

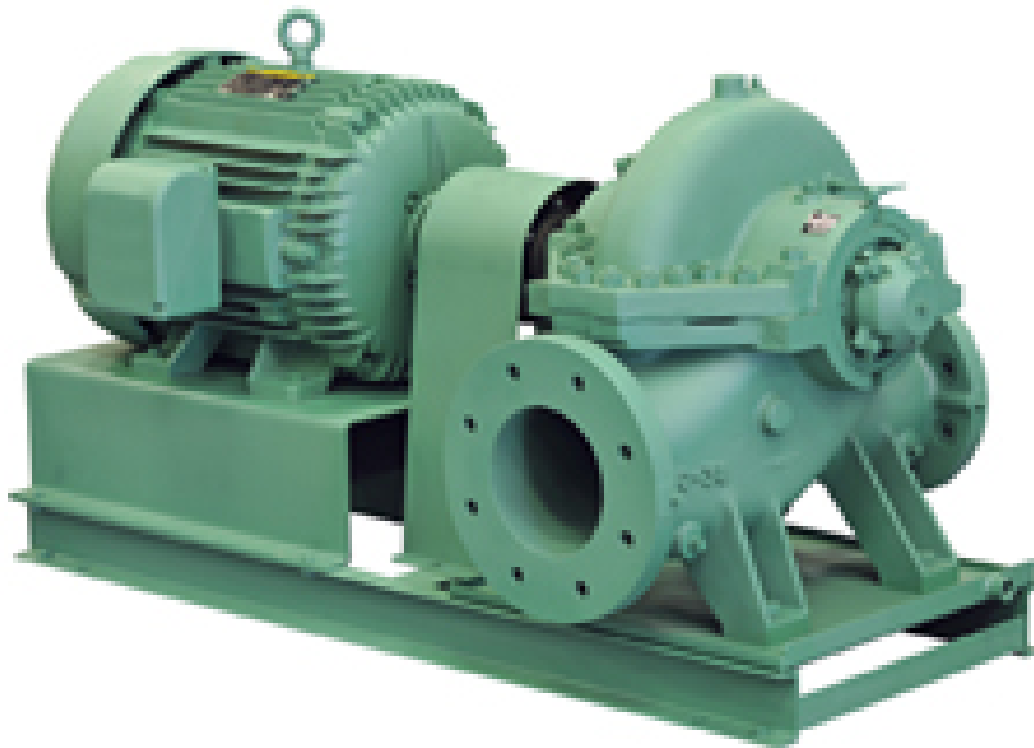


Installation, Operation and Maintenance Instructions

302-013

TA Base Mounted Pumps

The pump must be installed and operated in full compliance with these instructions. The pump may not be operated outside the limits specified on the nameplate and within this manual. The pump should only be operated by skilled trained personnel. The manufacturer will not accept liability if these instructions are not followed. This manual does not take into account any specific local regulations or bylaws that may be applicable, and it is the responsibility of the installer to ensure compliance with such regulations.



**ATTENTION! BE ALERT! YOUR SAFETY IS INVOLVED!
FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT
IN PERSONAL INJURY OR PROPERTY DAMAGE**

INTRODUCTION

All Taco pumps are designated by model number, size and type. This information is stamped on an identification nameplate which is mounted on the pump. This nameplate must never be removed. The pumps covered by these instructions, when correctly installed and maintained will provide many years of trouble free service. These instructions are to be carefully studied and followed at all stages of the pump installation and operating life. All work should be performed by qualified personnel.

Do it Once. Do it Right.

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1. Receiving Pump

Upon receipt a visual check should be made to determine if any damage has occurred during transit or handling. What to look for?

- (a) Broken or cracked components, including base, motor or pump feet and flanges.
- (b) Bent pump or motor shaft.
- (c) Broken motor end bells or damaged conduit boxes on motor.
- (d) Missing parts, damaged coupler guard.

Parts or accessories are sometimes wrapped individually or fastened to the equipment. If any damage or losses have been incurred, promptly notify your Taco representative and the transit company who delivered the product. When unloading pump units, lift equally as shown in figures 1 & 2.

CAUTION: When using a forklift, particular care should be taken to properly balance the load. The electric motor may be significantly heavier or lighter than the pump. If possible, use the original pallet or skid provided.

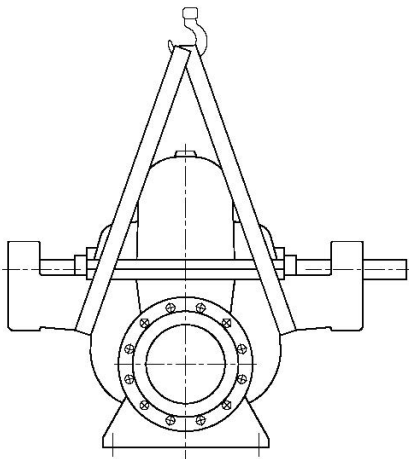


Figure 1: Attaching a Sling to the Pumpset

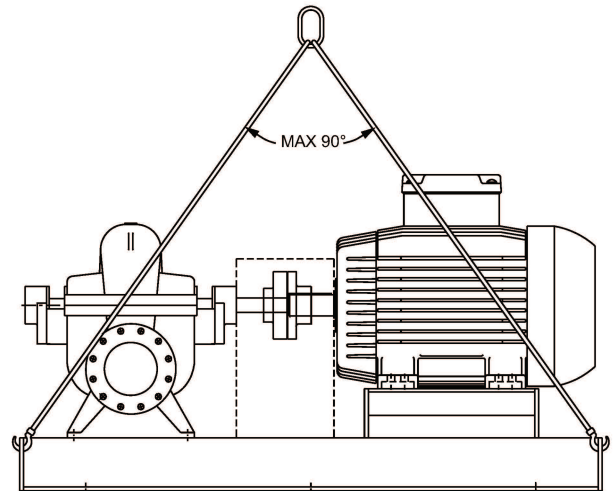


Figure 2: Lifting the Complete Pumpset

2. Temporary Storage

If the pump is not to be installed and operated soon after arrival, store it in a clean, dry place, having slow, moderate changes in ambient temperature. Steps should be taken to protect the pump from moisture, dust, dirt and foreign bodies. It is recommended that the following procedure is taken: —

- (a) Ensure that the bearings are packed with the recommended grease, to prevent moisture from entering around the shaft.
- (b) Ensure that suction and discharge branches of the pump and all other openings are covered with cardboard, wood or masking tape to prevent foreign objects from entering the pump.
- (c) If the pump is to be stored where there is no protective covering, it is advisable to cover the unit with a tarpaulin or other suitable covering.

3. Preparation

Before installing the pump, clean the suction and discharge flanges thoroughly.

4. Location

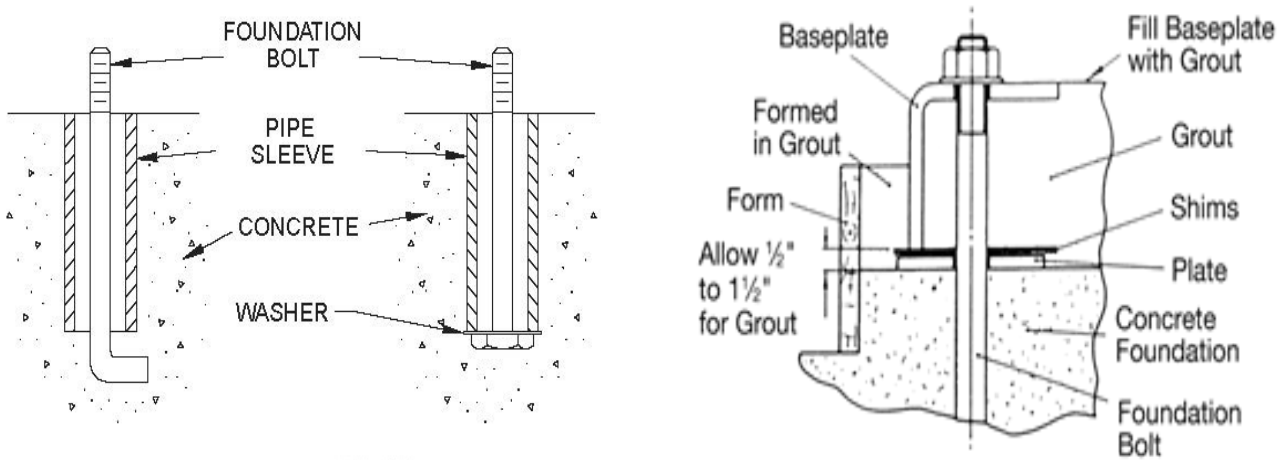
The pump should be installed as near the liquid source as possible with the shortest and most direct suction pipe practical.

The pump should be installed with sufficient accessibility for inspection and maintenance. Ample space and headroom should be allowed for the use of an over head crane or hoist sufficiently strong to lift the unit.

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

5. Foundation (See Fig. 3)

FIG.3



6. Baseplate Setting (See Fig. 3)

The foundation should be poured without interruptions. The top surface of the foundation should be well scored and grooved before the concrete sets: this provides a bonding surface for the grout. Foundation bolts should be set in the concrete. Lower base plate on pad through the anchor holes on the base plate. Snug up the flange nuts and washer. Allow enough length for grout, and shims. Use blocks and shims under base for support at foundation bolts and mid way between bolts, to position base approximately 1" above the concrete foundation with the studs extending through holes in the baseplate. By adding or removing shims under the base, level the pump shaft and flanges. The baseplate must be level. The concrete should be allowed to cure for 48 hrs. Draw foundation bolt nuts tight against baseplate and observe pump and motor shafts or coupling hubs for alignment.

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

Grout baseplate completely and allow grout to dry thoroughly before attaching piping to pump (24 hours is sufficient time with approved grouting procedure).

7. Grouting Procedure (See Fig.3) Visit www.taco-hvac.com for "How To" video presentation.

Grout compensates for uneven foundation, distributes weight of unit and prevents shifting. Use an approved, non-shrinking grout as follows, after setting and levelling unit: -

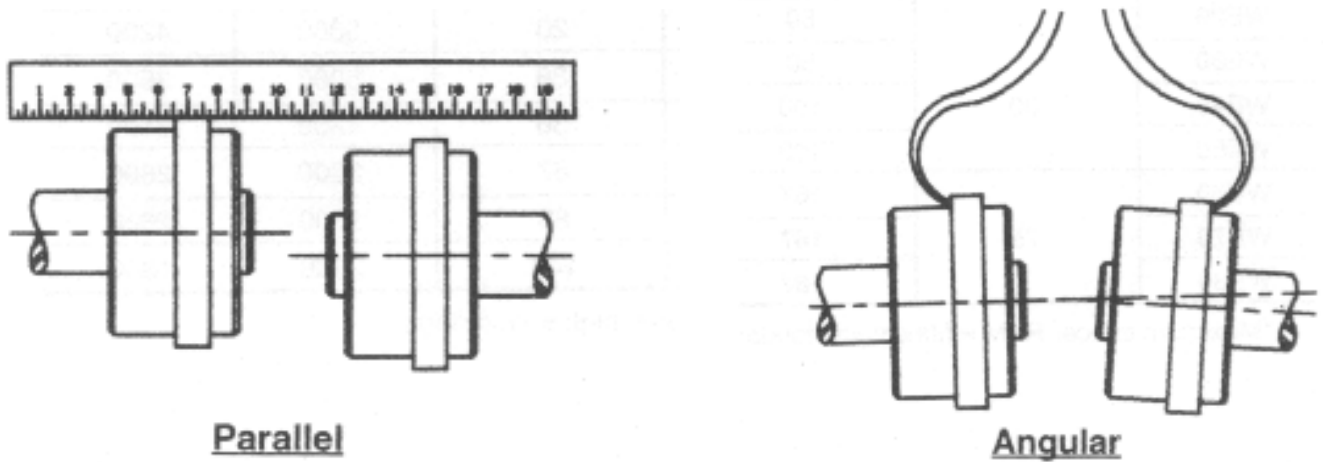
- (a) Build strong form around foundation to contain grout.
- (b) Soak top of concrete foundation thoroughly, then remove surface water.
- (c) Baseplate should be completely filled with grout and, if necessary remove trapped air.
- (d) After the grout has thoroughly hardened, check the foundation bolts and tighten if necessary.
- (e) Check the alignment after the foundation bolts are tightened.

8. Alignment Procedure (See Fig. 4)

The pump driver, if supplied, is correctly aligned on its baseplate at the factory. A certain amount of misalignment is possible during transit and it is therefore essential to check alignment, prior to final grouting.

A flexible coupling will only compensate for a small amount of misalignment and should not be used to compensate for excessive misalignment of the pump and driver shafts. Inaccurate alignment results in vibration and excessive wear on the bearings, and seals. Parallel alignment may be checked by placing a straight edge across the two hubs and measuring the maximum offset at various points around the periphery of the hubs. Do not rotate shafts. Reposition equipment until offset is as small as possible.

FIG. 4



9. **Forms of misalignment:-** Figure 4

(a) Angular – shafts with concentric axes but not parallel.

(b) Parallel - shafts with axes parallel but not concentric.

To check for angular alignment, insert a pair of inside callipers or taper gauge at four points at 90 degree intervals around the coupling. Angular alignment is achieved when the measurements at all points around the coupling faces are within 0.005" of each other.

To check for parallel alignment, place a straight edge across both coupling rims at the bottom, and at both sides. Parallel alignment is achieved when all points around the OD of the coupler is within 0.005". Alignment adjustments can be made by shimming under the driver mounting feet. After each adjustment it is necessary to recheck all features of alignment.

Alignment should be performed after the baseplate has been properly set and grout has dried thoroughly according to instructions. Final alignment should be made by shimming driver only.

NOTE: Final alignment should be made at operating temperatures.

10. **Suction and Discharge Piping** (See Fig. 5 & 6)

Piping should always be run to the pump. Do not move pump to pipe.

This could make final alignment impossible. Both suction and discharge piping should be supported independently and close to pump so that no strain is transmitted to the pump when the flange bolts are tightened. Use pipe hangers or other supports at necessary intervals to provide support. When expansion joints are used in the piping system, they must be installed beyond the piping supports closest to the pump. It is advisable to increase the size of both suction and discharge pipes at the pump connection to minimize frictional losses.

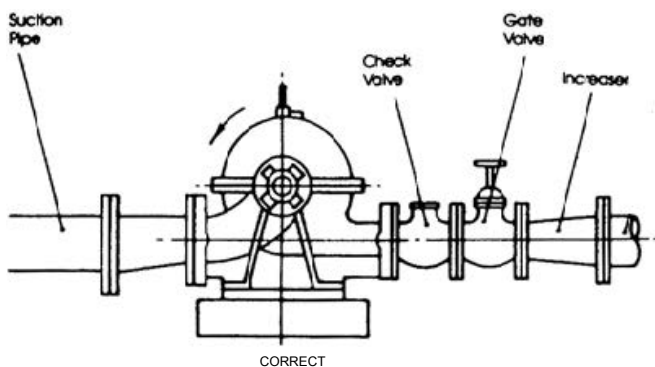


FIG.5

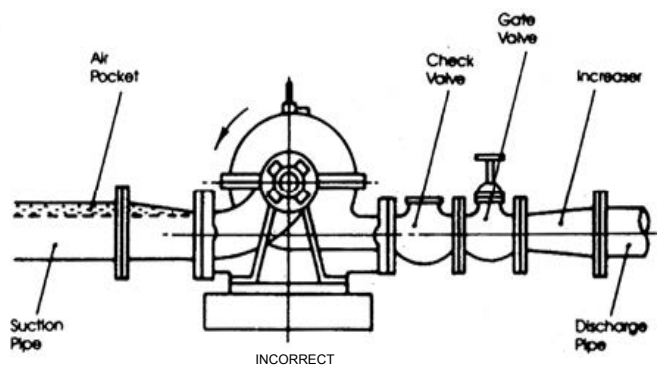


FIG.6

A suction diffuser or minimum of 5 pipe diameters of straight pipe of same size is acceptable. It is not recommended running the suction line parallel with the pump shaft with an elbow or suction diffuser leading directly to the pump. Install piping as straight as possible, avoiding unnecessary bends. Where necessary, use long radius elbows or a Taco suction diffuser at right angles to the pump shaft.

Make sure that all piping joints are air tight. Provide pipe expansions when hot fluids are to be pumped. Where reducers are used, eccentric reducers are to be fitted in suction lines and straight taper reducers in discharge and vertical lines. Undulations in the pipe runs are also to be avoided. This or misuse of reducers may cause the formation of air pockets in the pipe, and thus preventing the correct operation of the pump.

The suction pipe should be as short and direct as possible. Where suction lift is not very high, it is advisable to use a foot valve. Horizontal suction line must have a gradual rise to the pump.

The discharge pipe is usually preceded by a non-return valve or check valve and a discharge gate valve. The check valve is to protect the pump from excessive back pressure and reverse rotation of the unit and to prevent back flow into the pump in case of stoppage or failure of the driver. The discharge gate valve is used in priming, starting and when shutting down the pump.

NOTE: Strainers should be installed on the discharge side of the pump to minimize suction pressure losses.

OPERATION

1. Before initial starting of the pump, make the following inspection:
 - (a) Pump is primed. Never run the unit dry. The liquid in the pump serves as a lubricant for close fit parts within the pump. The pump can be damaged if operated dry. The pump can be primed by using an ejector exhaustless vacuum pump. If a foot valve is used in the suction line the pump can be primed by venting and filling the casing with liquid.
 - (b) Check alignment between pump and motor.
 - (c) Motor is correctly wired to starting device, check voltage, phase and frequency on motor nameplate with the line circuit. Confirm correct direction of rotation prior to coupling to pump. Check by starting motor and switching off immediately, confirm rotation is the same as the arrow direction on the pump casing.
 - (d) Bearing lubrication is provided (see lubrication section), also check driver lubrication.
 - (e) Mechanical seal has been fitted or stuffing box has been packed. The packing is allowed to leak
 - (f) All rotating components are found to be free when turned by hand.
 - (g) The pump base plate is grouted and bolted to the foundation pad.

IMPORTANT! These instructions should be read completely prior to installation of the equipment.

1. A copy of these instructions should be retained on file for future reference.
2. This pump is intended for the circulation of water or other suitable HVAC media. It is not intended for hazardous, corrosive, or flammable liquids.
3. Refer to motor instructions to determine proper terminal connections in order to obtain correct pump rotation.
4. Pump should be installed according to local electrical and safety codes using appropriate size wire and suitable over current protection.
5. Use a lockable isolator or circuit breaker conforming to EN60947-3. It is recommended that the pump be fitted with a suitable "EMERGENCY STOP".

SAFETY REQUIREMENTS

Pump must not be operated without guards in place.

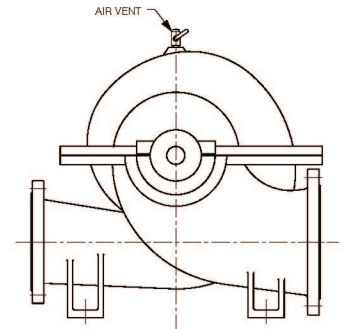


Caution: Always disconnect the pump from the electrical power source before handling. If the system fails to operate properly, carefully read instructions and perform maintenance recommendations.

2. Starting

Before the pump is started for the first time, it is important to check the following points.:

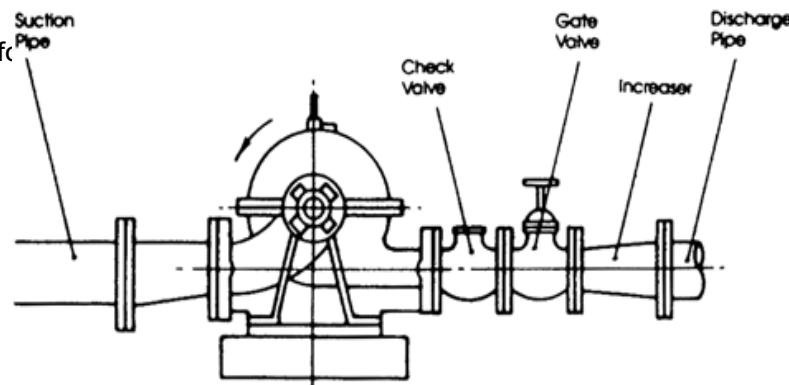
- (a) Check that the pump rotates freely by hand..
- (b) Open the air valve on top of pump casing to evacuate any air that may be trapped, close vent when all air is removed.
- (c) Jog the driver to check for proper rotation.
- (d) Start the pump driver.
- (e) When the pump reaches operating speed, open the discharge valve slowly. The pressure will gradually drop as the flow increases.



Do not operate pump for prolonged periods with closed discharge valve, so as to avoid overheating.

The pump should be shut down at once if the pump is running at its rated speed and found to have any of the following problems: —

- (a) No liquid delivered.
- (b) Not enough liquid delivered.
- (c) Not enough pressure.
- (d) Loss of liquid after starting.
- (e) Excess vibration.
- (f) Motor runs hot.
- (g) Pump bearing overheating



3. Running

While the pump is running, inspect and record the following as baseline data:

- (a) Stuffing box (soft packed pumps only). Ensure there is sufficient leakage to lubricate the packing.
- (b) Check the bearings for temperature, when pump reaches operating speed and temperature.
- (c) With mechanical seal fitted pumps, check that there is no leakage from the seal area.
- (d) Suction and discharge gauge pressure readings (if fitted)
- (e) Measure and record vibration readings.

4.

Minimum Flow Rate

Taco pumps should not be continually operated at a flowrate below 30% of the best efficiency point unless otherwise specifically agreed by the manufacturer. If the application is such that zero flow or less than 30% of original design flow will occur, a return/by-pass line must be fitted to dissipate heat.

Stopping

- (a) Slowly close the discharge valve as the pump slows to a stop.
- (b) Shut off external sealing liquid supply if supplied, to release stuffing box pressure.
- (c) Successful operation of the pump depends on the accuracy of the alignment. It is recommended to recheck the alignment after preliminary run.

PROBLEM ANALYSIS

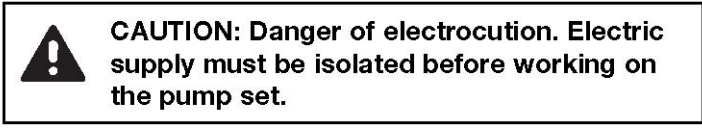


Caution: Always disconnect the pump from the electrical power source before handling. If the pump and driver fails to operate properly, carefully read instructions and perform checks noted below.

TROUBLESHOOTING

| SYMPTOM | POSSIBLE CAUSE(S) | CHECK |
|--|--|--|
| No Discharge | The pump is not primed. | If the case was vented and if suction and discharge valves are open. |
| | Speed is too low. | VFD settings. |
| | System head is higher than calculated. | The head calculations. |
| | Suction lift is higher than pump designed. | The NPSH required. Correct lift if NPSHR is higher than NPSHA. |
| | Impeller may be completely clogged. | The impeller visually, by removing upper casing cover half. |
| | Incorrect direction of rotation. | The motor wiring. |
| | | VFD settings. |
| Air leak in the suction line. | All pipe fittings. | |
| | All threaded & flanged connections. | |
| Insufficient Discharge Flow | Air leak in the suction line. | All pipe fittings. |
| | | All threaded & flanged connections. |
| | Speed is too low. | The motor wiring. |
| | | VFD settings. |
| | System head higher than anticipated. | The head calculations. |
| | Insufficient NPSHA. Suction lift too high. | Gages. |
| | | For clogged suction line or screen. |
| Impeller is partially plugged. | The impeller visually, by removing upper casing cover half. | |
| Mechanical defects: a. Worn wear rings. b. Impeller is damaged. c. Incorrect direction of rotation. | All major components by removing complete rotating assembly. | |
| Insufficient Discharge Pressure | Speed is too low. | The motor wiring. |
| | | VFD settings. |
| | System head is less than anticipated. | Design parameters |
| | Air in the system. | All fittings for leaks. |
| | | All air vents for leaks. |
| | Mechanical defects: a. Worn wear rings. b. Impeller is damaged. c. Impeller diameter is too small. d. Incorrect direction of rotation. | All major components by removing complete rotating assembly. |
| Clogged suction strainer. | The suction strainer. | |
| Loss of Suction | Leak in the suction line. | All pipe threads and flanged connections. |
| | | All fittings. |
| | Suction lift is too high. | For air in suction line. |
| | Insufficient NPSHA. | NPSHA calculations. |
| | Air in the system. | All pipe threads and flanged connections. |
| | | All fittings. |
| | Air through casing gasket or pump seals. | If leakage exists. |
| Clogged suction strainer. | The suction strainer. | |
| Excessive Power Consumption | Speed is too high. | The motor wiring. |
| | | VFD settings. |
| | System head is lower than calculated. | The head calculations. |
| | Specific gravity of the liquid is too high. | The calculations for viscosity correction. |
| | Mechanical defects: a. Bent Shaft b. Rotating element is binding. c. Worn wear ring(s). | All major components by removing complete rotating assembly. |

MAINTENANCE



1. ROUTINE MAINTENANCE

(a) General

Routine maintenance is a sound insurance against a forced shutdown, because of failure at a most inconvenient time. A high degree of cleanliness of the equipment and surrounding area should be maintained during all maintenance procedures.

(b) Frequency of Inspections

Inspections should be carried out in accordance with routine maintenance chart. Depending on operation and environmental conditions together with a comparison of previous inspections, the frequency of inspections may be altered to maintain satisfactory operation of the pump to suit established operating procedures.

ROUTINE MAINTENANCE CHART

| | |
|----------------|---|
| Every Week | Visually check for leaks. Check for lubrication. Monitor bearing temperature for temperature rise. Check and record pressure gage readings |
| Every Month | Check bearing temperature. |
| Every 6 Months | Check the seal for leakage and replace if necessary. Check alignment of pump and motor. Check holding down bolts for tightness. Check coupling for wear. |
| Every Year | Check rotating element for wear. Check wear ring clearances. Measure total dynamic suction and discharge head. |

2. Lubrication

Bearings are initially lubricated during manufacture. The regreasing interval depends upon the running speed of the unit: –

| PUMP RUNNING SPEED | REGREASING INTERVAL |
|--------------------|---------------------|
| 1750 RPM | 4250 HOURS |
| 3450 RPM | 2000 HOURS |

To recharge the bearings with fresh grease, use a grease gun through the two lubricating ports provided.

DO NOT APPLY LUBRICANT WHEN PUMP IS RUNNING.

Every 10,000 hours or 2 years, remove bearings from pump, degrease and repack or replace in accordance with reassembly instructions.

| | | |
|----------------------|------------------|------------|
| Recommended greases: | MAKE | GRADE |
| | Exxon | Polyrex EM |
| | Citgo | Polyurea 2 |
| | Connoco Phillips | Polyurea 2 |

3. Bearings

These instructions do not supersede any information issued by the bearing manufacturers.

Care and maintenance of bearings is a matter of ensuring that they are: –

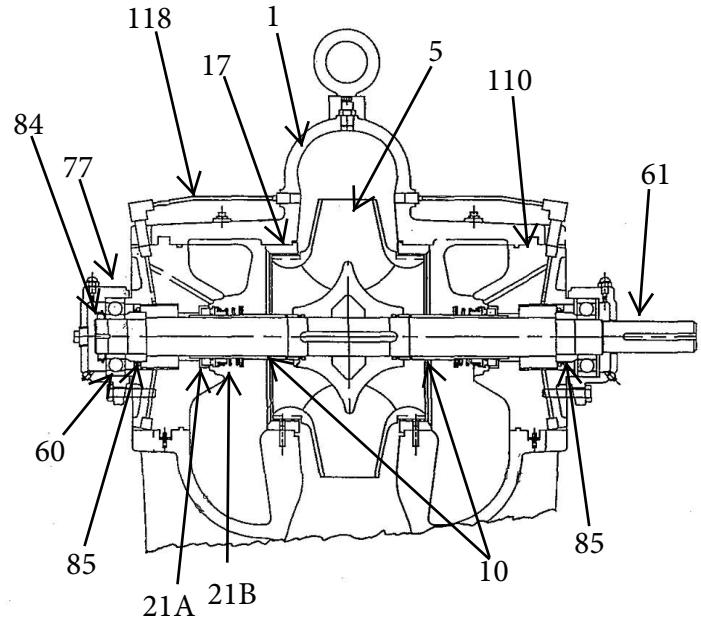
- (a) Correctly lubricated at intervals as laid down in routine maintenance chart.
- (b) Removed, cleaned and refitted with care.
- (c) Tools used and work areas should be clean.

To remove a bearing, use correctly suited withdrawal equipment. Inspect the bearing for wear, fractures, cracks, and corrosion which will necessitate a bearing replacement.

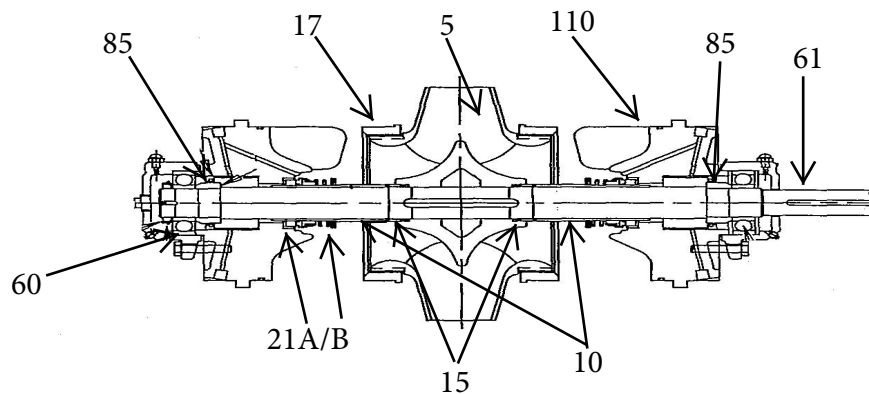
CAUTION: Damage can be caused by exerting force against the outer race of a ball bearing.

DISMANTLING PROCEDURE

1. Drain the pump by removing drain plug and remove copper flush lines (118).
2. Remove all casing cover nuts and 2 dowell pins.
3. Remove upper casing half (1) by inserting a pry bar between upper and lower casing halves.
4. Tap the inserts (110) to break the seal between the lower half casing and lift rotating element out of the lower casing half.
5. Remove the four hex head screws from each bearing cover (77) and remove from the bearing.
6. Remove bearing retaining nut (84) and lock washer from the non-drive end of the shaft.
7. Using a bearing or gear puller remove the bearing (60) from the shaft. Remove the drive end bearing in the same manner.
8. Slide inserts (110) off of the shaft with the shoulder rings (85).
9. Remove seal seat halves (21A) from both inserts.
10. Slide mechanical rotating seal half (21B) from the shaft sleeve.
11. Remove impeller wear rings (17) from impeller.



Rotating Assembly



CAUTION:

For CW rotation: **Do not attempt to remove sleeve (10) from drive end first:** it is keyed to shaft.

Clockwise Rotation-Remove shaft sleeve (10) from the non-drive end and slide it off the shaft. Remove impeller.

For CCW rotation: **Do not attempt to remove sleeve (10) from non-drive end first:** it is keyed to the shaft.

Counter Clockwise Rotation - Remove shaft sleeve(10) from the drive end and slide it off the shaft. Remove impeller.

ASSEMBLY PROCEDURE

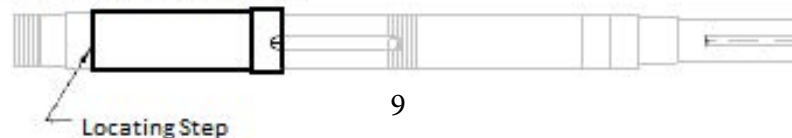
Wipe over shaft with clean light oil. Lubricate sleeve O-ring (15) with silicone grease and screw shaft sleeve (10) onto shaft drive end for CW rotation: non-drive end for CCW rotation until the non-threaded end of the sleeve lines up with the shaft step (see fig.7).

Clockwise Rotation

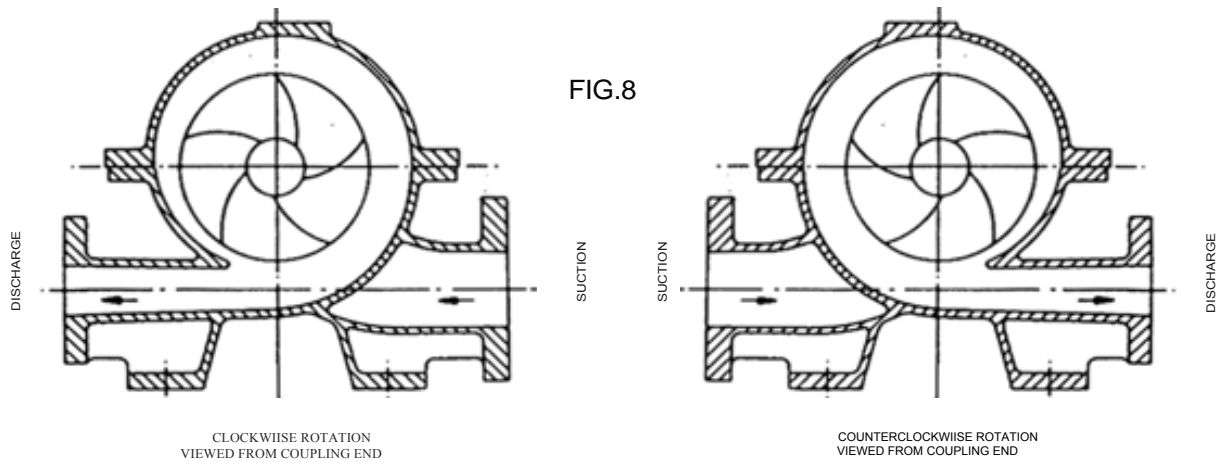


FIG. 7

Counter Clockwise Rotation



1. Place impeller key into keyway and tap milled end of key under the sleeve (Keyway relief).
2. Check the impeller for correct orientation (Fig.8) for pump rotation and slide onto shaft.
3. Lubricate sleeve O-ring with silicone grease (15) and screw second shaft sleeve onto the shaft.
4. Slide the impeller wear rings onto the impeller with locating step inward (toward impeller).



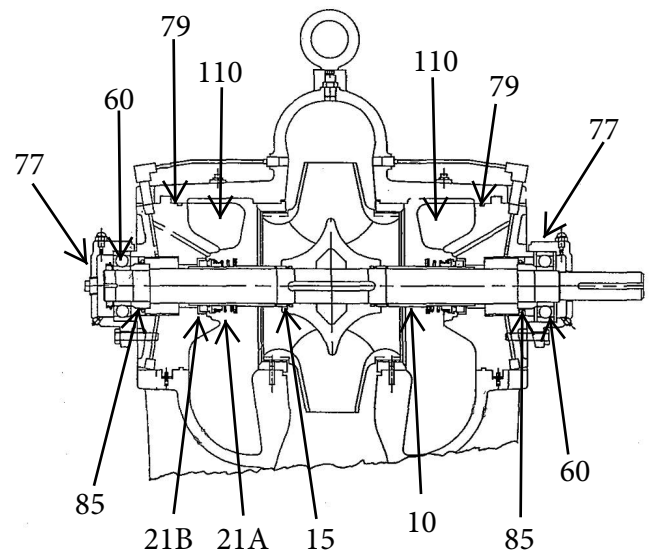
5. Lubricate the shaft sleeve (10) with silicone grease and slide seal rotating assembly (21A) onto the shaft sleeve.
6. Lubricate stationary seat seal half (21B) with silicone grease and press into insert housing (110).
7. Lubricate "O" ring (79) with silicone grease and roll into the groove in each insert (110).
8. Slide insert (110) over shaft with guide vane at top position.
9. Fit shoulder ring (85) onto shaft.
10. Heat the bearing (60) using a bearing heater or hot plate.

NOTE: Do not exceed (100 degrees C) 212 degrees F .

11. Repeat steps 5 thru 10 to complete the other side.
12. Slide the heated bearing onto the shaft to abut shoulder ring (85). Place star washer onto shaft and lock bearing nut tight against bearing.
13. Cool the bearing to room temperature and if required pack bearing with recommended grease.
14. Coat the inside of the bearing housing (77) with grease and slide into place over bearing. Secure bearing cover to the insert (110) with the four hex head screws hand tight.
15. At coupling end: Heat the bearing (60) using a bearing heater or hot plate.

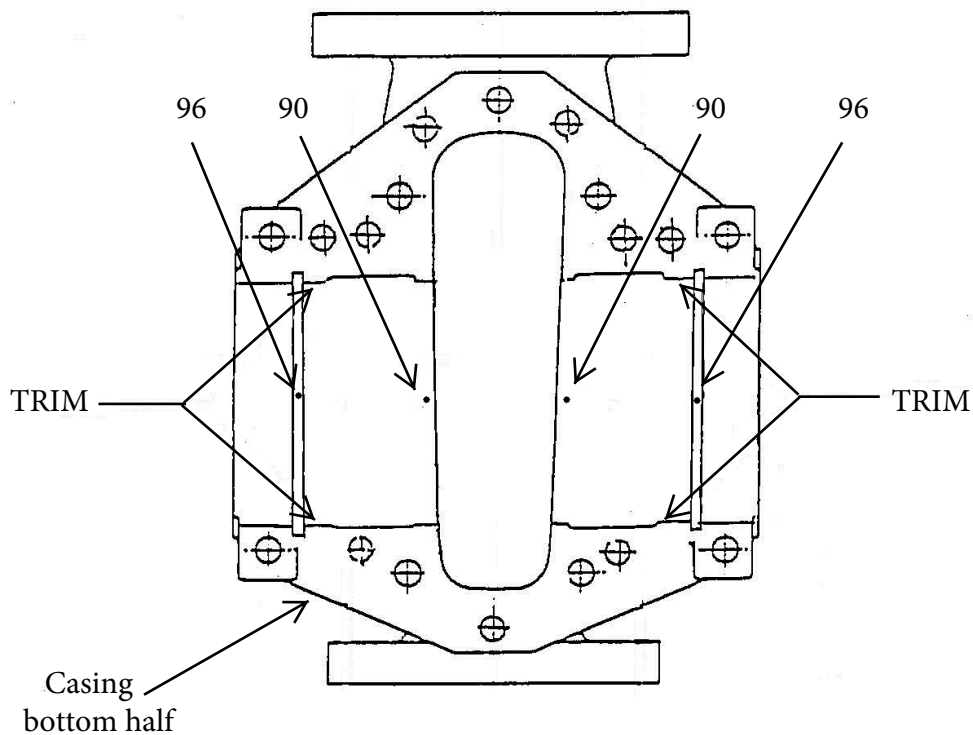
NOTE: Do not exceed (100 degrees C) 212 degrees F.

16. Slide the heated bearing onto the shaft to abut shoulder ring (85), (coupling end) and let cool. Pack the bearing if required with the recommended amount of grease.
17. Coat the inside of the bearing housing (77) with grease and slide into place over bearing. Secure bearing housing to the insert with the four hex head screws hand tight.



18. Place the casing gaskets on the pump casing bottom half. Pull the gaskets tight against the casing studs and trim the four areas of the gaskets as shown in Fig. 9. Remove gaskets and apply light spots of fast curing silicone at the inner edge where the gasket meets the O-ring. This will assure a good seal.
19. Set the rotating element in the pump casing bottom half. Locate both insert tongues in their respective casing grooves. Locate pins (90 & 96) in their respective slots. Correct any excessive O-ring buckling. Check that the impeller rotates freely and is centrally located within the casing.Á
20. Install casing gaskets and apply light spots of fast curing silicone at the inner edge where the gasket meets the O-ring. This will assure a good seal.

Fig. 9



22. Lower the upper half casing cover into place and install casing stud nuts hand tight.
NOTE: When installing upper half casing, make sure that the "O" rings (79) are not cut or pinched.
23. Insert casing dowel pins and hand tighten the stud nuts.
24. Rotate the shaft by hand to assure smooth turning and that it is free from rubbing or binding.

Tightening Torques and Sequence

Hexagon stud nuts should be tightened to the torques stated in Table and in the sequence as shown in Fig. 10.

| Bolt Size | TORQUE CHART | |
|-----------|--------------|-----|
| | Foot pounds | Nm |
| 5/8" UNC | 65 | 88 |
| 3/4" UNC | 130 | 178 |
| 7/8" UNC | 220 | 300 |

Tightening Sequence.

- Tighten the four 'corner' nuts marked 1, 2, 3 and 4.
- Work outwards along the shaft axis towards the bearings in opposite quarters tightening nuts in regions 5, 6, 7 and 8.
- Work outwards along the branch towards the bearings in opposite quarters tightening nuts in regions 9, 10, 11 and 12.
- Repeat the whole sequence.

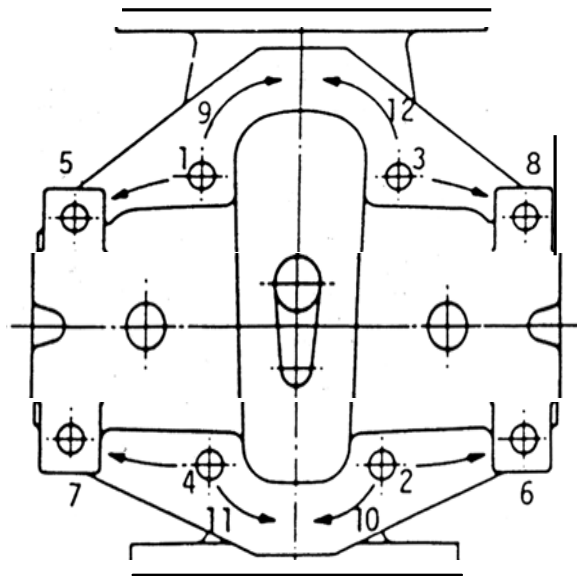


FIG. 10



Caution: Always disconnect the pump from the electrical power source before handling. If the system fails to operate properly, carefully read instructions and perform maintenance recommendations.

Procedures for long-term storage

Here are some general suggestions for long term storage. The applicability of all, or some of these suggestions depend on several factors such as type of equipment, length of storage, and condition of the environment in which they are stored in:

1. Drain the casing completely and dry it thoroughly, including its bearing housing and stuffing box, or seal chamber. Apply a coat of soluble rust preventive solution both internally and externally.
2. Cover all openings. Flanged openings (such as suction and discharge nozzles) should be covered with blind flanges with elastomer gasket. Threaded openings should be covered with steel plugs or caps.
3. Remove the shaft coupling; it may cause the shaft to develop a permanent sag during prolonged storage.
4. Wrap the exposed shaft and key with corrosion inhibitor waterproof paper or waxed cloth.
5. Protect the bearing housing from moisture by placing bags of vapor phase inhibitor crystals around the housing.
6. Cover the equipment with industrial strength plastic, preferably transparent to allow its visual inspection, including its nameplate, without uncovering the unit.
7. Store the unit in its normal position in a dry, temperature controlled environment.
8. Inspect the unit periodically and turn the shaft a few times plus 1/4 turn at least once a week. Turning the shaft prevents pitting of finished surfaces. The extra 1/4 turn is to displace the sag and prevent the shaft from developing a permanent bow.

