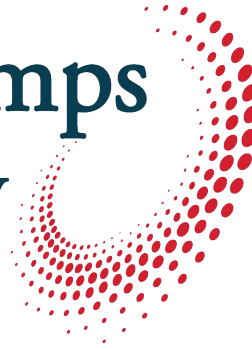


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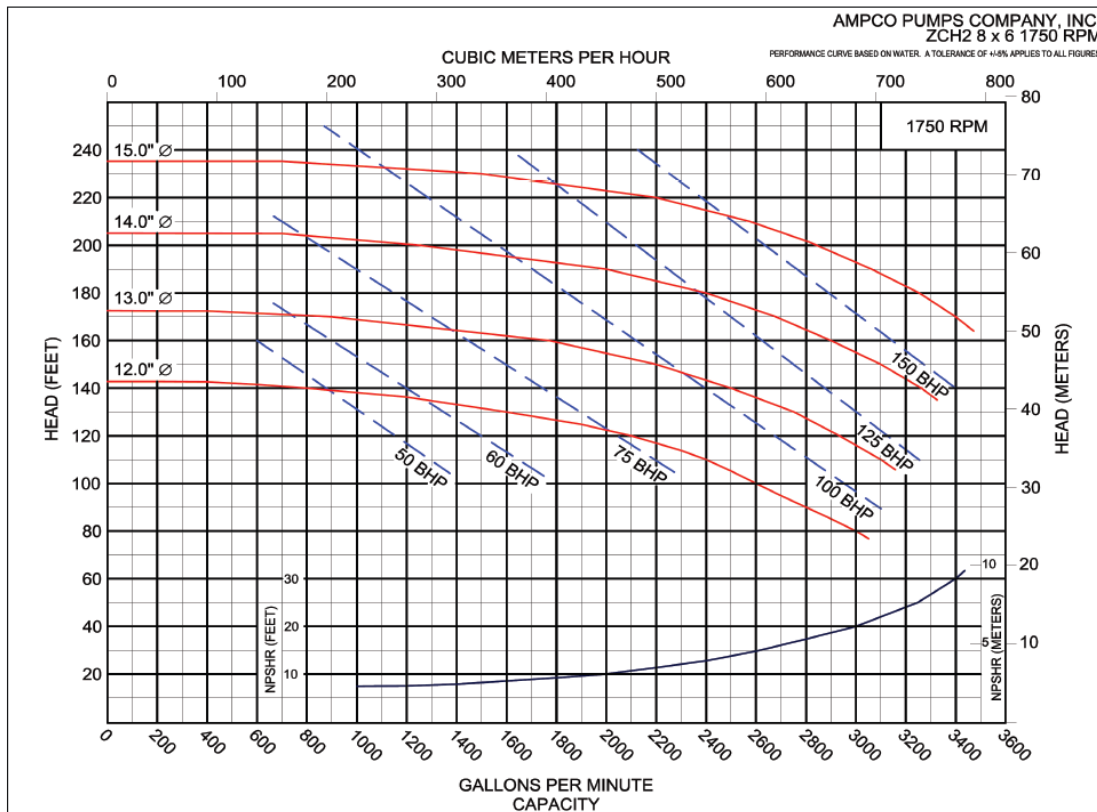
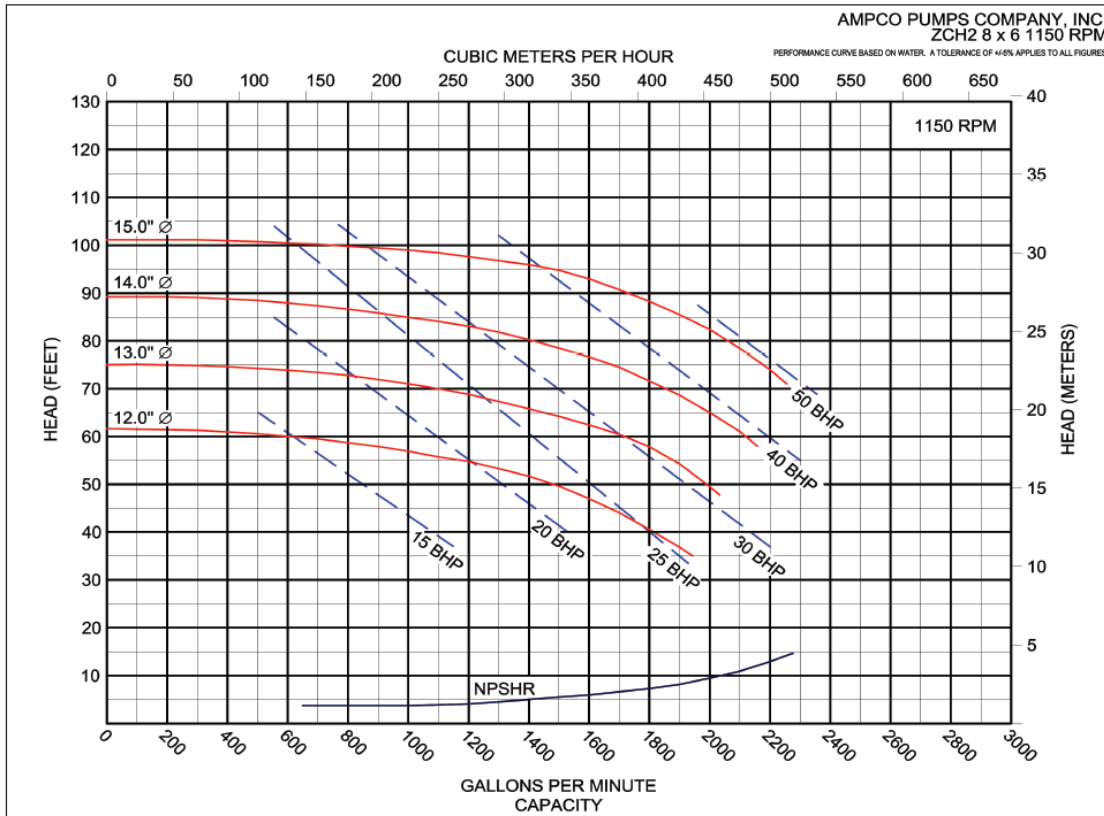
Z-Series: 8x6 Centrifugal Pump **Service Manual**



This service manual includes installation, operation, and maintenance instructions for Ampco Pump Company's Z-Series 8x6 pumping system. Failure to learn the correct procedures for installing and servicing the pump from this manual could result in equipment failure.

Ampco Pumps Company

Z Series 8x6 Performance Curves



PUMP INSTALLATION

Receiving pumps:

Visually inspect shipping crate(s)/pallet(s) for damage. Ampco pumps will be shipped in boxes labeled Ampco Pumps 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 pump for any damage that may have occurred during shipping. Attempt to turn the impeller, it should turn freely. There should be a little noise from the seal which is normal. If there is metal-to-metal contact when the impeller is turned then shipping damage is likely. Leave the protective covers on the inlet and discharge connections until the pump is installed and is ready to be connected to the piping to stop debris from getting into the pump.

Pump Location

Use the following pump location guidelines to help ensure proper pump performance:

- Locate the pump so that the shortest and most direct possible suction piping can be used.
- To facilitate priming, ensure a steady flow, and provide positive suction head, locate the pump below system level, when possible.
- Ensure the NPSH available to the suction end is always equal-to or greater-than the specified NPSH required on the pump performance curve by considering the pump's location in relation to the entire system.

Foundation

The base attached to the pumping unit has pre-drilled mounting holes so that the pumping unit can be fixed to a foundation, providing a permanent rigid support. The foundation is necessary in order to absorb vibration, strain, and shock on the pumping unit. The foundation should be about 6 inches longer and wider than the pump base and have a depth of about 20 times the diameter of the foundation bolts.

General Piping Notes

- Pipe hangers or other supports must be used at proper intervals to ensure proper piping support near the pump. **Do not use the pump to support piping!**
- When flange bolts are tightened no strain should be transmitted to the pump, thus suction and discharge piping should be supported independent of the pump and care should be taken that the pump and piping are properly aligned.
- Piping must be as straight as possible. Avoid all unnecessary bends and fittings. When bends are necessary use 45° or long-sweep 90° pipe fittings in order to decrease minor friction losses.
- Make sure all flanged joints have matching inside diameters and properly aligned mounting holes – especially close to the pump.
- **Do not force piping when making connections. This can cause the impeller to rub on the casing or premature seal failure.**

Suction Piping

It is very important that suction piping be selected and installed such that it minimizes pressure loss and allows sufficient liquid flow into the pump. A proper suction piping system design can eliminate many NPSH problems. The following precautions should be followed to ensure a proper suction piping system.

- Suction piping must be kept as direct as possible. It is suggested that any elbows be kept at least 5 pipe diameters away from the pump's suction flange.
- Suction piping length should be at least ten times the pipe diameter overall.
- When suction piping has a larger diameter than the pump suction opening an eccentric reducer must be used, with the taper oriented down. (Note: Do not use a concentric reducer)
- Suction piping must never have a smaller diameter than the pump suction opening.
- When possible, horizontal suction piping should follow an even gradient.
- For suction lift conditions it is recommended that the suction piping have a gradual upward slope approaching the pump. For positive suction head the suction piping should have a gradual downward slope approaching the pump.

- High point such as loops or arcs must be avoided as they may create air pockets, throttle the system, and produce erratic pumping.
- A valve must be installed in the suction piping in order to isolate the pump during shutdown and maintenance, and to facilitate pump removal. If two or more pumps are connected to a single suction line, each pump should be isolated by a separate valve.
- Gate valves need to be positioned so that air pockets are not produced. If NPSH is critical, globe valves should not be used. (**Note: During operation all valves installed on the suction line must be at full open**)
- To enable the pump operator to monitor pump performance, properly sized pressure gauges may be installed in gauge taps on pump suction and discharge nozzles. Pressure gauges will also indicate the presence of cavitation, vapor binding, or other unstable operation by showing wide fluctuations in suction and discharge pressures. For these reasons Ampco highly recommends gauges.

Discharge Piping

To ensure proper pump performance the following precautions regarding discharge piping should be followed:

- If the discharge piping distance is short the piping can be the same diameter as the pump discharge opening.
- Long horizontal lengths of discharge piping should maintain an even gradient.
- A valve needs to be installed near the pump's discharge opening to prime and start the pump, as well as to isolate the pump during shutdown, maintenance, and to facilitate pump removal.
- High points should be avoided in discharge piping as they can entrap air or gas and retard pump operation.
- If liquid hammer might exist, such as when check valves are used, the discharge gate valve should be closed prior to pump shutdown.

Coupling Alignment

Although the pump and motor were aligned before leaving Ampco Pumps Company, the handling during shipping can alter the alignment, so the alignment procedure must be done carefully. A properly aligned pump will result in a trouble-free installation and smooth pump operation.

Remove the coupling guard and use a small straight edge and feeler gauges or a dial indicator to check the horizontal, vertical, and angular alignment of the coupling hubs. Figure 1 and Figure 2 show a poorly aligned pump being examined. The coupling is properly aligned when a straight edge makes even contact with both coupling hubs in the horizontal and vertical position. If using a dial indicator, alignment is achieved when the dial indicator indicates 0.005" or less of run out in any direction. If adjustments need to be made loosen the motor so that it can be shifted or shimmed as necessary then retighten the bolts and re-check alignment. (**Note: Only make adjustments to the motor. Do not shift the pump to adjust alignment if piping has already been installed, this will cause piping strain.**)

Once final piping connections have been made, motor wiring has been checked, correct shaft rotation has been established, and the piping has filled with liquid, re-check the coupling alignment. After the priming procedure has been completed perform a final coupling alignment check and replace the coupling guard before starting the pump.

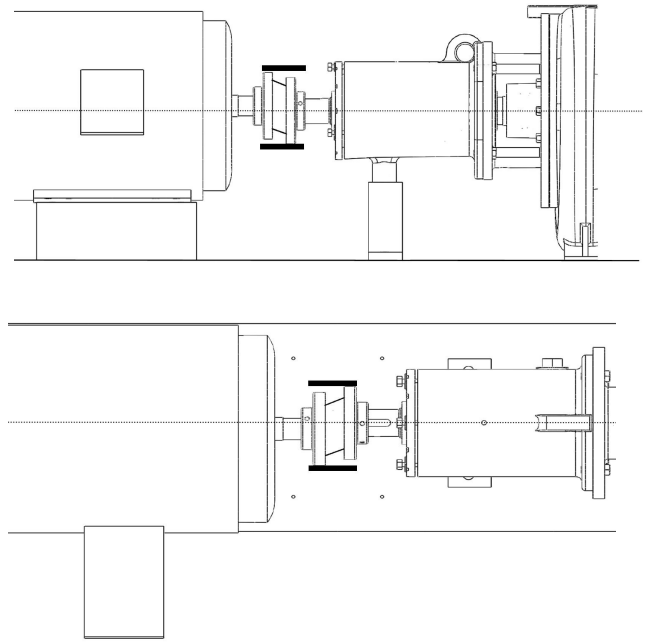


Figure 1: Determining parallel alignment

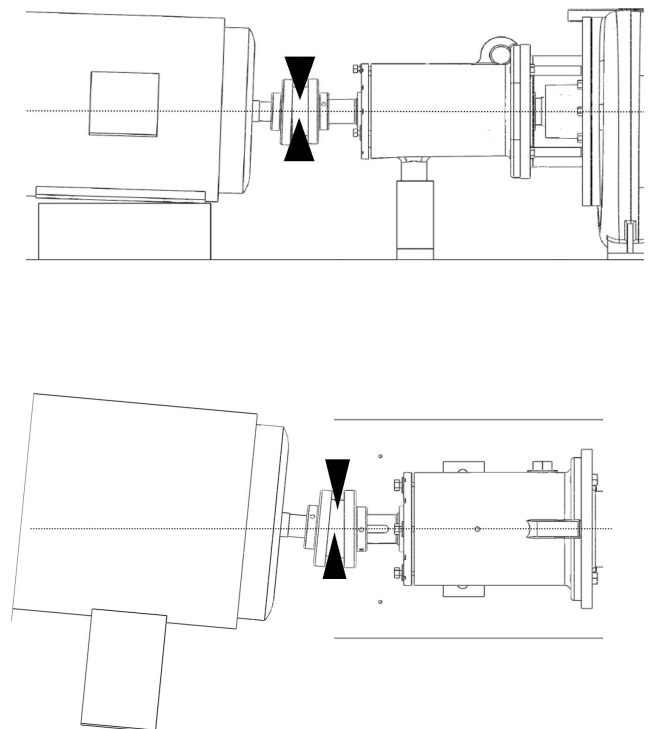


Figure 2: Determining angular alignment

Impeller Clearance Setting (Refer to Figure 3A/B)

During the pre-start check, if the shaft does not turn smoothly check that the impeller has proper clearance. The impeller [2] should be set so that it is not making contact with the casing [1] within the suction flange area. In order to adjust the horizontal position of the shaft the rear bearing frame cover [30] must be rotated (cover is threaded), rotating the cover will move the shaft in and out. To rotate the cover the set screws [32] must be replaced with longer bolts so that a board can be inserted between two of the bolts and the shaft and used as a lever to slowly rotate the rear cover.

Priming

The Z-Series 8x6 pump is not a self-priming pump and must be completely filled with the pumping liquid before operation. If the system has a positive suction head priming can be done by opening the valve in the suction piping as well as the pump's air vents to allow the liquid to enter the pump casing. Rotate the shaft by hand to free entrapped air from the impeller and then ensure that all air has been forced out by the liquid before closing the air vents. If the pump has a suction lift, priming must be done by using foot valves, ejectors or manual filling of the pump casing.

CAUTION!

Running the pump dry will result in serious damage to the mechanical seal.

Pre-Start Checklist

Before operating the Z-Series 8x6 pump ensure that all of the following requirements are met

- Check that all motor and starting device wirings match the wiring diagram.
- Make sure the shaft rotates clockwise when viewed from behind the motor.
- Refer to motor instructions before starting if the motor has not been operated over an extended period of time.
- Make sure that that voltage, phase, and line circuit frequency match what is specified on the motor data plate.
- Turn shaft by hand to make sure it rotates freely.
- Tighten all gauge and drain tap plugs. When not in use, close the gauge cocks on pumps fitted with pressure gauges.
- Check that all flange bolts are tightened and the suction and discharge piping is not leaking.

Pump Operation

WARNING

Operating the pump without an approved coupling guard installed could result in operating personnel injury.

Start Up Instructions

1. Install coupling guard.
2. Set the suction line gate valve to full open and close the discharge line gate valve.
3. Fill the suction line and prime the pump.
4. Start the motor and immediately check the pump and suction piping for leaks.
5. As soon as the pump reaches operating speed, open the discharge gate slowly until complete system flow is achieved. There may be valve chatter during transient periods during valve adjustment. Be aware that the pump's motor is specified for the flow and pressure specified by the customer and that higher flow rates could damage the motor.
6. Check for leaks in the discharge piping.
7. (For pumps with pressure gauges) Open gauge cocks and record pressure reading. Check that the pump is performing as specified by the performance curve.

Shut Down Instructions

(Note: If the pump will be shut down for an extended period refer to the Extended Duration Shutdown)

1. Slowly close the discharge piping gate valve. (Closing valve too quickly can cause hydraulic shock)
2. Turn off power supply to the pump.

Short Duration Shutdown

For short shutdown periods the pump can remain filled but make sure the pump is fully primed prior to restarting. If the pump is subject to freezing conditions then the pump exterior should be insulated or heated and the fluid within the pump casing must be kept moving in order to prevent freezing.

Extended Duration Shutdown

For extended duration shutdowns close the suction piping gate valve or if no suction valve is installed then drain the suction line to stop liquid flow to the suction nozzle. Remove pump drain and vent tap plugs as required and completely drain the pump casing. If the pump will be subjected to freezing conditions during shutdown then all liquid must be completely blown out of all passages and pockets using compressed air or the pump must be filled with an antifreeze solution to prevent damage.

Assembly – 8x6

(Refer to Figure 7A/B)

1) Attach the [14] bearing frame's foot (GX5108901) onto the [13] bearing frame (GX108900) with a [18] 1-8 x 2.25 UNC bolt (GX5509135).

2) Attach the bearing frame assembly to the steel base using (2) 3/4-10 x 2.75 UNC bolts (GX5508145) as shown in Figure 3 and the corresponding nuts, washers, and lock washers.

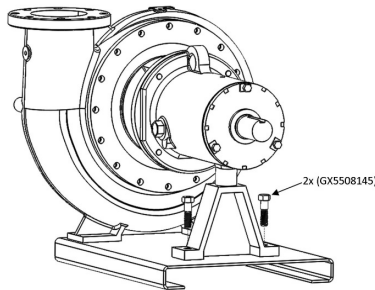


Figure 3: Step 2 illustration

3) Gently tap the bearing frame shaft's [10] drive pin (GX5096410) into the shaft with a small hammer

4) Press the [37] bronze labyrinth seal provided with the bearing frame into the [5] pump adapter (GX8406591) follow the orientation shown in Figure A. Put the large O-ring (GX5508140) around the 5.9" diameter rim (surrounding the labyrinth seal). Affix the adapter to the bearing frame assembly using (4) 5/8-11 x 1.5 UNC bolts (GX5507120) – tighten the bolts evenly and gradually.

5) Press the stationary portion of the 2-3/4" elastomer-bellows seal into its pilot in the seal housing by hand or with a plastic pipe. Do not use hard objects on the seal face. Refer to Figure 4.

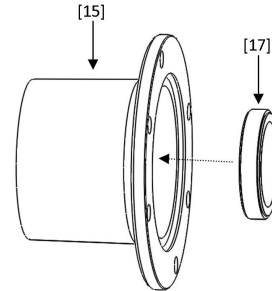


Figure 4: Step 5 illustration

6) Place the [8] seal housing gasket (GX8206621) onto the pump-side of the adapter. Align the 6 holes and place the [15] seal housing (DX9406587) into its pilot.

7) Press the cover's [7] wear ring (DW8206787) into its respective place in the cover.

8) Attach the [4] cover (DC8406547) to the adapter – align the 6 holes and affix it with (6) 1/2-13 x 1.5 UNC bolts (GX5505120).

9) The following instructions apply to single seal pumps only, for double seals refer to Appendix B. Prepare the shaft sleeve (DX8206757): Place the #140 O-ring inside in the groove, and the #150 O-ring on the shoulder's face. Next drop the spring onto the sleeve so that it rests on the shoulder and push the rotating portion of the elastomer-bellows seal onto the sleeve to meet the spring. The use of a rubber emulsion temporary lubricant is suggested. Make sure the polished sealing face is directed away from the shaft sleeve's face/shoulder. Refer to Figure 5.

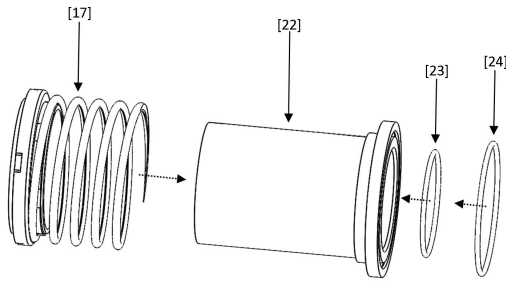


Figure 5: Step 9 illustration

- 10) Insert the shaft sleeve with the rotating portion and spring attached around the pump shaft slowly until it meets with the seal. You must align the notch in the shaft sleeve with the drive pin from step 3. Place the impeller key into the tapered keyway.
- 11) Prepare the impeller nut (DI8206767): Place the #147 O-ring into the groove on the impeller nut. Apply a generous amount of anti-seize to the female threads in the nut.
- 12) Place the impeller onto the drive shaft making sure to align the tapered keyway. The impeller will compress the spring on the seal so some resistance will be felt. Affix the impeller nut by using a torque wrench and a 2 5/8" socket. Hold the impeller in one of its veins using a non-marring rod to stop the impeller from rotating. Torque to 200 ft-lbs. Refer to Figure 6.
- 13) Prepare the pump casing (DV8406507): Press the wear ring (DW8206777) into its respective place in the casing. Place the large gasket (GX8206611) onto the large opening (opposite the inlet flange). Refer to Figure 6.

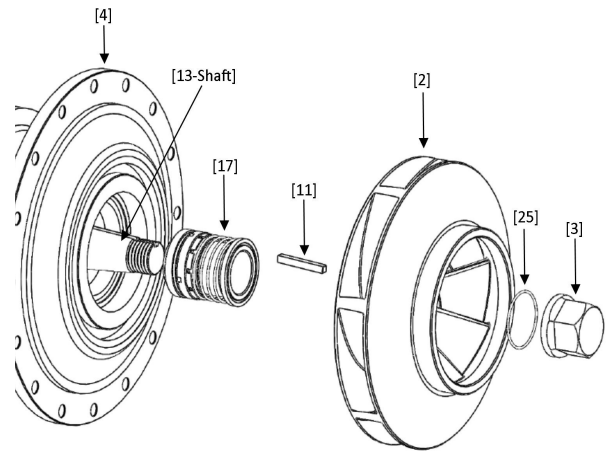


Figure 6: Step 12 and Step 13 Illustration

- 14) Lift the casing and place it onto the adapter. Be careful to guide the impeller into its wear ring on the casing. Attach it with (16) 5/8-11 x 1.5 UNC bolts making sure to go through the holes in the gasket.
- 15) Align the pump casing's foot mount slots with the holes in the base and attach using (2) 1/2-13 x 2.5 UNC bolts (GX5508140) and the corresponding nuts, washers, and lock washers.

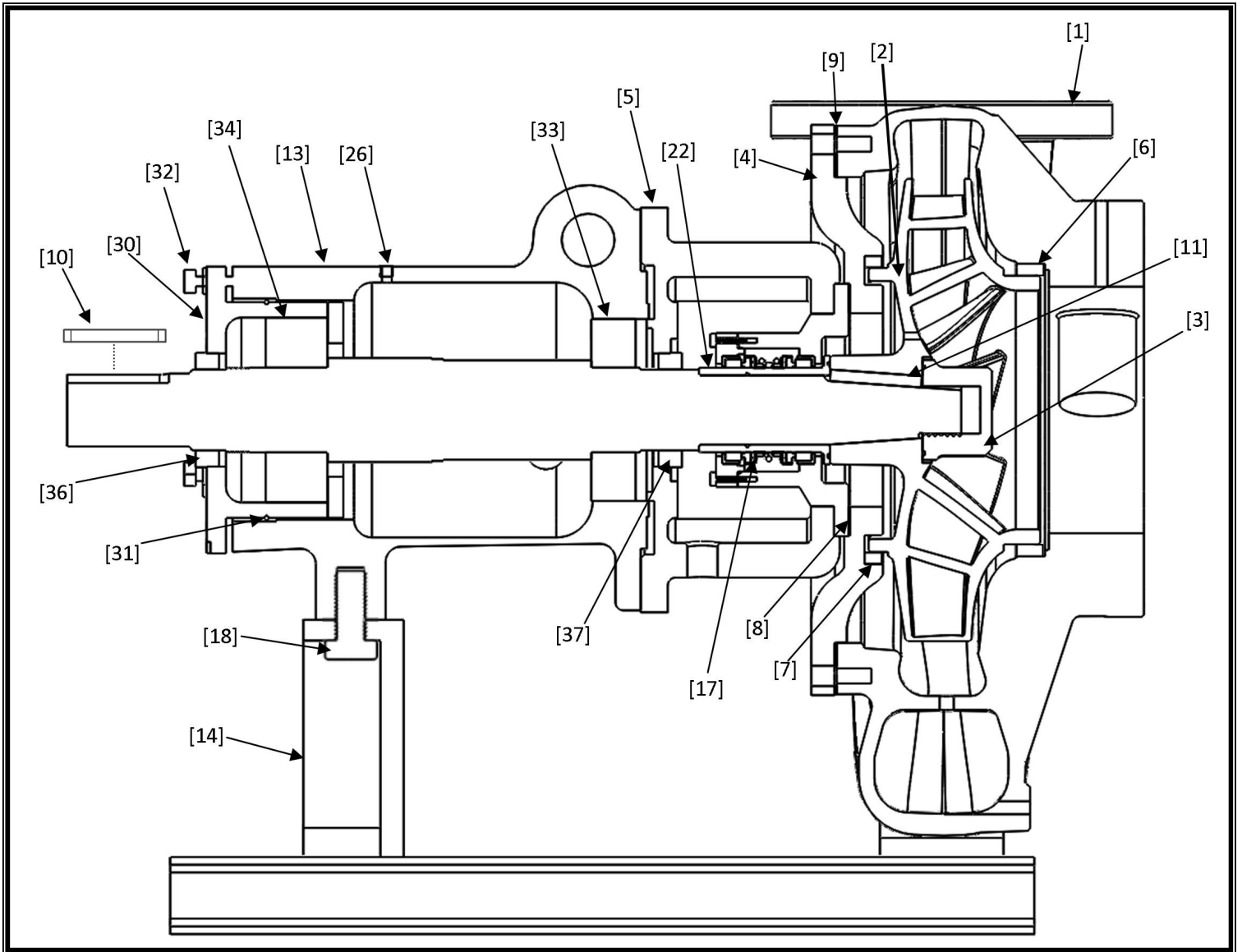


Figure 7A: Double Seal Parts Diagram

*Refer to the parts list appended to this manual for the part name, ordering number, and quantity corresponding to each number in Figure 7.

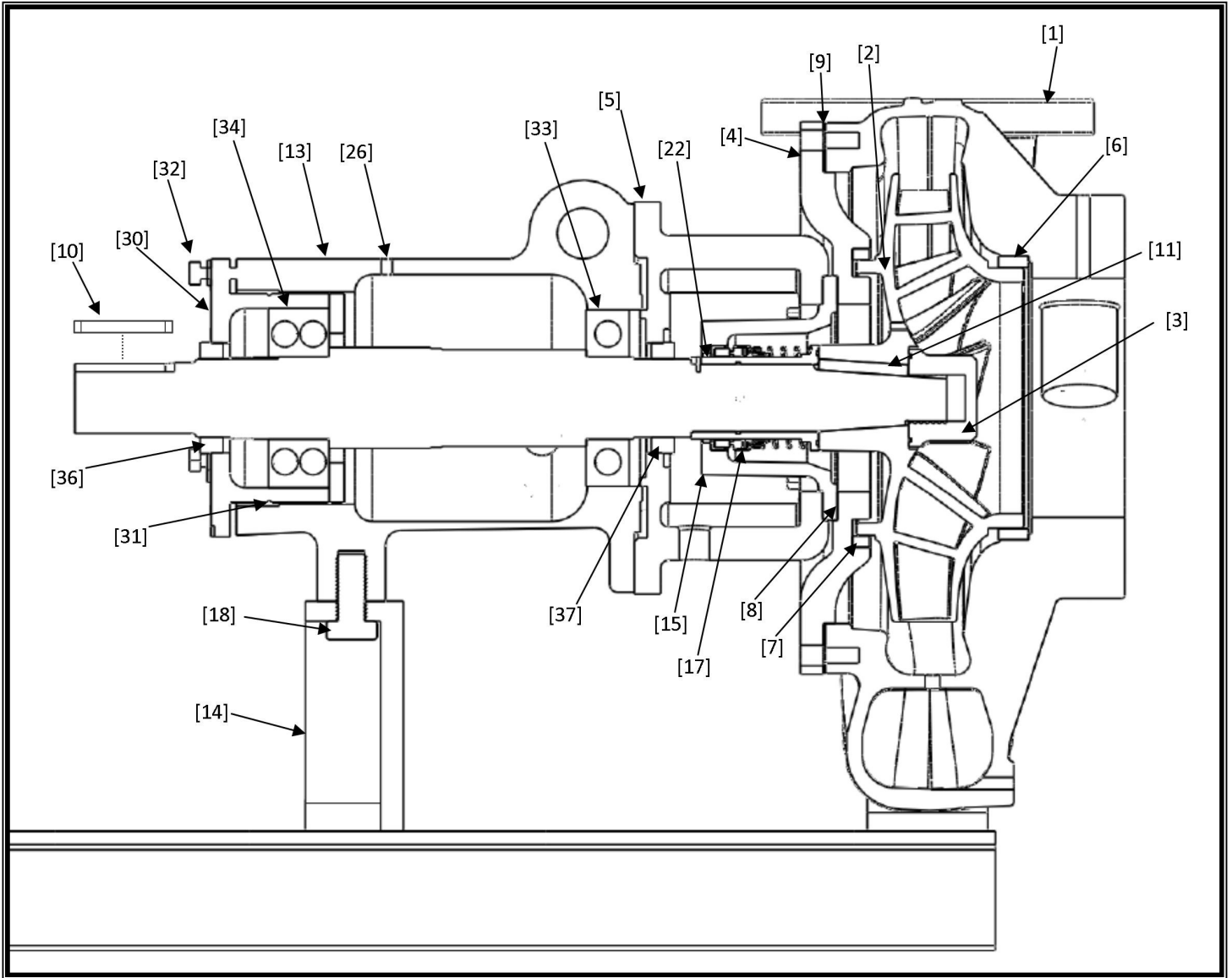


Figure 7B: Single Seal Parts Diagram

*Refer to the parts list appended to this manual for the part name, ordering number, and quantity corresponding to each number in Figure 7.

Lubrication

CAUTION!

Check the sight glass to ensure oil levels are correct prior to operating the pump

Over lubrication and under lubrication of ball bearings is detrimental to bearing performance and will result in increased heating and a reduced life. To determine overheating always use a thermometer- not the sense of touch. Below, Table 1 shows the approximate normal operating temperature with a tolerance of plus 15°F for varying temperatures of pumping liquid; based on a pump operating in room temperature of 70°F. The bearings have a maximum operating temperature of 175°F.

The relationship between temperature and lubrication is an indication of performance. The tabulation shown in Table 1 is intended to serve as an approximate guide for determining operation for standard pumps.

Table 1: Approximate Normal Operating Temperatures

	Temperature (°F)		
Pumping Liquid Temperature	60	200	300
Approximate Normal Line Bearing Temperature	115	140	160

It is necessary to flush water on the shaft through a flushing gland or the rear cover plate seal cage when liquid temperatures are above 250°F. This can be done either through a flushing gland or the rear cover plate seal cage.

Oil Lubrication

Standard lubrication is an oil bath. Only use premium quality hydraulic oil containing anti-foam, anti-oxidation, and anti-rust additives. Do not use detergent oils.

Over time, contamination causes oil to lose its lubricating qualities. After 200 hours or the first month of operation an oil change is recommended, and then every three months or 2000 hours (whichever occurs first). Use Table 2 to determine the recommended viscosity of oils based on operating temperature.

Table 2: Recommended oil viscosity

Bearing Temperature	ISO Grade	Oil Viscosity at 100°F
Up to 150°F	46	215 SSU
150°F to 200°F	68	300 SSU
Above 200°F	100	470 SSU

Appendix: A

Parts List

Number	Description	Part Number	Qty. per pump
1	Pump Casing	DV8406507	1
2	Impeller	DI8406527	1
3	Impeller Nut	DI8206767	1
4	Rear cover	DC8406547	1
5	Pump Adapter	GX8406591	1
6	Casing Wear Ring	DW8206777	1
7	Cover Wear Ring	DW8206787	1
8	Stuffing Box Gasket	GX8206621	1
9	Rear Cover Gasket	GX8206611	1
10	Drive Pin (shaft to shaft sleeve)	GX5096410	1
11	Impeller Key	GX5051800	1
12*	Casing Drain Plug (3/8 NPT)	DX5075500	1
13	Bearing Frame w/ 17-4PH shaft	GX5108900	1
14	Bearing Frame Base	GX5108901	1
15	Stuffing Box (single seal)	DX8406587	1
16*	Adapter oil-seal o-ring	GX5042813	1
17	Seal (2-3/4) Elastomer Bellows	Varies - Contact Factory	1
18*	Bearing Frame Base Screw	GX5509130	1
19*	Cover screws	GX5076700	12
20*	Stuffing box screws	GX5505130	6
21*	Stuffing box lock washers	GX5505010	6
22	Shaft sleeve	DX8206757	1
23*	#140 O-Ring	GX5042800/01/02	1
24*	#150 O-Ring	GX5042805/06/07	1
25*	#147 O-Ring	GX5042810/11/12	1
26	Fill plug		1
27*	Clamp Ring (rear bearing)		1
28*	Locknut (rear bearing) – N14		1
29*	Lock-washer - N14		1
30	Rear Bearing Carrier		1
31	Rear Bearing Carrier o-ring		1
32	Set Screw – bearing carrier		3
33	Front Bearing (inboard)		1
34	Rear Bearing (outboard)		1
35*	Oil Fill Level Indicator – Sight Glass		1
36	Rear Labyrinth Seal (outboard)		1
37	Front Labyrinth Seal (inboard)		1

Note: Starred numbers have not been called out in Figure 7.

Double Seal Assembly Instructions

The double seal-supplied pumps require sub-assembly of the stuffing box prior to installation on the pump. Below are the steps required (Refer to Figure 8):

1. Press the inboard stationary seal [2] into the inner cavity of the stuffing box [1] (DX8307347)
2. Press the outboard stationary seal [7] into the gland [9] (DX8307337)
3. Prepare the shaft sleeve [3] (DX8307367):
(Refer to Figure 9)
 - a. With the flanged edge facing the inboard direction (toward the impeller) first put the shaft sleeve through the seal face in step 1. Apply the inboard rotating seal [4] onto the shaft sleeve with the use of temporary rubber emulsion lubricant or clean water. **You must do this sideways as gravity will allow the inboard seal face to drop out of the bellows.**
 - b. Place the spring [5] onto the shaft sleeve and make sure it seats around the inboard seal from step 3a.
 - c. Apply the outboard rotating seal [6] onto the shaft sleeve in the reverse direction of the inboard seal again using temporary rubber emulsion lubricant or clean water.

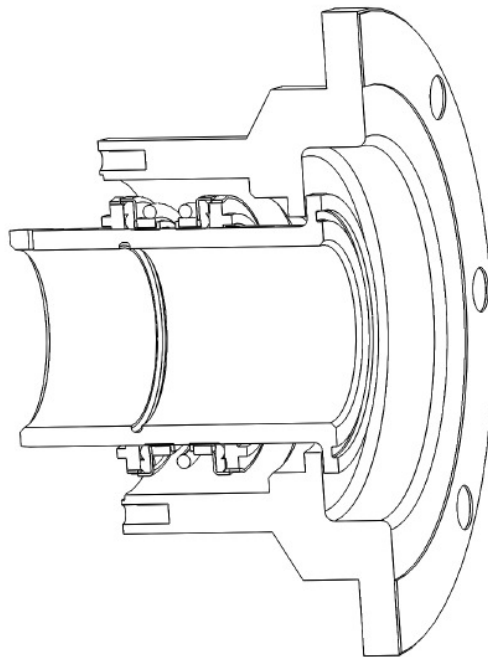


Figure 9

Appendix: B

Double Seal Assembly Instructions

4. Place the gland [9] with the outboard stationary seal so that it locates on its pilot in the rear of the stuffing box. **Do not forget the o-ring [8] (GX5042814)**
5. Tighten the 4 screws [11/10] (GX5501110) evenly and carefully.
6. Prepare the shaft sleeve: Place the #140 O-ring inside in the groove, and the #150 O-ring on the shoulder's face– the double seal sub-assembly is now complete and can be assembled onto the pump.

Continue pump assembly with step 11.

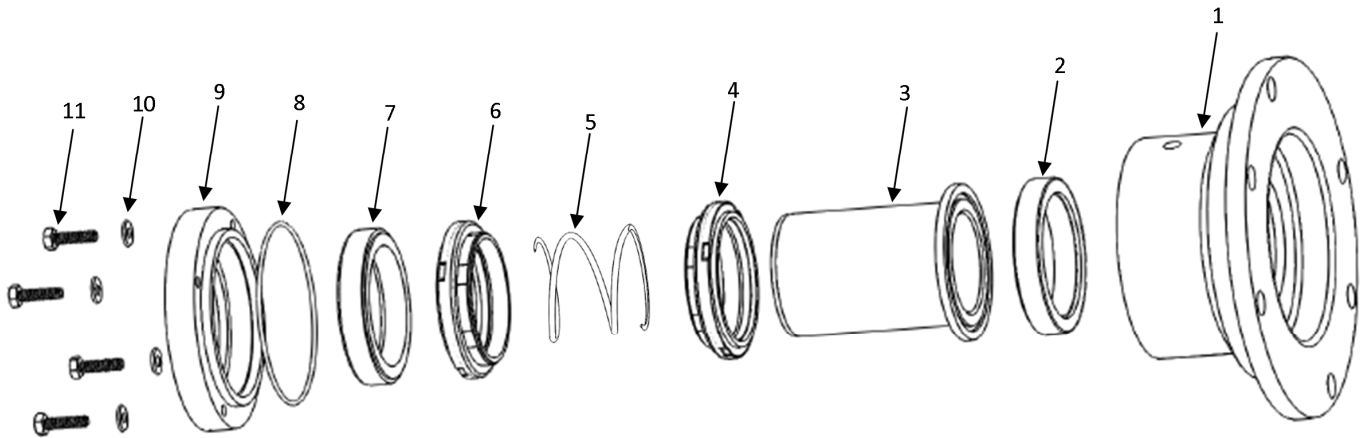


Figure 8

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%

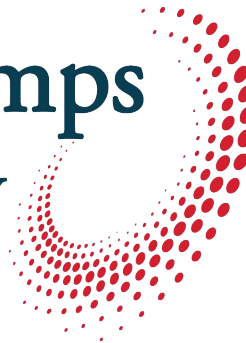
Additional restocking charges may be assessed for any of the following circumstances.

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.

Ampco Pumps Company



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