

## INSTRUCTIONS

The care required of this pump, while nominal, is very important. We recommend a careful review of the installation and maintenance covered in this instructional pamphlet to ensure extended trouble-free service.

## LOCATION

The motors used on Ampco pump units have been selected as the best for the anticipated environment. For greatest service life, mount the pump and motor where the environment is relatively clean, dry, and non-corrosive. Standard totally-enclosed motors may be installed where dirt, moisture and mild corrosion are present or in outdoor locations. Specialty motors may be required for moist, corrosive, or explosive environments. Motor drain plugs (if not equipped with automatic drains) must be removed periodically to drain accumulated condensation. Pump units should be located where daily visual inspection is possible and no surrounding structure interferes with ventilating air over or through the motor.

## INSTALLATION

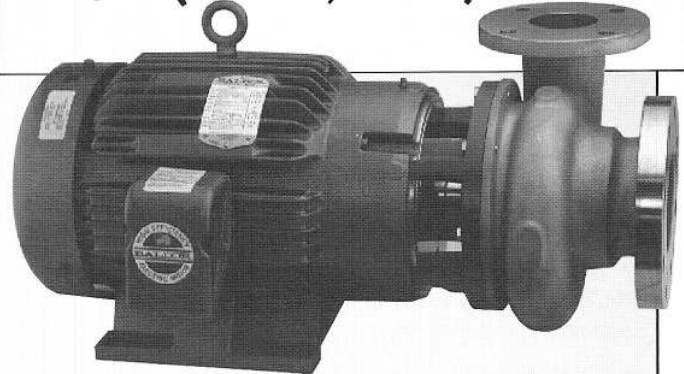
Installation of Ampco pumps should be made as close to the supply of liquid as possible, with short and direct suction piping. Avoid high points in the piping where air pockets can form. The suction and discharge piping should be simple with the connections properly aligned to prevent any strain from being placed on the pump casing. Provisions should be made for pipe expansion and contraction in services handling hot or cold liquids. Base-mounted pedestal pumps must be realigned AFTER installation and piping is completed.

## MAINTENANCE

Daily observation of Ampco pumps while in operation is the ounce of prevention needed to extend the service life. Mechanical seals are selected for maximum life with due consideration to the economy of the installation. The seal and shaft sleeve are expendable items. Other pump parts are designed for indefinite life expectancy, except as they may be corroded and/or eroded by aggressive products or by misapplication such as undersizing, oversizing, cavitation, etc. Bearings on some pedestal pumps and some motors are prelubricated and require no additional lubrication. Schedule for regreasing other types of bearings will vary, depending on size, speed, duty, and environment. For guidance, a steady running, indoor installation in a relatively clean atmosphere at 40°C(104°F) ambient should not require grease for two years. Care should also be taken not to over grease motors. Pumps handling corrosive or otherwise aggressive solutions should be flushed with clean water after each use because stagnant conditions are usually most corrosive. In sea water, Ampco Alloy pumps provide cathode protection for stainless steel parts. To prevent crevice corrosion and pitting, drain and then flush out the pump with fresh water when inactive for periods greater than one week.

Ampco "Z" Series pumps fitted with standard mechanical seals have all-metal seal parts of 316 stainless steel, carbon rotating face, ceramic stationary seat, and Buna-N elastomers. Other seal types are supplied when specified. Optional materials such as

## ZC2/ZCH2 PUMPS KC2 (1½x1¼, 2x1½) PUMPS



Viton, EPDM, or Teflon elastomers, Tungsten Carbide, Silicon Carbide, or Ni-Resist faces can be supplied when requested. The mechanical seal should be replaced at the first sign of leakage where the shaft enters the pump. Leakage may cause motor bearing damage. Also, since the primary seal surfaces are lapped to precise flatness, the seal should be replaced whenever the pump is dismantled to the point of separating the seal faces. Always keep a replacement seal kit on hand. It includes a complete seal along with all the gaskets and o-rings required to rebuild the pump.

There may be other pump assemblies, parts and seal arrangements not shown or otherwise described in this pamphlet, that require the same philosophy of seal positioning. It is suggested that highlights of these instructions be applied while paying close attention to parts arrangement during dismantling.

### MECHANICAL SEALS (Self-Locating)

The instructions on the following pages are specifically for bellows type mechanical seals. Being self-locating, the rotating parts need only to be approximately positioned on the shaft sleeve so that contact occurs between the rotating and stationary seal parts before the sleeve butts against the locating shaft shoulder. This sequence of contacts will cause the oil-lubricated rotating seal to slide along the sleeve to the correct location. The oil-softened film will then set up, bonding the bellows to the shaft sleeve to maintain position and transmit torque.

### MECHANICAL SEALS (not Self-Locating) Type-9

Mechanical seals which are not self-locating require seal manufacturer's instructions as to the initial spring compression, drive collar location, etc. Following those instructions, the assembler may best determine and mark such locations on the shaft or sleeve by first assembling the pump without the seal. The gland location or end stuffing box may then be scribed onto the shaft or sleeve as a reference point for locating seal's rotating parts in relation to stationary parts.

## Single Mechanical Seal T-21

### DISMANTLE AND REPLACE PARTS AS FOLLOWS:

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

1. Remove casing by unbolting eight casing bolts. There is a choice of (a) first removing the inlet and discharge piping, or (b) sliding the motor and remaining pump parts back and free of the casing without disturbing the piping.
2. Remove the impeller screw. Ease the impeller off the shaft. Pinch bars between the impeller and cover may be required. Remove the impeller key.
3. The shaft sleeve and rotating parts of the mechanical seal are removed by drawing the sleeve off the shaft (Initial use of anti-seize lubricant should permit hand removal). A puller, if necessary, should be the type that grips the O.D. The cover may now be removed from the adapter or pedestal. This is a piloting fit, pry if tight.

**The fluid end is now completely dismantled: additional procedures are dictated by purpose for which unit was disassembled.**

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

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

4. The seal's flexible bellows may stick tightly to the sleeve. Bathe in oil to soften the adhesive, or cut away with knife. Remove the o-ring from the shaft I.D. (ZCH2 models only).
5. Press the seal's stationary seat with cup or o-ring out of the cover.
6. Thoroughly clean sleeve, seat cavity and shaft with solvent and dry with a clean cloth.

**Loss of capacity and/or head due to excessive running clearance (1/16" or more per side) between impeller and casing ring may be restored by replacing wear ring (Z-Series pumps only).**

7. The wear ring is a press fit in the casing. To remove the ring, cut through two sides, releasing the pressure of the press fit. This may be accomplished by drilling a hole through longitudinal dimension of the ring, then cracking the remaining ring wall. Drill size "a" is the approximate size.
8. When inserting a new ring, be sure the matching surfaces are clean and free of burrs. Press the new ring in, keeping it perfectly straight. If no press is available, ring may be driven in with hammer and wood or suitable fiber block.

Replacement of other parts is accomplished by substituting during normal assembly as follows:

### Mechanical Seal Replacement and Reassembly

The rotating portion of the mechanical seal is positioned by sliding the sleeve into position as the impeller screw draws the impeller into place. Oiling the O.D. of the sleeve and the I.D. of the seal facilitates this by softening an adhesive film on the seal (Use soap, glycerin, etc. if oil is not permitted i.e. EPDM). Do not use grease, as this would prevent the adhesive film from resetting. Final adherence to the sleeve is essential for shaft, sleeve, and seal to rotate as a unit.

### Proceed as follows:

1. Lightly oil bore and finger press stationary seat with gasket or o-ring into this cavity. Seat (usually ceramic) is fragile. Do not abuse.
  2. Oil and hand fit (no tools) rotating portion of mechanical seal onto sleeve. Check direction, carbon should face small end of the sleeve. Complete assembly without delay after seal is placed on the sleeve.
  3. Slip cover and seat over the shaft into its locating bore positioning the internal bypass hole between 1 and 2 o'clock for top discharge. Avoid bumping the seat into the shaft.
  4. Insert sleeve I.D. o-ring (ZCH2 models only). Lubricate I.D. of sleeve and shaft O.D. with an anti-seize lubricant. Slide sleeve with seal parts onto the shaft, the carbon washer should contact its mating stationary seat before the sleeve engages the shaft shoulder. Continue to push the sleeve through the seal parts until the sleeve nears its final position.
- Engage the spring with the rotating seal assembly by passing it over the large end of the sleeve (Discard seal spring retainer).
5. Place the o-ring in the end of the sleeve. Align the keyways and insert the key. Place the gasket or o-ring in the impeller depending on style and slide the impeller onto the shaft over the key. Use blue Loctite #242 on the impeller screw threads and hand tighten the impeller screw.
  6. Tighten the impeller screw with a 6 pt socket until the sleeve is against the shaft shoulder and all rotating parts are secure. A screw driver or equivalent placed into the impeller O.D. will steady the rotating assembly for tightening. Check the freedom of parts by hand rotating the impeller.
  7. Install a new casing gasket on the shoulder of the cover. Place the casing in position and secure with the eight cap screws. Tighten the cap screws uniformly. Rotate the impeller by hand again to check for rubbing.

**One way to damage a new seal is to run it dry. Be sure pump is in place and primed before operating.**

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

# Single Mechanical Seal T-21

## ZC2/ZCH2 PUMPS

1 1/2x1 1/4, 2x1 1/2, 2 1/2x2, 3x2 1/2, 4x3; KC2 1 1/2x1 1/4, 2x1 1/2

### AMPCO PUMPS COMPANY PARTS BREAKDOWN

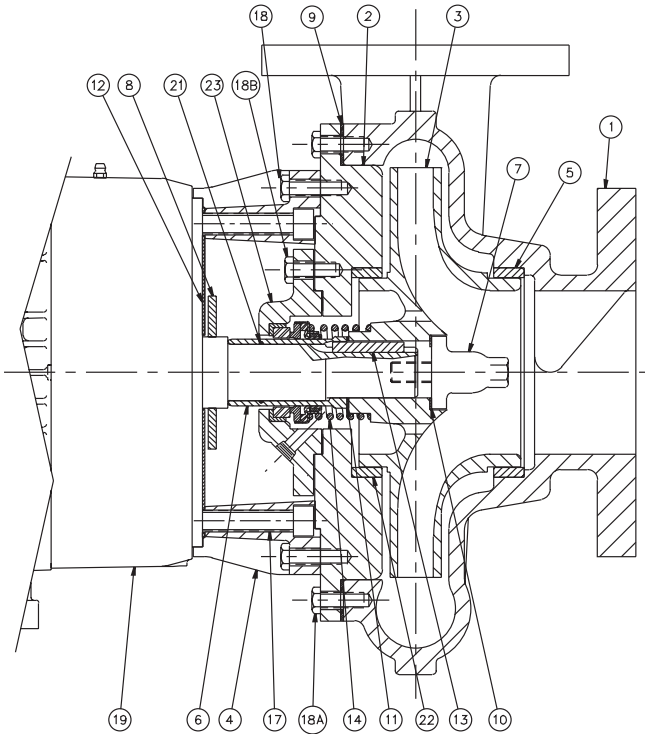
DETAIL NO.	REQ. NO.	PART NAME
22 <sup>1,3</sup>	1	WEAR RING (COVER)
21 <sup>2</sup>	1	O-RING (SHAFT/SLEEVE)
20 <sup>1</sup>	2	PIPE PLUG (OPTIONAL)
19	1	MOTOR
18	8	CAP SCREW (CASING/ADAPTER)
17	4	CAP SCREW (MOTOR/ADAPTER)
16 <sup>1</sup>	2	DRIVE SCREW
15 <sup>1</sup>	1	NAME PLATE
14	1	MECHANICAL SEAL
13	1	IMPELLER KEY
12	1	SPLASH PLATE
11	1	O-RING (SLEEVE/IMPELLER)
10	1	GASKET or O-RING (IMPELLER SCREW)
9	1	GASKET (CASING/COVER)
8	1	SLINGER
7	1	IMPELLER SCREW
6	1	SHAFT SLEEVE
5	1	WEAR RING (SUCTION)
4	1	ADAPTER
3	1	IMPELLER
2	1	COVER
1	1	CASING

<sup>1</sup>NOT SHOWN

<sup>2</sup>ZCH2 ONLY

<sup>3</sup>ZC2/ZCH2 4x3 ONLY

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



## ZC2/ZCH2 PUMPS

1 1/2x1 1/2, 2x2, 3x2, 4x3L, 4x3C, 5x4, 5x4P, 6x6

### AMPCO PUMPS COMPANY PARTS BREAKDOWN

DETAIL NO.	REQ. NO.	PART NAME
24	1	STUFFING BOX GASKET
23	1	STUFFING BOX
22 <sup>3</sup>	1	WEAR RING (COVER)
21 <sup>2</sup>	1	O-RING (SHAFT/SLEEVE)
20 <sup>1</sup>	2	PIPE PLUG (OPTIONAL)
19	1	MOTOR
18B	4	CAP SCREW (COVER/STUFFING BOX)
18A	X <sup>4</sup>	CAP SCREW (CASING/COVER)
18	8	CAP SCREW (COVER/ADAPTER)
17	4	CAP SCREW (MOTOR/ADAPTER)
16 <sup>1</sup>	2	DRIVE SCREW
15 <sup>1</sup>	1	NAME PLATE
14	1	MECHANICAL SEAL
13	1	IMPELLER KEY
12	1	SPLASH PLATE
11	1	GASKET (SLEEVE/IMPELLER)
10	1	GASKET or O-RING (IMPELLER SCREW)
9	1	GASKET (CASING/COVER)
8	1	SLINGER
7	1	IMPELLER SCREW
6	1	SHAFT SLEEVE
5 <sup>5</sup>	1	WEAR RING (SUCTION)
4	1	ADAPTER
3	1	IMPELLER
2	1	COVER
1	1	CASING

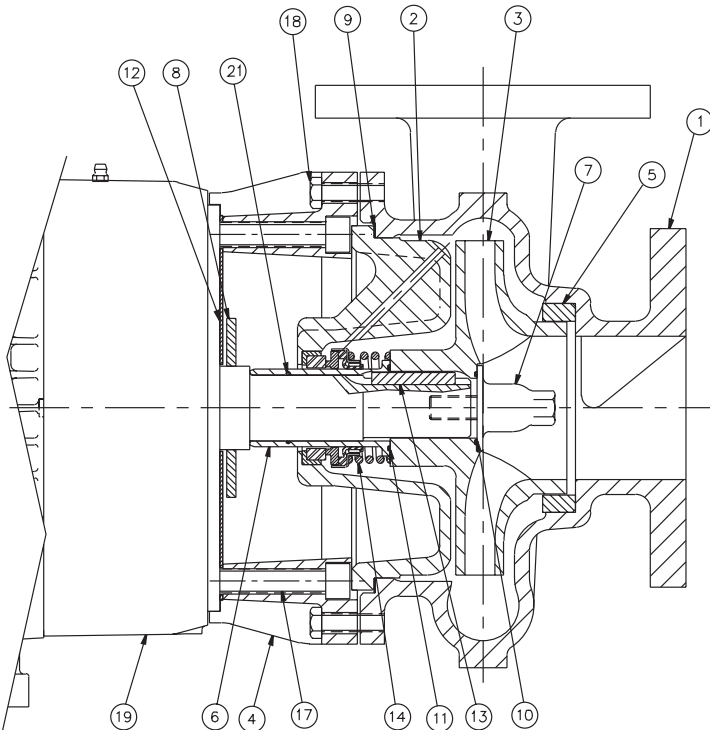
<sup>1</sup>NOT SHOWN

<sup>2</sup>ZCH2 ONLY

<sup>3</sup>NOT ON 1 1/2x1 1/2, 6x6

<sup>4</sup>8-1 1/2x1 1/2, 2x2, 5x4P, 6x6 12-3x2, 4x3L, 4x3C, 5x4

<sup>5</sup>NOT ON 6x6



# Troubleshooting and Applications

## COMMON TROUBLES AND THEIR CAUSES

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

### 1. No liquid delivered

- a. Pump and suction line not completely primed
- b. Speed too low
- c. Required discharge too high
- d. Suction lift too high
- e. Impeller, piping, or fittings completely plugged up
- f. Wrong direction of rotation

### 2. Not sufficient capacity

- a. Air leaks in suction pipe or shaft seal
- b. Speed too low
- c. Required discharge head too high
- d. Suction lift too high or insufficient NPSH available
- e. Impeller, piping, or fittings partially plugged
- f. Insufficient positive suction head for hot water or other volatile liquids
- g. Liquid viscosity too high
- h. Mechanical problems – wear rings worn, impeller damaged, shaft seal defective
- i. Wrong direction of rotation
- j. Suction pipe entrance too close to surface of liquid
- k. Air pockets in pipe high points

### 3. Not sufficient pressure

- a. Speed too low
- b. Mechanical problems – wear rings worn, impeller damaged, shaft seal defective
- c. Small impeller diameter
- d. Air or gas in liquid
- e. Wrong direction of rotation
- f. Air pockets in pipe high points

### 4. Pump operates for a while, then quits

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

### 5. Pump takes too much power

- a. Speed too high
- b. Pumping too much water because required head is lower than anticipated
- c. Viscosity and/or specific gravity is higher than specified
- d. Mechanical problems – binding at wear rings from distortion due to piping strains, shaft bent, impeller rubbing casing, stuffing box too tight
- e. Wrong direction of rotation

## SOME TYPICAL APPLICATIONS

Your Ampco Pump was selected for a specific service. Other Ampco pump styles are available to successfully handle many additional applications including the following partial list. Ask you Ampco representative for complete information.

abrasive slurries  
activated carbon filter slurries  
acetone  
alum solution  
amide solution  
anodizing solutions  
beer  
beer filter slurry (diatomaceous earth)  
brine solutions  
cane juice  
carbon suspension  
carbon tetrachloride  
caustic  
chromic acid  
cleaning solutions  
dye  
deionized water  
ethylene glycol  
fatty acid  
fermentation gas  
formaldehyde  
glycerin  
hydrofluosilicic acid  
hydrofluoric acid  
lard oil and fatty acid  
luminiscent solutions  
marine sanitary service  
marine water desalting equipment  
mineral water  
molasses  
nitric acid  
oleic acid  
phosphoric acid  
plating solutions  
potassium acetate  
polyethyl benzene  
salt water (oil field)  
sludge fuel  
sodium chloride  
sodium fluoride  
sodium hydroxide  
solvent  
spin bath solution (rayon)  
starch  
sugar liquor  
stillage with solids  
sulfuric acid  
tall oil  
tea  
vinegar  
vegetable oil  
vinyl liquor  
water solutions (corrosive and/or abrasive)  
whey  
wort (beer and molasses)  
yeast cream

Consult Ampco for applications not listed.