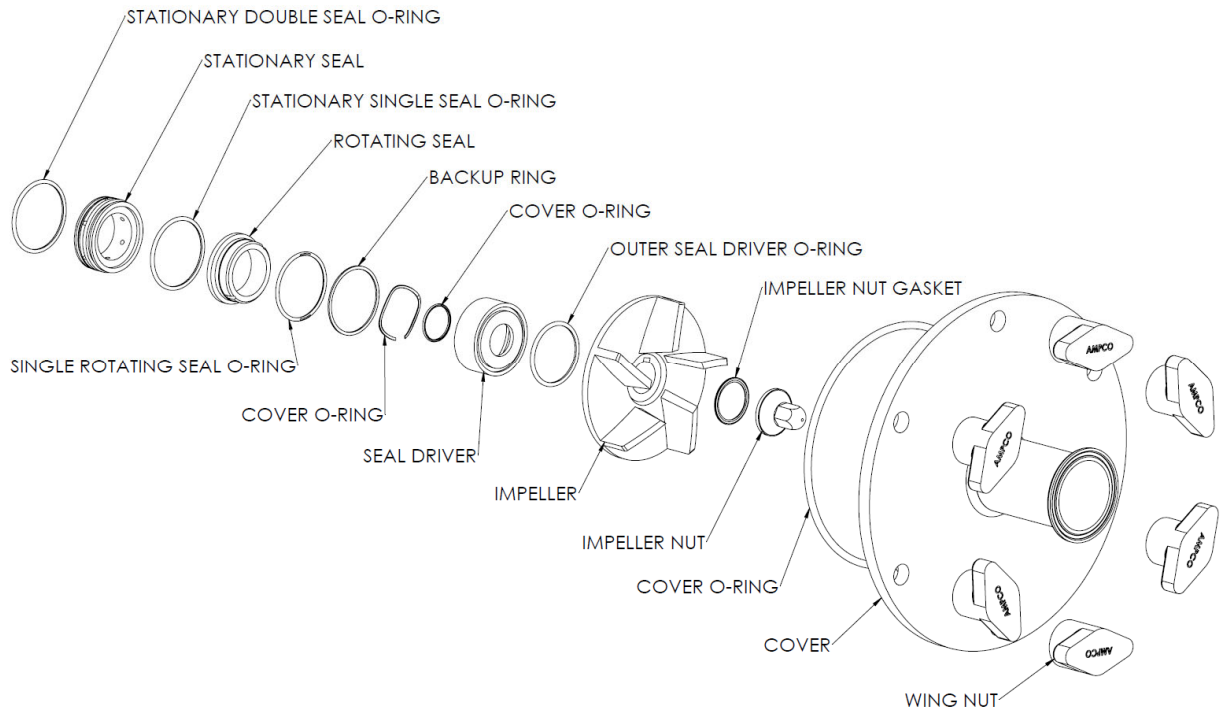
RECOMMENDED TORQUE VALUES

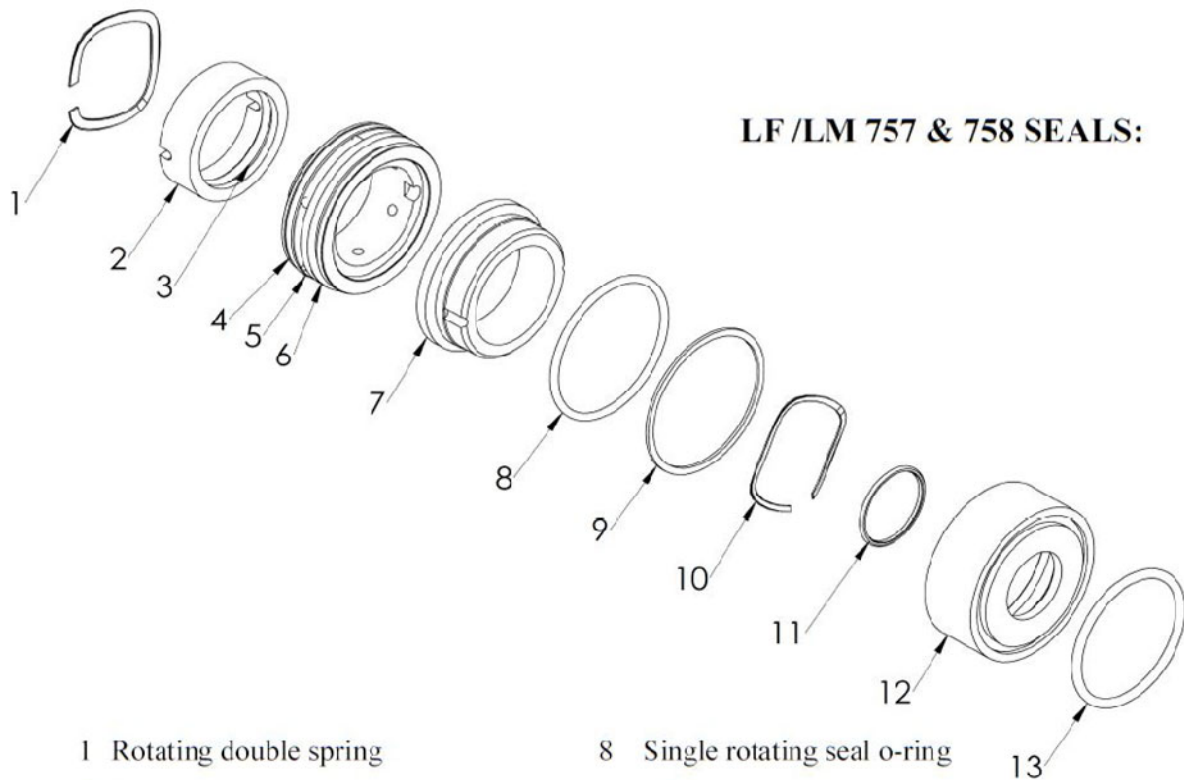
Rotor Nuts
 SM1300.....7.5ft-lbs / 10N-m
 SM1437/ SM2437.....40ft-lbs / 54N-m
 SM1575/ SM2575.....40ft-lbs / 54N-m
 SM1700.....40ft-lbs / 54N-m
Adapter Cap Screws
 NEMA 56C-140TC/ IEC 80-112.....20ft-lbs / 27N-m
 NEMA 180TC-280TC/ IEC 132-200.....50ft-lbs / 68N-m
 NEMA 320TC-360TC.....110ft-lbs / 149N-m
Shaft Collar Socket Head Cap Screws
 NEMA 56C-140TC/ IEC 80-112.....6ft-lbs / 8N-m
 NEMA 180TC-280TC/ IEC 132-200.....30ft-lbs / 41N-m
 NEMA 320TC-360TC.....40ft-lbs / 54N-m

CASING TO ROTOR CLEARANCE

SM1300.....0.506in/12.8mm
SM1437 & SM2437.....0.797in/20.2mm
SM1575 & SM2575.....1.000in/25.4mm
SM1700.....1.000in/25.4mm

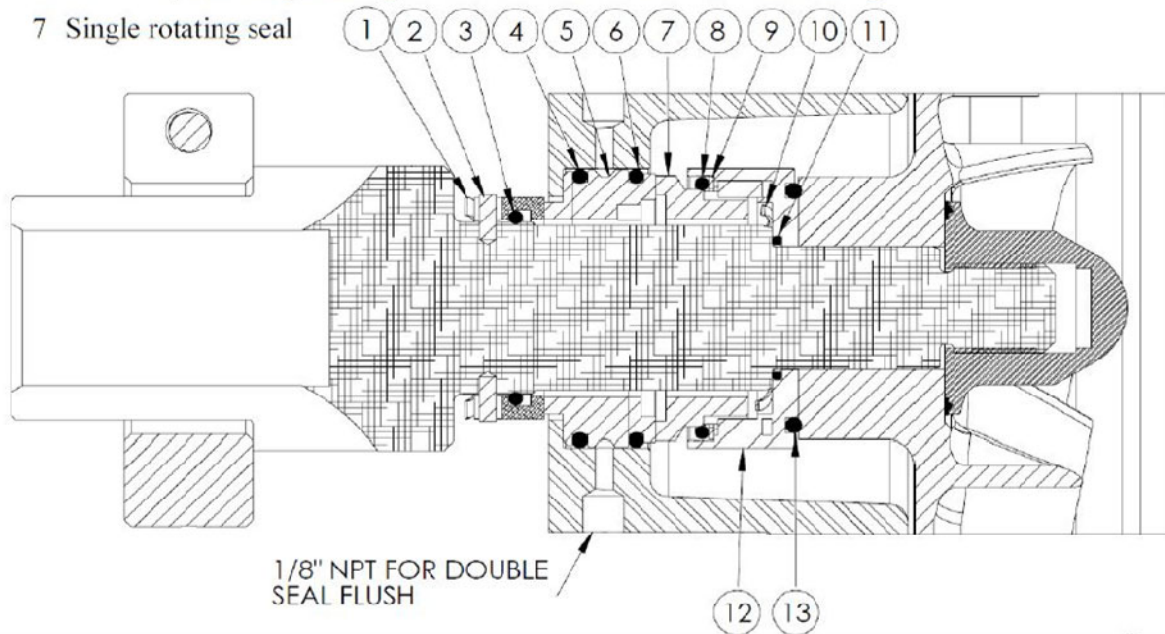
EXPLODED ASSEMBLY (SM1000 SERIES):





LF /LM 757 & 758 SEALS:

- | | |
|---------------------------------|-------------------------------|
| 1 Rotating double spring | 8 Single rotating seal o-ring |
| 2 Rotating double seal | 9 Backup ring |
| 3 Rotating double o-ring | 10 Seal spring |
| 4 Stationary double o-ring | 11 Seal driver inner o-ring |
| 5 Stationary seal | 12 Seal driver |
| 6 Stationary seal single o-ring | 13 Seal driver outer o-ring |
| 7 Single rotating seal | |



SERVICE MAINTENANCE AND SCHEDULING

DAILY MIXER MAINTENANCE CHECKS

1. Mixer leakage (seal or otherwise)
2. Pressure reading and flow indication
3. Change in operating sound
4. Change in bearing temperature
5. Flow through lip seal lines

Motor lubrication schedule: Every 2200 Hrs of standard service.
Every 1100 Hrs of severe service.
Every 220 Hrs of extreme service

Standard service is 8-16 hours of service per day and up to 104°F/40°C in a clean/little corrosion atmospheric contamination.

Severe service is 16+ hours of service per day and up to 120°F/50°C in a moderate dirt, corrosion atmospheric contamination.

Extreme service is 8-16 hours of service per day and over 120°F/50°C in a severe dirt, abrasive dust, corrosive heavy shock or vibration environment.

SEMI-ANNUAL MIXER MAINTENANCE CHECKS

1. Mechanical seal assembly
2. Motor bearing lubrication

ANNUAL MIXER MAINTENANCE CHECKS-INCLUDES SEMI-ANNUAL MAINTENANCE CHECKS PLUS:

1. Remove seal for inspection
2. Bearing check
3. Check of axis/running clearance of rotor

CONTINGENCY PLAN

FOR INSPECTION FINDINGS AND BREAKDOWNS, AN ADEQUATE SUPPLY OF PROBABLE REPLACEMENT PARTS SHOULD BE KEPT ON HAND.

THE MINIMUM SPARE PARTS ARE AS FOLLOWS:

1. Single mechanical seal kit
2. Cover gasket
3. Rotor key

IN ADDITION AMPCO RECOMMENDS:

4. Rotor
5. Cover
6. Rotor nut

MIXER INSTALLATION**Receiving Mixer:**

Visually inspect shipping crate(s)/pallet(s) for damage. AMPCO mixers will be shipped in boxes labeled AMPCO mixers or in crates. If there is any damage it is imperative to notify the driver at the time of delivery. Failure to do so will make it difficult, if not impossible, to file a damage claim and AMPCO Pumps will not be held accountable. Please contact AMPCO Pumps shipping department with damage details ASAP.

Once unpacked, carefully inspect the mixer for any damage that may have occurred during shipping. Using a socket, an extension drive and ratchet, turn the rotor nut to make sure the rotor turns freely. There should be a little noise from the seal which is normal. If there is metal to metal contact when the rotor is turned shipping damage is likely. Leave the protective covers on the inlet and discharge connections until the mixer is installed and is ready to be connected to piping.

Mixer location:

Install mixer in an optimal location. Be sure that there is room around the mixer so it can be accessed readily for maintenance. Ensure that the motor has adequate ventilation. Make sure the motor type is suitable for the environment in which it is installed.

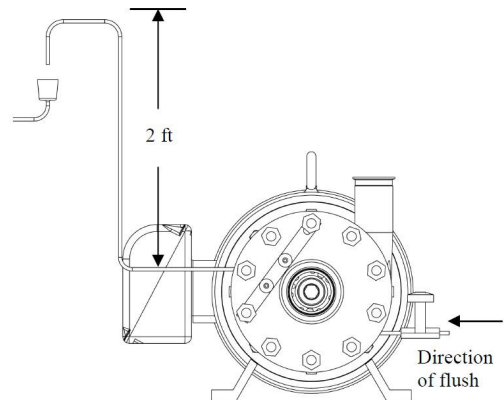
Electrical installation:

Have a qualified electrician connect the motor using sound electrical practices. Do not test run the motor with the mixer dry. Mechanical seals can be damaged running dry even momentarily.

The mixer must be flooded and the flush must be connected with flushing water flowing before starting the mixer. The mixer and motor has been selected for a specific environment and system application. Changing the environment or system conditions (i.e. change of fluid, change in head losses, change in NPSHr) can overload the motor. When changing system conditions or when in doubt, contact AMPCO Pumps Company for technical assistance and someone will be ready to assist.

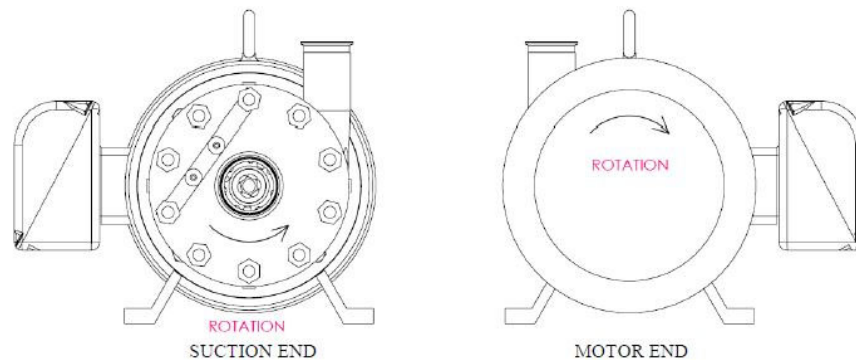
Double seal flush:

Install flush piping as shown on right. The regulating valve must be on the inlet end of the flush. The flush requires 4-8 gallons per hour at 4-5 PSI (0.27-0.34 BAR). The tubing on the exit side of the flush has a least 2 ft / 0.6m of height so once the flush has ran there will be a small amount of water on the seal and it will not run dry. Direction of flow should always be from a lower elevation inlet to a higher elevation outlet to evacuate air if there is a difference in elevation.



Mixer operation:

Make sure the mixer is clean and free of any foreign matter. Once the motor, flush and piping all have been properly connected, the flush is turned on and is visibly flowing (if the mixer has a flush option) and the mixer has been flooded, the mixer can be momentarily turned on to check the motor rotation. The correct rotation is counter-clock wise while looking at the mixer from the suction end clock wise if looking at the mixer from the motor end.



When the rotation of the motor has been verified to be correct the mixer is ready to run continuously for service.

Shut down instructions:

- Turn off power supply to the mixer.
- Close shut-off valves.
- Drain and clean mixer.

MIXER DISASSEMBLY & SEAL REMOVAL**ATTENTION!**

BEFORE ATTEMPTING ANY SERVICE ON ANY MIXER OR MOTOR, DISCONNECT OR LOCKOUT ELECTRICAL POWER TO THE MIXER MOTOR. IF THE MIXER AND MOTOR ARE TO BE REMOVED AS A UNIT, NOTE THE WIRING AND CONFIGURATION. USE COLORED OR NUMBERED TAPE TO MARK THE WIRE CONNECTIONS OF THE MIXER MOTOR AND POWER SOURCE, FOR RECONNECTION.

TOOLS REQUIRED TO DISMANTLE MIXER AND REMOVE SEAL:

Socket wrench for the rotor nut

3/8" round bar 90°

7/16" wrench/socket (SM1300)

9/16" wrench/socket (all other models)

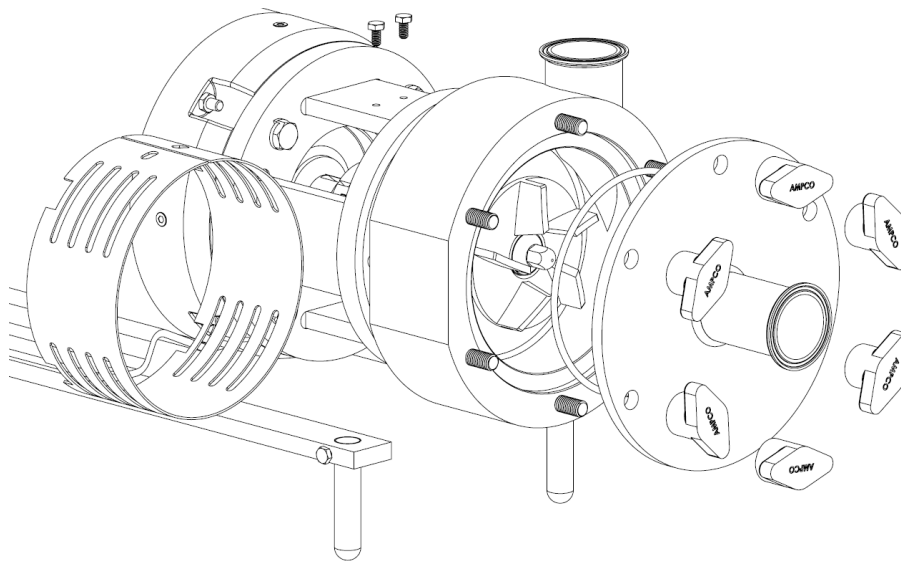
Torque wrench

O-ring pick

Dead blow hammer (soft face)

3/16, 1/4, or 1/4" Allen wrench

1. Disconnect electrical power to the mixer motor and follow any lockout / tagout Procedures in place at your facility.
2. Disconnect mixer from the suction piping. Drain all fluids from the mixer. Then disconnect discharge piping.
3. Loosen and remove cover wing nuts, cover, cover gasket and shaft guard, as seen in Figure 1.

**Figure 1**

4. Insert a 3/8" bar in the hole in the stub shaft as shown in Figure 2. Turn the rotor nut with a socket wrench counterclockwise to remove the rotor nut.

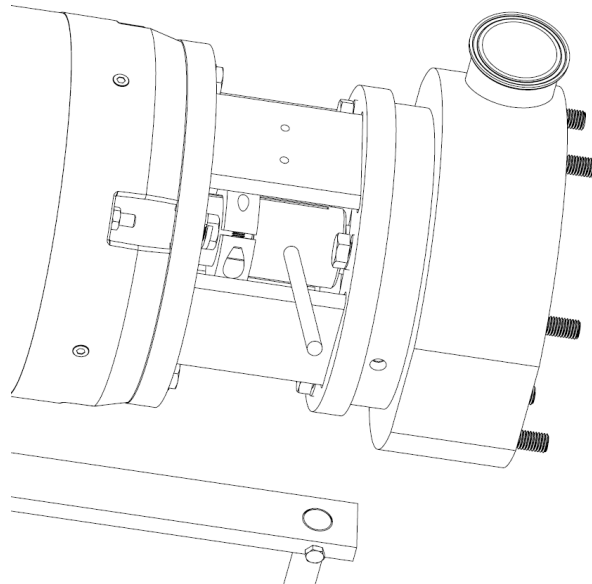


Figure 2

5. Remove the rotor nut, the rotor nut gasket, rotor, then the key as shown in Figure 3. The seal driver may be pushing against the key. With one hand push the seal driver into the casing with index and middle finger on opposite sides of the shaft. Then with your free hand remove the key.

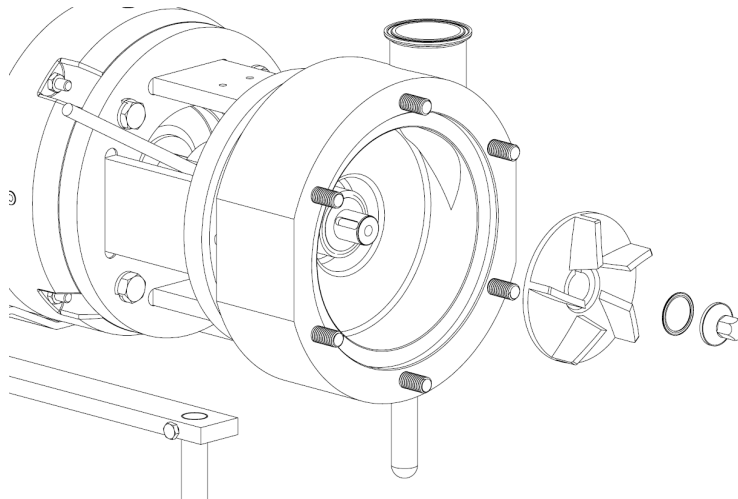


Figure 3

6. Pull out the seal driver. You may have to use a pick to separate the rotating seal from the stationary seal. See Figure 4.

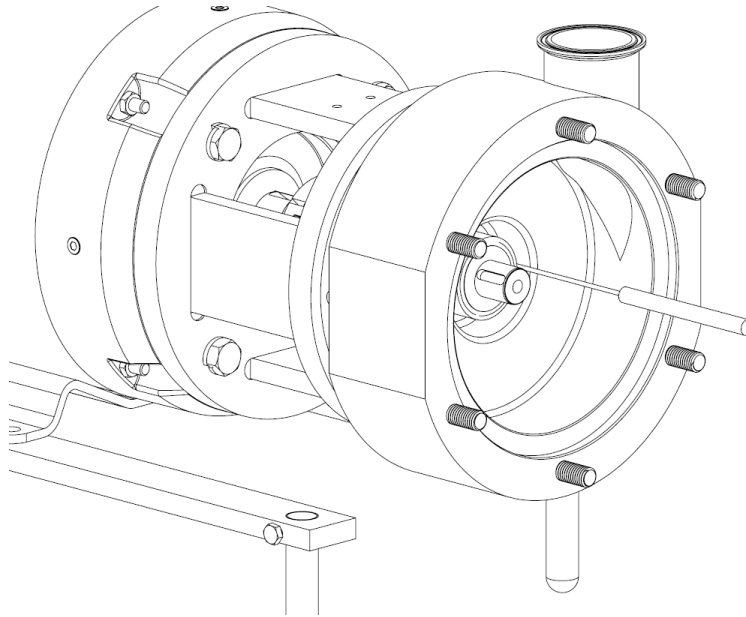


Figure 4

7. The rotating seal, O-ring and spring will come out as a single component as can be seen in Figure 5.

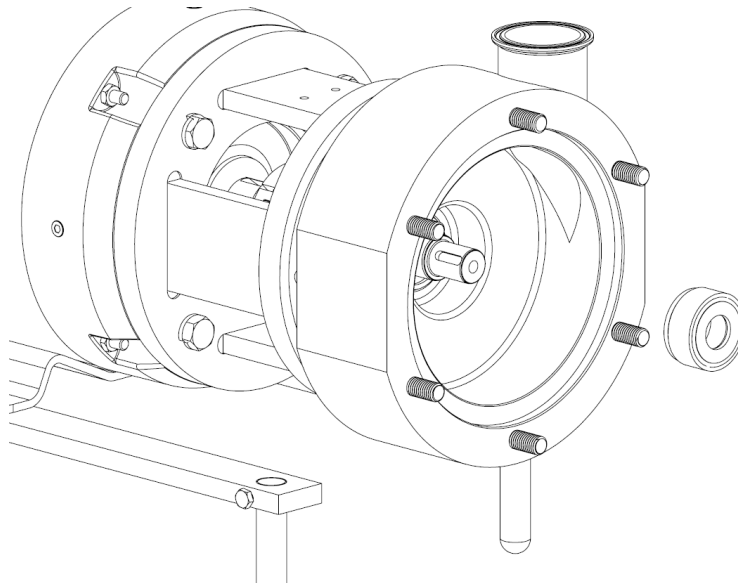


Figure 5

8. Push the stationary seal out from the back of the housing using an O-ring pick or your fingers or both. Pushing on opposite sides of the shaft with constant light pressure is the best method. Make sure to push outside of the rear seal face. See Figure 6.

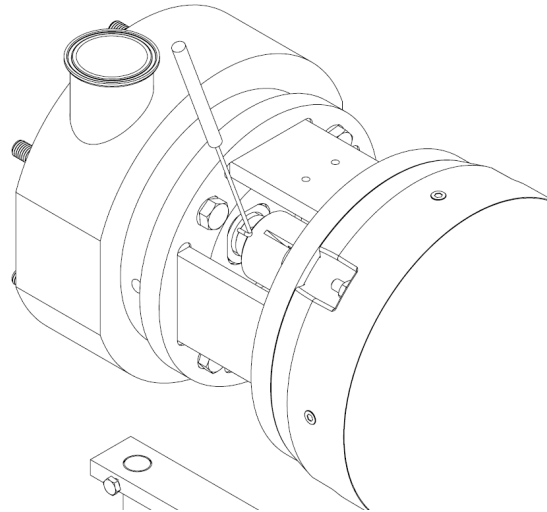


Figure 6

9. Remove the stationary seal once pushed out of its' bore, as shown in Figure 7.

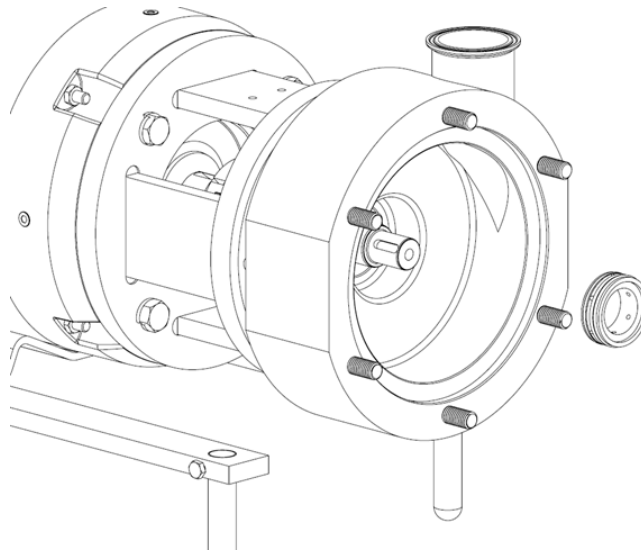


Figure 7

10. Remove the double rotating seal assembly and spring if the mixer has the double seal option. Check the condition of the casing, rotating seal, stationary seal and double seal. Clean and remove any foreign matter before reinstalling the seal. See Figure 8. ***Inspect the seal faces before installing, clean with acetone to remove any oils. Avoid touching with bare fingers***

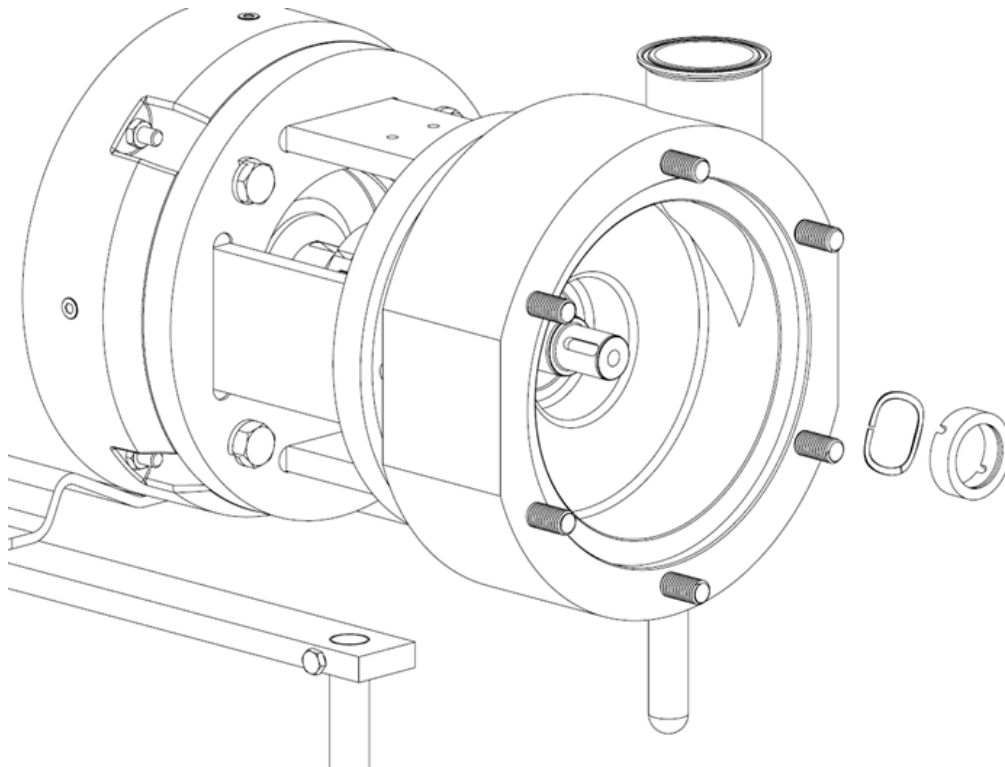


Figure 8

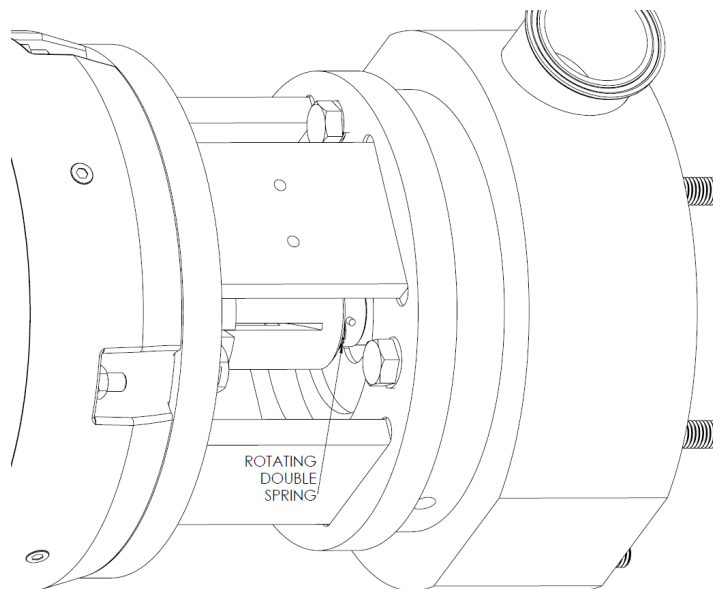
MIXER ASSEMBLY AND SEAL INSTALLATION

When replacing the seal assembly it is recommended that the motor and pump be in a vertical upright position to maintain concentricity about the axis. Prior to starting, lubricate all O-rings with food grade lubricant to ease assembly. Once the mixer is fully assembled turn the stub shaft a few revolutions by hand making sure it turn relatively freely and nothing is rubbing inside the mixer. Running the mixer with foreign objects in the mixer or having the rotor contact the cover will result in serious damage if not completely destroying the mixer. For assembling mixers with single seals, start at step 4.

TOOLS REQUIRED FOR ASSEMBLY AND SEAL INSTALLATION:

Socket for impeller nut	Torque wrench
3/8" wrench/socket (SM1300)	3/8" round bar
9/16" wrench/socket (all other models)	

1. Slide the rotating double spring onto the stub shaft and use the slot to maneuver the spring behind both rotating drive pins, as shown in Figure 9. There are two seal springs in the double seal kit. The rotating double seal spring is the heavier spring.

**Figure 9**

2. Slide the rotating seal over the shaft through the casing as shown in Figure 10.

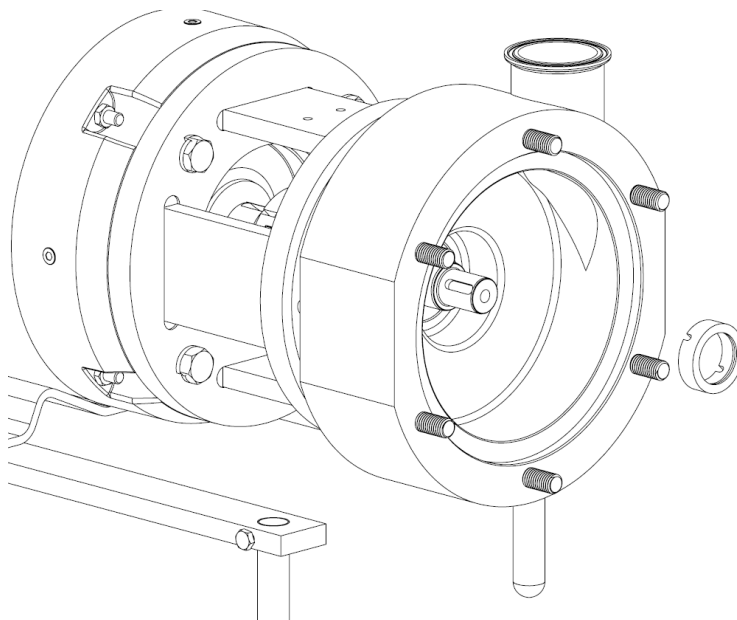


Figure 10

3. Set the slots in the rotating seal over the drive pins as shown in Figure 11.

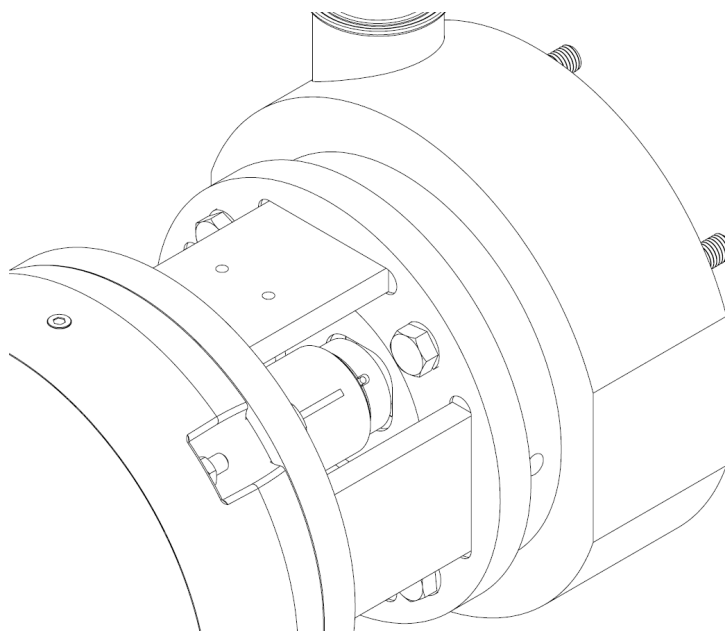


Figure 11

4. Note the square end of the stationary seal. Insert this end in first and slide the stationary seal over the shaft and into the casing as shown in Figure 12.

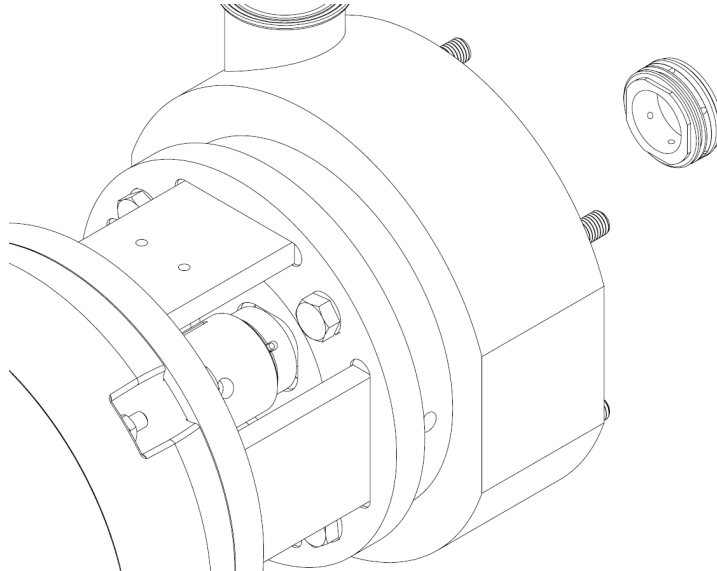


Figure 12

5. Line up a flat on the stationary seal to a flat of the window of the casing and gently press the stationary seal into the casing bore. Food grade lubrication on the stationary seal O-ring(s) may be required. See Figure 13.

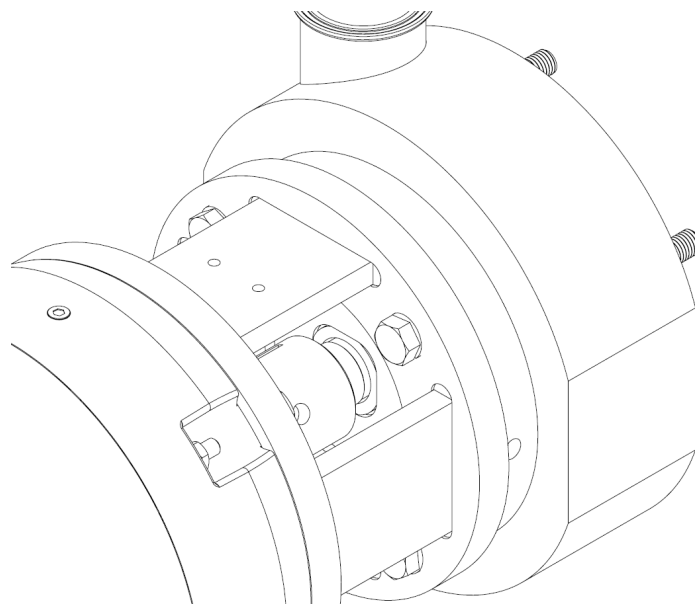


Figure 13

6. Assemble the rotating half of the seal. The order of assembly can be seen in Figure 14. Insert the single seal spring into the seal driver. The single seal spring is smaller than the rotating double spring. Next insert the backup ring. The backup ring may need to be pushed in. Insert the single rotating seal O-ring then insert the single rotating seal. Be sure to line up the slots in the rotating seal with the pins in the seal driver.

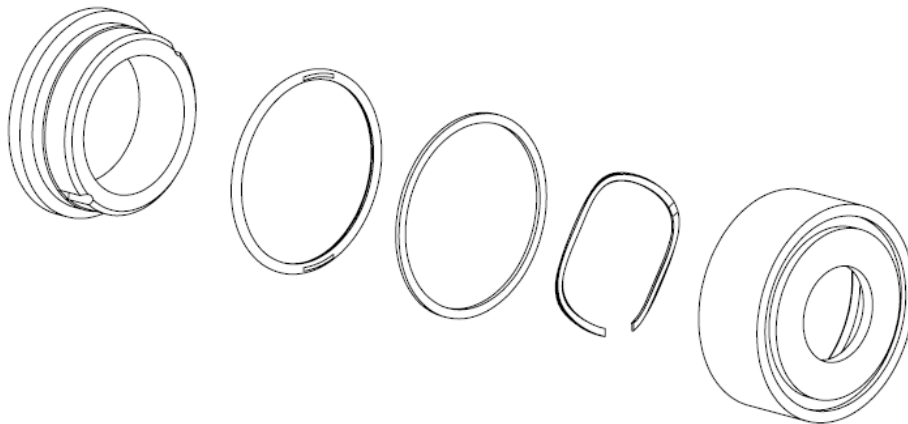


Figure 14

7. Install inner seal driver O-ring, then slide the rotating seal assembly onto the stub shaft, as seen in Figure 15, against the stationary seal. Be sure the outer seal driver O-ring is in the O-ring groove of the seal driver.

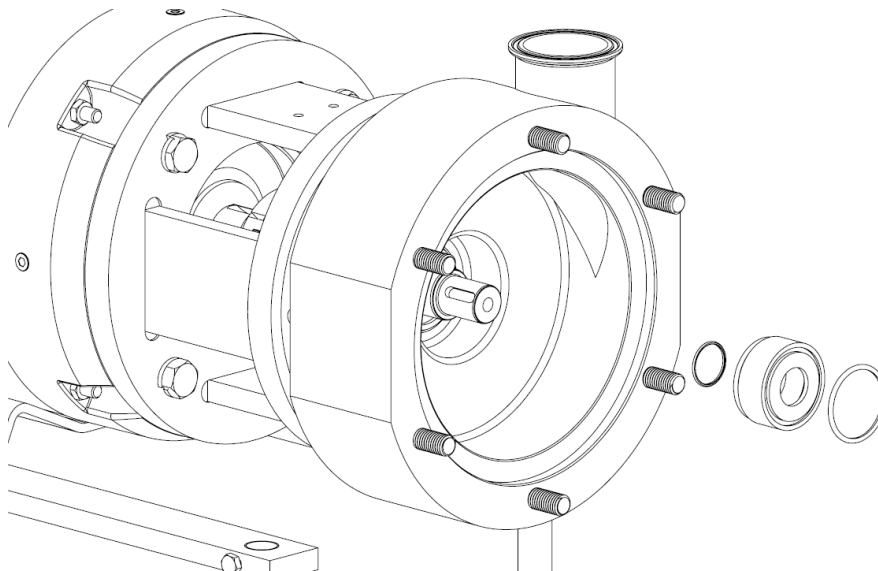


Figure 15

8. Insert key into the keyway in the stub shaft, Figure 16.

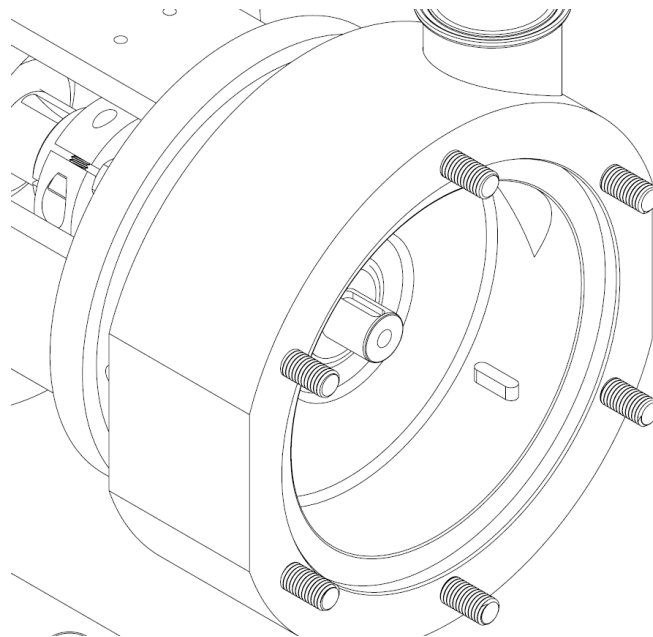


Figure 16

9. Replace the rotor, rotor nut and gasket, Figure 17.

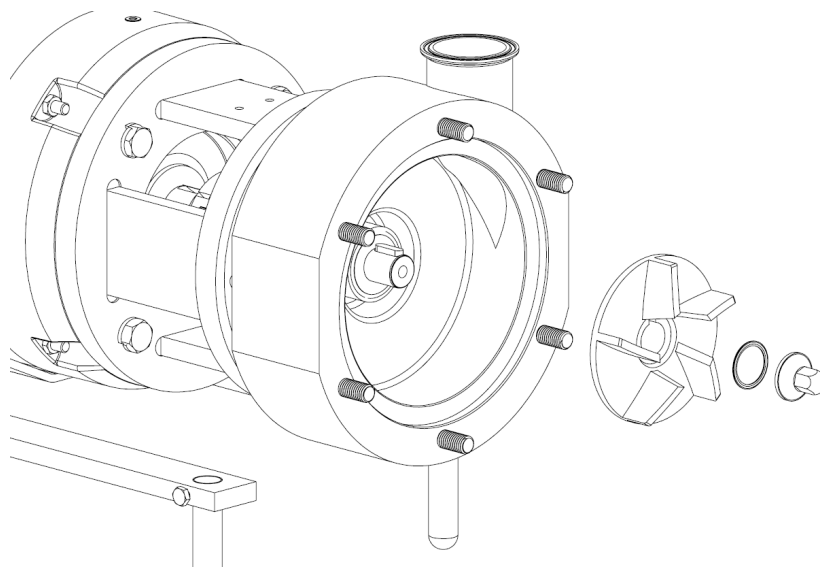


Figure 17

10. Insert the 3/8" bar into the stub shaft, Figure 18, and torque the rotor nut to its respected value (page 5).

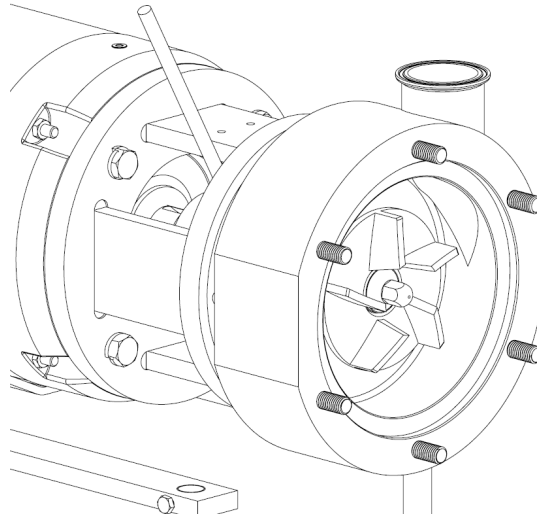


Figure 18

11. Replace the cover, cover gasket and wing nuts as shown in Figure 19. Once the wing nuts are tightened turn the stub shaft by hand or with an extended socket wrench a few revolutions, listening to make sure nothing is rubbing inside the mixer. Running with foreign objects in the mixer or having the rotor making contact with the cover will result in serious damage if not completely destroying the mixer. If the shaft turns freely and the rotor is not rubbing the any other components replace the shaft guard and the mixer is ready to be re-connected to the piping system.

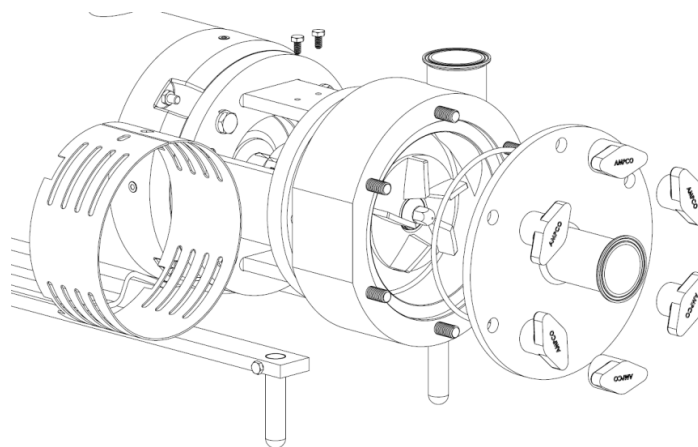
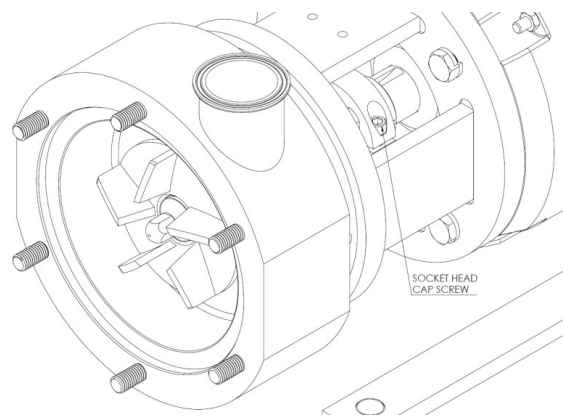


Figure 19

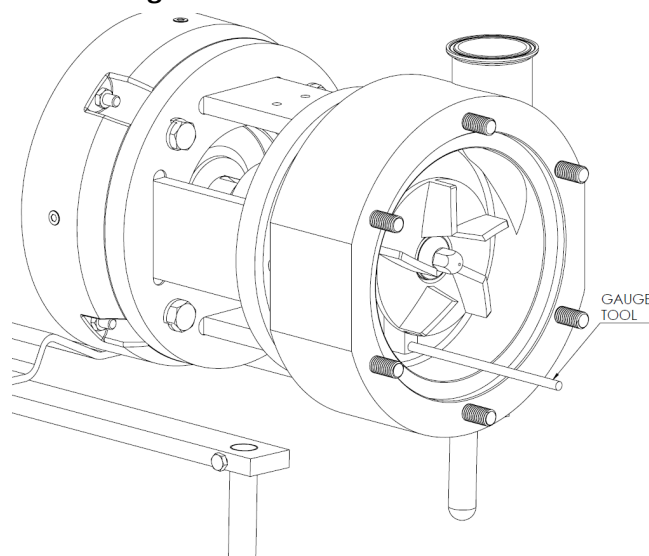
SETTING THE IMPELLER CLEARANCE

Assemble the mixer as described in the Mixer Assembly and Seal Installation section of this manual. For double seals perform steps 1-10 and for single seals perform steps 4-10 of the Mixer Assembly and Seal Installation instructions. Take note that the shaft collar screw must be torqued to the proper torque value as determined by the frame size of the motor (page 5). Using a torque value less than the prescribed value may allow the shaft to move toward the cover and cause damage to the mixer.

1. Loosen the socket head cap screw in the shaft collar and retighten it just enough so the shaft is still able move along the motors axis. See Figure 20.

**Figure 20**

2. Once the stub shaft is able to slide on the motor shaft, insert the gauge tool provided between the back side of the rotor back plate and the back of the casing's bore, as shown in Figure 21.

**Figure 21**

3. While pushing the rotor nut and rotor (figure 21) such that the gauge tool contacts both the rotor back plate and the housing, tighten the socket head cap screw in the shaft collar. Tighten the socket cap screw to the torque value that correlates to the frame size of the motor. It should be noted that tightening the shaft collar screw more than the recommended value may damage or break the screw.

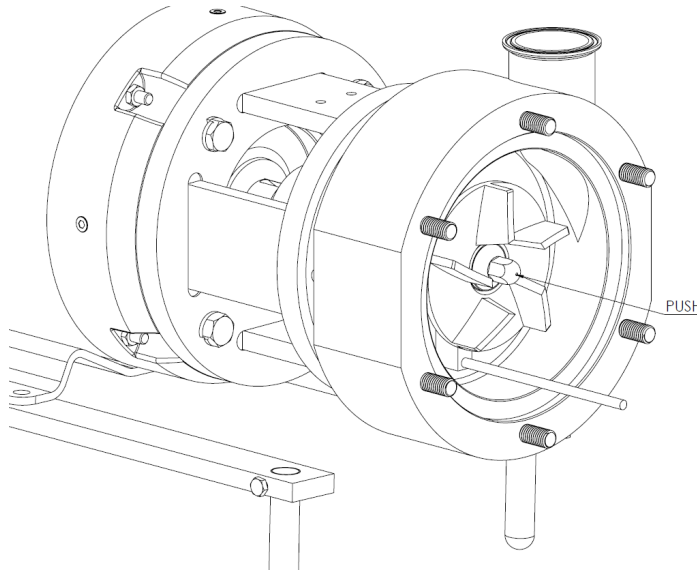


Figure 21

4. After tightening the shaft collar, use the gauge tool to check for play between the rotor back plate and the housing, as shown in Figure 22. If there is noticeable play observed by the gauge tool, loosen the shaft collar and repeat steps 1-3.

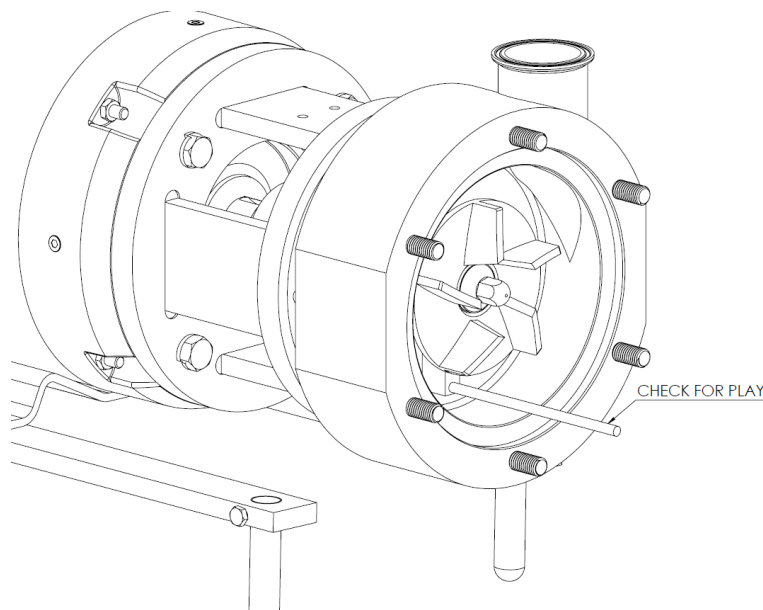


Figure 22

5. Replace the cover, cover gasket and cover nuts, as shown in figure 23. Once the cover nuts are tightened turn the stub shaft by hand for a few revolutions, making sure nothing is rubbing inside the mixer. Running the mixer with any foreign objects inside, or with the rotor making contact with either the cover or the housing will result in serious damage or complete destruction of the mixer. If the shaft turns freely and the rotor is not rubbing against any internal components, mount the shaft guard. The mixer is now ready to be reconnected to the piping system.

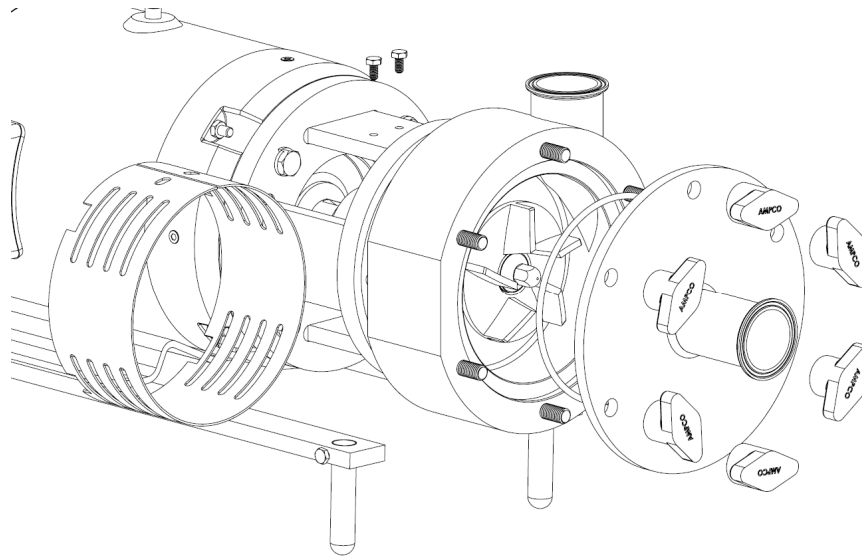


Figure 23

Note: Always turn the stub shaft by hand before start up making sure nothing is rubbing inside the motor, such as foreign objects or the impeller touching either the back inside of the casing or the cover. Also never run this pump dry. Seals will heat up instantly at operating RPMs, score and may no longer seal when damaged.

WARNING: Mechanical seal must never run dry. Seal damage will result.

Sound Piping Practices

Suction and discharge piping must be properly supported and aligned with the mixers suction and discharge ports, to avoid piping stress.

Avoid throttling valves in the suction line of the system.

Check valves must be at a minimum of 5 pipe diameters from the mixer's discharge (Figure 24).

Keep the suction piping short and as direct as possible. Avoid elbows in the suction line of the system. If this is unavoidable, locate the elbow as least 5 pipe diameters away from the mixers inlet. Elbows should have radii greater than twice the diameter of pipe (Figure 24).

Make sure that the NPSH available is always greater than the system's NPSH required.

Avoid bending piping over obstacles, as this will cause the formation of air pockets in the suction line, leading to cavitation and internal damage (Figure 25). Route piping under any obstructions whenever possible (Figure 26).

When using a reducer on the suction end, the reduced centerline should not be below the suction centerline (Figure 27).

The centerline of the small diameter end of the reducer should be above the centerline of the suction line (Figure 28).

Injection line angles should be 45° or less (Figure 29).

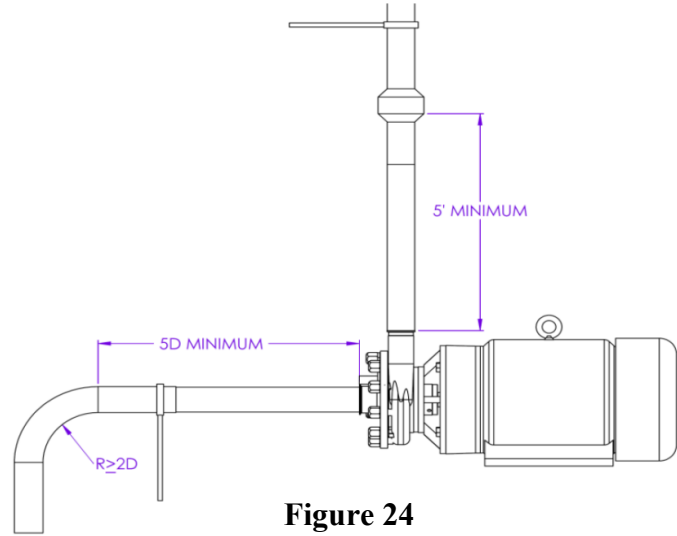


Figure 24

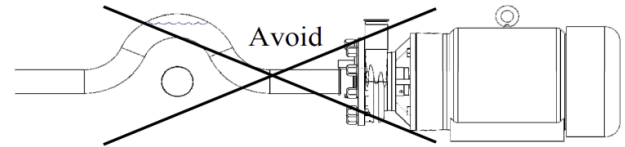


Figure 25

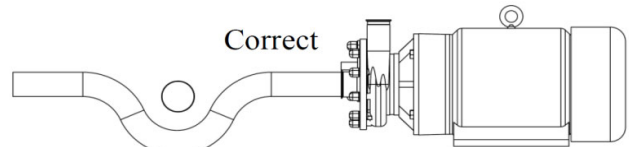


Figure 26

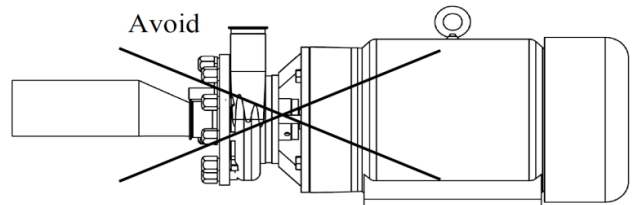


Figure 27

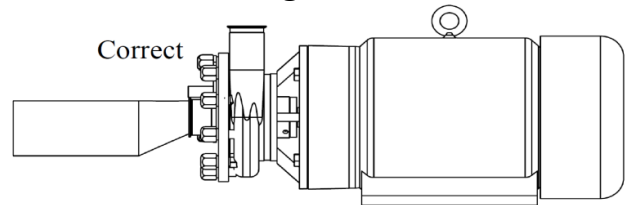


Figure 28

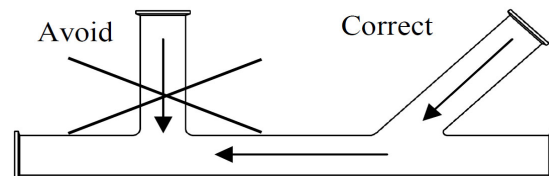


Figure 29

TROUBLESHOOTING

COMMON TROUBLES AND THEIR CAUSES

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

1. No liquid delivered

- Mixer and suction line not completely primed
- Speed too low
- Required discharge too high
- Suction lift too high
- Rotor, piping, or fittings may be clogged
- Wrong direction of rotation

2. Not sufficient capacity

- Air leaks in suction pipe for shaft seal
- Speed too low
- Required discharge head too high
- Suction lift too high or insufficient NPSH available
- Rotor, piping, or fittings partially plugged
- Insufficient positive suction head for hot water or other volatile liquids
- Liquid viscosity too high
- Mechanical problems-rotor damaged, shaft seal defective
- Wrong direction of rotation
- Suction pipe entrance too close to surface of liquid
- Air pockets in pipe high points

3. Not sufficient pressure

- Speed too low
- Mechanical problems- rotor damaged, shaft seal defective
- Small rotor diameter
- Air or gas in liquid
- Wrong direction of rotation
- Air pockets in pipe high points

4. Mixer operates for a while, then quits

- Leaky suction line
- Air leaking in through shaft seal
- Suction lift too high or insufficient NPSH available causing cavitation
- Air or gas dissolved/entrained in liquid
- Suction piping and fitting not completely freed of air during priming
- Air pockets in pipe high points

TROUBLESHOOTING (Continued)

5. Mixer takes too much power

- Speed too high
- Too much flow because required head is lower than anticipated.
- Viscosity and / or specific gravity is higher than specified
- Mechanical problems—binding inside seal from distortion due to piping strains, shaft bent, rotor rubbing on housing
- Wrong direction of rotation

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.

Terms and Conditions

Ampco Pumps Company

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	20%
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.
4. For any pumps and/or parts purchased over (1) year ago, credit will be determined on a case-by-case basis.

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.



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For additional information on the ZP3 series and other Ampco Pumps products, please visit our website: www.ampcopumps.com