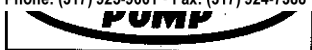


MAINTENANCE AND REPAIR INSTRUCTIONS

TYPE TH PUMPS



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Sterling Fluid Systems (USA), Inc.

4849357

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MAINTENANCE

WARNING

Disconnect power to the pump driver before starting any repairs.

5-1. Regular, consistent maintenance is the best way to avoid serious trouble which may require taking the pump out of service for extensive repair. As the bearings and stuffing boxes are most important for good operation particular care should be taken in their maintenance.

5-2. BEARINGS. It is most important to provide proper lubrication and keep bearings clean. Frequency of lubrication must be determined by experience as it depends upon bearing size, speed, operating conditions and location (environment). Table I should be used as a guide for grease re-lubrication.

**TABLE I
LUBRICATION INTERVALS**

| Service | To 1800 RPM | To 3600 RPM |
|--|-------------|-------------|
| Normal, 8-hour day operation. Room free of dust and damaging atmosphere. | 6 Months | 3 Months |
| Severe, 24-hour day operation. Room with moderate dust and/or damaging atmosphere, or outdoor service. | 1 Month | 2 Weeks |
| Light, approximately 10-hour week. Room relatively free of dust and damaging atmosphere. | 12 Months | 6 Months |

5-3. CLEANING. Clean bearings in the following manner after 2 years operation; more often, if the pump is in severe service.

- a. Remove bearings from the housings, referring to disassembly instructions.
- b. Place bearings in a wire basket - so there is space for the cleaning solvent to reach all parts.
- c. Immerse the basket in Stoddard solvent, agitating the basket until grease is thoroughly loosened and can be flushed out.
- d. Place bearing on a screened surface.
- e. Using a spray gun with air filter and clean Stoddard solvent flush each bearing until all grease and sludge is removed.
- f. Blow solvent out of bearings with dry filtered air.
- g. Lubricate bearings immediately after cleaning with light spindle oil and place them in a covered container.
- h. Do not spin bearings any time during cleaning.

5-4. REMOVAL OR REPLACEMENT. Refer to the Disassembly Instructions for the specific type pump for disassembly to the point of removing bearings from the shaft. Normally they should be removed only to clean and inspect after operating trouble is traced to the bearings.

5-5. INSPECTION. After bearings have been cleaned, inspect visually for defects given in Table II. Replace any bearing having any defect listed.

LUBRICATION AMOUNTS

| PUMP SIZE | BEARING SIZE | OUNCES | GRAMS |
|-----------|--------------|--------|-------|
| 25 & 32 | 06 | .25 | 7 |
| 40 & 50 | 07 | .30 | 8.5 |
| 65 | 08 | .35 | 10 |

TABLE II
BEARING DEFECTS

(Failures - Replace if found.)

| DEFECT (Failure) | APPEARANCE | PROBABLE CAUSE |
|-------------------------|--|--|
| Flaking and cracking | In the early stages the surface of the inner and outer races develop small cracks, which flake. The cracks and flaking ultimately spread over the entire race surface. | 1. Normal fatigue failure. 2. Bearing loads in excess of bearing capacity caused by misalignment. |
| Indentations | Indentations or cavities in the inner and outer races. | 1. Dirt in the bearings. 2. Excessive impact loading of the bearings such as improper mounting or removal. |
| Broken separator (cage) | Cracked separator or separator in pieces. | 1. Poor lubrication. 2. Misalignment of shaft. 3. Excessive shaft deflection. |
| Wear | Bore and OD of outer ring of bearing galled or braided. | 1. Fit on shaft or in housing too loose. 2. Bearing locked by dirt and turning on shaft or in housing. |
| Fractured ring | Hairline cracks or complete ring fracture. | 1. Forcing a cocked bearing on or off a shaft. 2. Too heavy a press fit. |
| Discoloration | Rolling elements and races darker than normal appearance of bearing metal. (Moderate discoloration of rolling elements and races not a reason for discard.) | 1. Inadequate lubrication. |
| Corrosion | Rolling elements and raceways rusted. | 1. Water entering the housing. 2. Condensation inside the housing. 3. Lubricant breaks down into acid. (Wrong lubricant) |

5-6. Stuffing box. The stuffing box glands require periodic adjustment to insure proper packing lubrication. When the pump is running, there must always be a slight leakage from the glands. The amount of leakage required for proper lubrication is hard to define but we recommend a steady dripping of water through the gland.

5-7. When leakage is excessive, tighten all of the gland bolts evenly while pump is running, approximately one-quarter turn at a time. Allow an interval for the packing to adjust to new position. Proceed slowly until the required liquid flow is achieved. Never tighten the gland to be leak proof as this will cause damage to the stuffing box components.

| Pump Size | Number of Packing Rings | |
|-----------|-------------------------|-----------|
| | Suction | Discharge |
| 25 & 32 | 3 | 4 |
| 40 | 4 | 5 |
| 50 & 65 | 5 | 5 |

5-8. **REPACKING.** Replace packing in the stuffing box as follows:

a. Close suction and discharge line valves and any other valves in auxiliary cooling, vent or packing seal lines. Drain the suction casing (1C) by removing the drain plug at the bottom of the casing.

b. Take precaution to prevent driver being inadvertently started - tie disconnect switch open, remove fuses or use other means as applicable.

c. Remove packing gland, referring to disassembly instructions for the pump.

d. Remove and discard old packing rings; do not damage the lantern ring if one is fitted.

e. Clean out the stuffing box.

f. Insert rings of packing as required and lightly tamp them to seat them against the bottom of the box. Insert the lantern ring when one is used being sure that it is at the correct location in the stuffing box for entry of sealing fluid and then follow with the remaining rings of packing.

g. Install the gland and install gland stud nuts until they are just snug. After the pump is running, tighten these nuts as required to control leakage properly.

NOTE

If a mechanical seal is used, follow the seal manufacturer's instructions for removal, assembly and/or adjustment.

CAUTION IF FLUID IS HOT!

PRESSURE - TEMPERATURE - RPM LIMITS

SUCTION:

Structural: 250°F and 230 PSIG maximum (121°C and 1585 kPa)

Uncooled Packing: Structural limits permissible

Mechanical Seal: Pressure versus temperature maximums permissible vary with RPM, pump size and seal seat material. Refer to the Peerless representative for specific details if operating conditions will not be the same as you specified at the time of the pump selection and order placement.

| Temperature | | Maximum Discharge Pressure | | | |
|-------------|-----|----------------------------|------|-------------|------|
| | | Size 25, 32, 40 | | Size 50, 65 | |
| °F | °C | PSIG | kPa | PSIG | kPa |
| To 200 | 93 | 460 | 3171 | 360 | 2482 |
| 225 | 107 | 440 | 3033 | 360 | 2482 |
| 250 | 121 | 415 | 2861 | 360 | 2482 |

RPM is limited to 3600 unless specific quotation is made for higher RPM.

5-9. IMPELLER CLEARANCE. The nominal diametral clearances between the impeller sealing diameters and mating bore diameters in stationary parts is as listed below. Radial clearances are 1/2 (half) of diametral clearances.

DIAMETRAL CLEARANCE

| SIZE | New, Nominal | | Worn, Maximum | |
|------|--------------|-----|---------------|-----|
| | INCH | MM | INCH | MM |
| 25 | .010 | .25 | .020 | .50 |
| 32 | .010 | .25 | .020 | .50 |
| 40 | .010 | .25 | .020 | .50 |
| 50 | .010 | .25 | .020 | .50 |
| 65 | .012 | .30 | .024 | .60 |

5-10. TROUBLES. To reliably establish the malfunctioning of either the pump or driver, instruments such as tachometers, pressure gauges and electric meters, must be in proper working condition and preferably of recent calibration. In many cases, much time and expense has been expended with faulty instruments. Table III lists a number of troubles commonly occurring. If unable to determine the cause, and remedy the trouble, from this list, refer the problem to the Peerless representative.

TABLE III - TROUBLES

| TROUBLE | PROBABLE CAUSE | REMEDY |
|--|---|--|
| Failure to deliver liquid or sufficient pressure | Pump not primed | Reprime |
| | Pump not up to speed | Check for low motor voltage or motor overload. Other drives, increase driver speed when possible. |
| | Discharge head too high | Check to see that all discharge valves are opened and the discharge line is free from obstructions. In some cases, the installation has to be altered or a pump of suitable rating must be provided. |
| | Insufficient available NPSH | Check NPSH requirements of pump and increase system NPSH accordingly. |
| | Incorrect direction of rotation | Check rotation of driver. |
| | Air leaks in suction line or through suction end stuffing box, suction pressure below atmospheric | Tighten packing. Check for air leaks past "O" ring 14E under sleeve. Passage from eye side shroud of first stage impeller to suction stuffing box must be open to deliver sealing fluid to packing. Check suction line joints for air leakage. Check mechanical seal if installed. |
| | Impeller passages restricted. | Disassemble the pump and clean impeller. |
| | Worn impeller sealing diameters or mating stationary part bores | Repair or replace impeller and/or stationary parts. |
| | Damaged impeller. | Repair or replace impeller. Specify impeller diameter when ordering replacement. |
| | Foot valve too small or restricted by dirt. | Replace with adequate size foot valve or clean foot valve. |
| | Leaking discharge check valve on standby pump | Repair or replace. |
| Recirculation valve open or leaking. | Close, repair or replace. | |

TABLE III -- TROUBLES (continued)

| TROUBLE | PROBABLE CAUSE | REMEDY |
|---------------------------------|--|--|
| Pump loses prime after starting | Air leaks in suction line Insufficient available NPSH. | Tighten packing. Check for air leaks between sleeve and shaft and replace O-Ring if there is an air leak. Check all suction line joints for bad gaskets and loose joints. Check NPSH requirements of the pump and increase the system available NPSH accordingly. |
| Overload on driver | Pump speed high Total head lower than rating Tight packing. Liquid is of higher specific gravity or viscosity than rating. Mechanical trouble of pump or driver. | Motor voltage higher than name plate rating will cause the motor to run faster. Either reduce motor voltage or trim impeller diameter. On other drives, reduce speed if possible. If speed reduction not realized, trim impeller diameter. ** Check suction and discharge pressures and determine the total dynamic head. If TDH lower than ratings, throttle discharge to rated TDH or if this is not possible, reduce impeller diameter. ** Stop pump - follow proper repacking procedure. Check for scored sleeve; and for sleeve run-out if packing wears rapidly. Replace sleeve and packing as required. Check with Peerless distributor to determine if a larger motor is required. See if pump and motor turn freely. Check impeller fit, shaft straightness and bearings. |
| Pump vibrates or is noisy | Driver unbalanced, pump clogged. Misalignment Cracked foundation Worn bearings Unbalanced impeller Bent shaft | Disconnect driver and operate it alone. Check pump for large pieces of debris, such as wood, rags, etc. Realign pumping unit Replace foundation Replace bearings. Check lubricants for proper grade. Check pump alignment. Rebalance Replace |

** Always obtain new trim diameter from Peerless representative.

5-11. SPARE PARTS. To keep delays to a minimum when pump repairs are required, we suggest that the following spare parts be stocked. The number of each part required depends upon the application. For a minimum, we recommend:

- (A) One inboard bearing
- (B) One outboard bearing
- (C) One set of shaft sleeves for packed pumps
- (D) 2-4 sets of packing for packed pumps or a set of mechanical seals for pumps so equipped.
- (E) One set of case wear rings when fitted.
- (F) In some cases, an entire rotating element should be stocked.

5-12. To obtain quick and accurate service when ordering spare parts, provide the following information:

- (A) Pump size and type as noted on nameplate.
- (B) Pump serial number as noted on nameplate.
- (C) The name and number of the parts as shown on the sectional drawings.
- (D) Quantity required of each item.

Aid may be obtained from the Peerless representative, or an authorized distributor, for planning an adequate supply of spare parts.

REPAIR

DISASSEMBLY — ASSEMBLY

TYPE TH MULTISTAGE PUMP

Preparation for Service Work

Refer to Sectional Drawing supplied in these instructions.

Close suction and discharge line valves and any other valves in auxiliary cooling, vent or packing seal lines. Drain the suction casing (1C) by removing the drain plug at the bottom of the casing.

CAUTION IF FLUID IS HOT!

NOTE: If only the outboard bearing (18) at the discharge end of the pump or the stuffing box at the same end is to be serviced, the pump need not be disconnected from system piping or removed from its base.

If the pump requires service on parts other than the discharge end bearing or stuffing box, disconnect the pump from all piping and then remove the pump foot bolts to the baseplate. **Important:** Notice the bolting at the pump discharge end; for some high suction temperature pumps, special bolting will be provided to permit axial expansion. Make a notation of the bolting details so it can be reinstalled in the same manner. Disconnect the flexible coupling between the pump and the driver and remove the pump from the base with suitable and safe lifting means. Remove the pump half coupling using a suitable puller; never drive off the coupling half using hammer blows. Use heat only if it is known that there can be no damage to the coupling parts. Remove coupling key (46).

Always disassemble the pump from the discharge end.

All threads are right-hand unless noted specifically and are metric.

DISASSEMBLY

1. Remove outboard bearing cap (43).
2. Remove bearing locknut (22). Hold the shaft with a spanner at the coupling end.
3. Remove bolts holding bearing housing (99) in place. Remove housing (99) with outboard bearing (18) using a 2-jaw bearing or wheel puller.
4. For Stuffing Box Pumps:
 - a. Remove spacing sleeve (14B) with deflector (40).
 - b. Remove gland stud nuts, gland (17) and packing rings (13).
 - c. Remove shaft sleeve (14) with its "O" ring (14E).
5. For Mechanical Seal Pumps:
 - a. Remove circulation piping (80P) between glands-seal (17D) and (17H).
 - b. Remove spacing sleeve (14B) with deflector (40).
 - c. Remove nuts on gland-seal studs.
 - d. Remove gland-seal, HP (17H) with seal seat, HP (65H). Protect seal face from dirt and damage.
 - e. Remove rotating element of mechanical seal (seal head, HP) (80H) and shaft sleeve (14D) with its "O" ring (14E); protect seal face from dirt and damage.
6. Remove the nuts and washers from the tie bolts and set them aside.

7. Remove principal pump parts as follows:
 - a. Discharge casing (1D). (Diffuser (5L) will come off with casing when fitted on some size pumps.)
 - b. Impeller (2) Caution: Do not pry between vanes if tight, apply pressure at vanes.
 - c. Impeller key (32).
 - d. Stage casing (1F) with diffuser (5) will come off together with "O" ring (1H). The diffuser need not be separated from the stage casing unless it requires replacement.
 - e. Remove the next impeller (2), etc., until all impellers and their keys(32) are removed. Note: Impellers may not have equal diameters; their position is not critical. Never substitute other diameters. Specify impeller diameter when ordering replacement.

8. Remove bolts holding inboard bearing cap (41) in place, remove cap.

9. To remove shoulder ring (16A) and snap ring (16B), bearing (16) inner race must be driven toward the discharge end of the pump about 0.10" (2.5 mm) because the shoulder ring(16A) covers the snap ring (16B). Remove the snap ring with snap ring pliers and slide shoulder ring (16A) off the shaft.

10. Remove bolts or stud nuts holding bearing housing (99) in place and remove the housing with all associated parts exactly as was done at the discharge end of the pump.

Caution: Mechanical seals at both ends of the pump are not identical. Be sure to tag the seals and glands for the suction or discharge end.

11. The shaft (6) with spacing sleeve (14A) may now be removed.

12. Clean all parts, check for wear or damage. Check for damage to impeller hub surfaces and other surfaces where parts abut each other along the shaft. These surfaces must be smooth, square to the bore and clean. If outboard bearing (18) requires replacement, drive out of housing (99), otherwise leave in place.

REASSEMBLY

All original parts to be reused must have been thoroughly cleaned and checked, new parts must be thoroughly cleaned.

Caution: Surfaces where "O" rings seat must be cleaned and free of burrs.

Assembly is from the suction end of the pump.

1. Install spacing sleeve (14A) and adjacent shaft sleeve (14) for packing, or (14D) for mechanical seal, with keys (32A) to the shaft (6) at the suction (coupling) end.

2. Insert shaft (6) through the bore of the suction casing (1C).

FASTENER TORQUE VALUES

| Location | Pump Size | | | | | | | | | |
|-----------------------------|-----------|--------|-------|-------|---------|---------|-------|-----|---------|---------|
| | 25 | | 32 | | 40 | | 50 | | 65 | |
| | Lb-Ft | N.m | Lb-Ft | N.m | Lb-Ft | N.m | Lb-Ft | N.m | Lb-Ft | N.m |
| Tie Bolts, 2-5 Stages | 33-36 | 45-49 | | | | | | | 46-51 | 62-69 |
| Tie Bolts, 6 or more Stages | 46-51 | 62-69 | 33-36 | 45-49 | | | | | 46-51 | 62-69 |
| Bearing Caps | 8-9 | 11-12 | | | | | | | 16-18 | 22-24 |
| Bearing Housings to Casings | 16-18 | 22-24 | | | 38-42 | 52-57 | | | | |
| Mech. Seal Flange Stud Nuts | 12-14 | 16-19 | | | 30-33 | 41-45 | | | | |
| Bearing Locknut | 73-75 | 99-102 | | | 108-112 | 146-152 | | | 215-225 | 292-305 |

3. For pumps with mechanical seals:

Install seal head, LP (80L) that was tagged for the suction end on shaft sleeve (14D). Install gland seal, LP (17D), with gasket (73C) and seal seat, LP (65L), over studs and start, do not tighten nuts.

4. Install spacing sleeve (14B) and deflector (40).

5. Install bearing housing (99) with bolts and fasten securely in place on the suction casing (1C). Be sure bearing housing drain tap is in correct bottom position with relation to required suction position. Inboard bearing (16) outer race will be in place if not replaced, it should be pressed into the housing if a new bearing is used.

6. Install the bearing (16) inner race and rolling element on the shaft (6) using a brass sleeve to force into position so shoulder ring (16A) and then snap ring (16B) can be installed. Snap ring (16B) must be installed with its concave side next to bearing (16) inner race as shown on the sectional drawing. (16A) must be free to rotate.

7. Do not install bearing cap (41) at this time.

8. Install first stage impeller key (32) and impeller (2) being sure hub faces are clean. Follow with diffuser (5) and first stage casing (1E) that has mounting feet with "O" ring (1H) being careful not to damage the "O" ring. Be sure mounting feet are in correct position with relation to suction position! If diffuser (5) was separated from first stage casing (1E), tap the diffuser into the stage casing being sure that the cast raised spot on the stage casing wall is between any two guide vanes on the diffuser. This raised spot prevents rotation of the diffuser and must be between vanes. The same procedure applies to subsequent stages.

9. Follow with additional stages of impeller keys, impellers, diffusers and stage casings until all are installed.

10. Install discharge casing (1D) with its "O" ring (1H), with diffuser (5L) and its pin (5P) when used on larger size pumps, being careful not to damage the "O" ring. Be sure four feet are all aligned and make a flat surface.

11. Install the tie bolts with their nuts and washers below each nut and tighten diagonally and to equal tightness around the pump. Never tighten the tie bolts in sequence, tighten diagonally opposite bolts.

12. Install outboard stuffing box parts and bearing housing (99) as was done at the suction end. Outboard bearing (18) must be in housing (99). Start on shaft and drive inner race on shaft using a brass sleeve until locknut (22) can be installed to finish final positioning on shaft. Hold the shaft (6) stationary with a spanner in the coupling keyway while tightening the bearing locknut (22). This nut firmly positions all parts on the shaft tightly against each other and the nut must be tight.

13. Check at the coupling end to be sure that shoulder ring (16A) was pushed up tight against snap ring (16B) and covers snap ring to insure the correct axial position of all rotor parts. Tighten locknut (22) more if parts are not in position. Finally, install bearing cap (41) with its bolts. The rotor is now automatically positioned in the pump and must turn freely without rubs to prove assembly is correct.

14. Install packing rings (13) and glands (17) on packed pumps. Stagger joints of consecutive rings 90°. Do not tighten gland nuts until the pump is in operation. For mechanical seal pumps, tighten nuts on seal plates studs and install circulation piping (80P).

Reinstall coupling key (46) and pump half coupling, do not hammer coupling half on the shaft.

Reinstall the pump on the base plate. For pumps where provision for axial expansion was noted during removal of the pump from the base, reinstall fasteners so that the outboard foot is free to move axially as the pump was originally mounted.

Realign the flexible coupling.

Reconnect all piping and open closed system valves.

Follow initial start-up procedures as the pump is returned to service.

PARTS LIST
Type TH
Multistage Pump

| Item No. | Description | Item No. | Description |
|----------|-----------------------------|----------|----------------------|
| 1C | Suction Casing | 16 | Inboard Bearing |
| 1D | Discharge Casing | 16A | Shoulder Ring |
| 1E | First Stage Casing | 16B | Snap Ring |
| 1F | Stage Casing | 17 | Gland |
| 1H | "O" Ring | 17D | Gland - Seal, LP |
| 2 | Impeller | 17H | Gland - Seal, HP |
| 5 | Diffuser | 18 | Outboard Bearing |
| 5L | Diffuser * | 22 | Bearing Locknut |
| 5P | Pin * | 32 | Impeller Key |
| 6 | Shaft | 32A | Shaft Sleeve Key |
| 7B | Wear Ring * | 40 | Deflector |
| 7E | Wear Ring * | 41 | Inboard Bearing Cap |
| 7BB | Straight Pin, Spring Type * | 43 | Outboard Bearing Cap |
| 7EE | Straight Pin, Spring Type * | 46 | Coupling Key |
| 13 | Packing | 65L | Seal Seat, LP |
| 14 | Shaft Sleeve | 65H | Seal Seat, HP |
| 14A | Spacing Sleeve | 73C | Gasket |
| 14B | Spacing Sleeve | 80L | Seal Head, LP |
| 14D | Shaft Sleeve | 80H | Seal Head, HP |
| 14E | "O" Ring | 80P | Piping |
| 14F | Shaft Sleeve | 99 | Bearing Housing |

* These parts are not on all pump sizes.

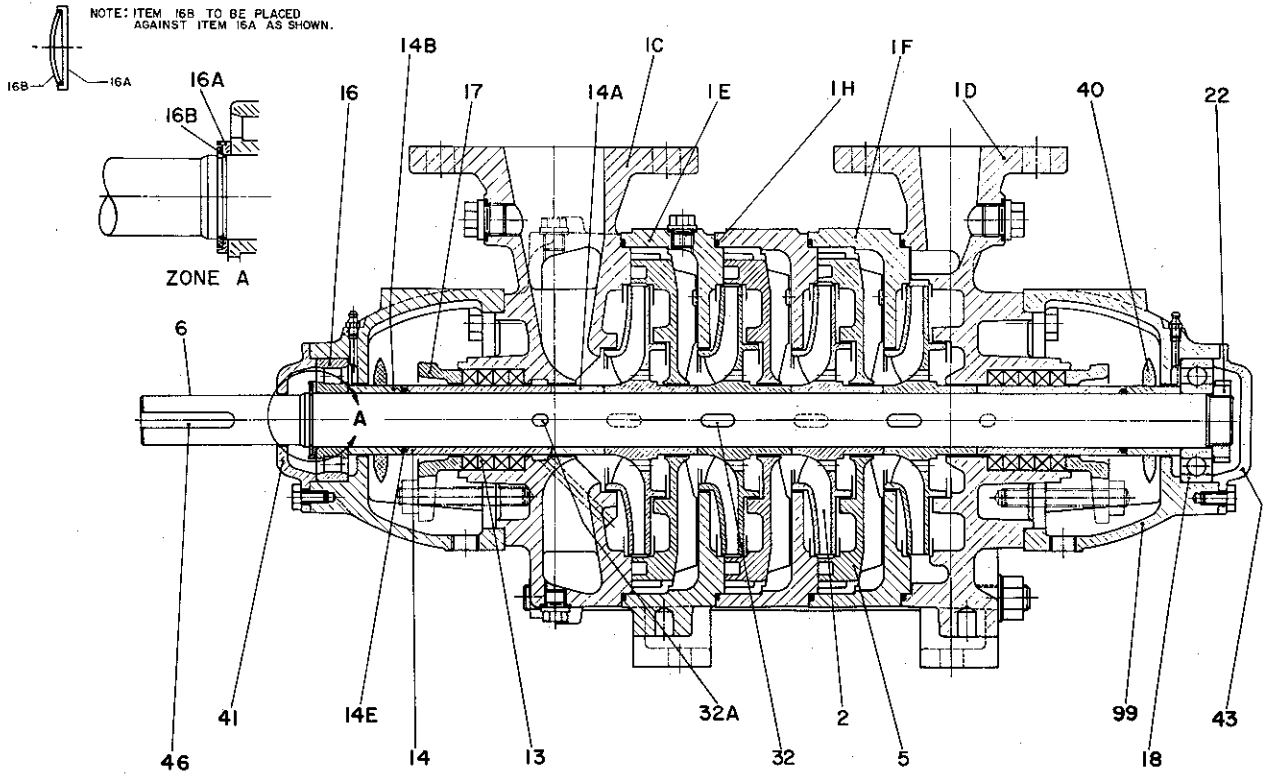
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Rev. A - 9/79

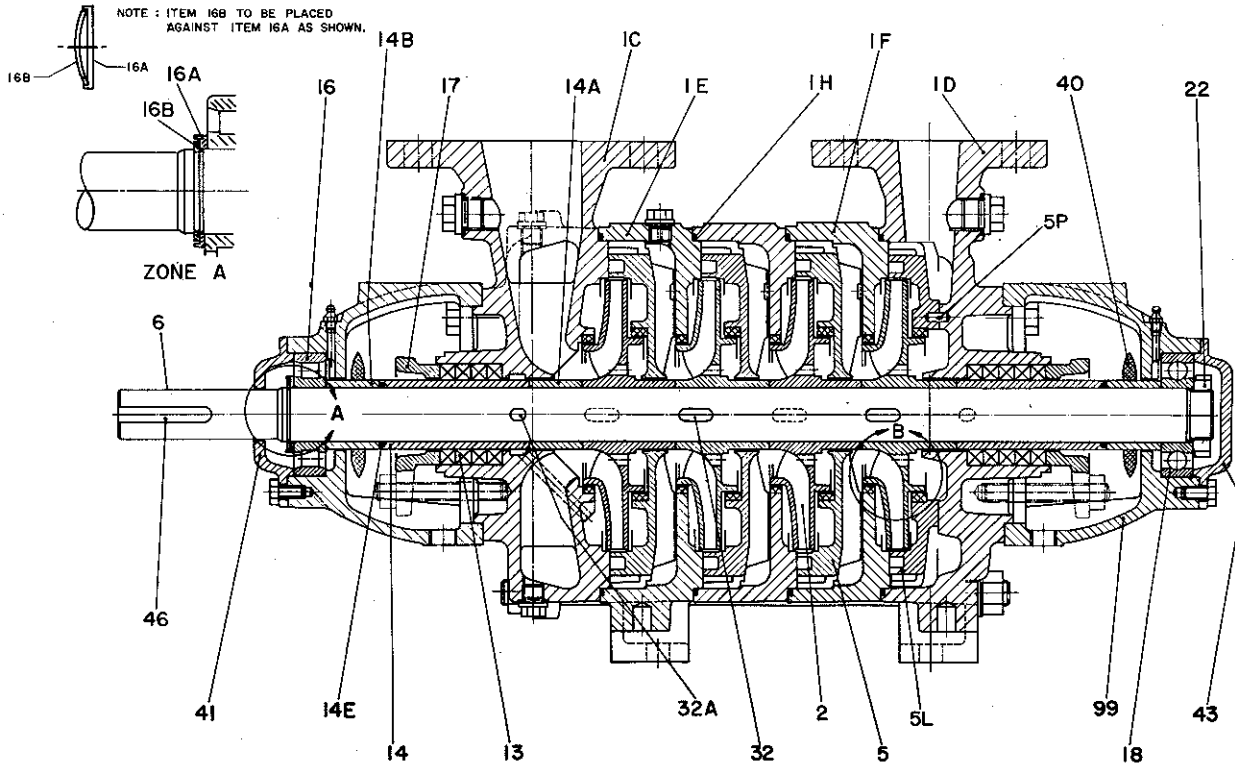
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C - 11/79

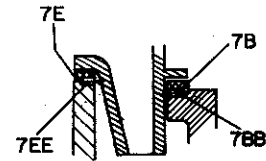
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with Packing



CROSS SECTIONAL DRAWING 4849292
Type TH65
with Packing

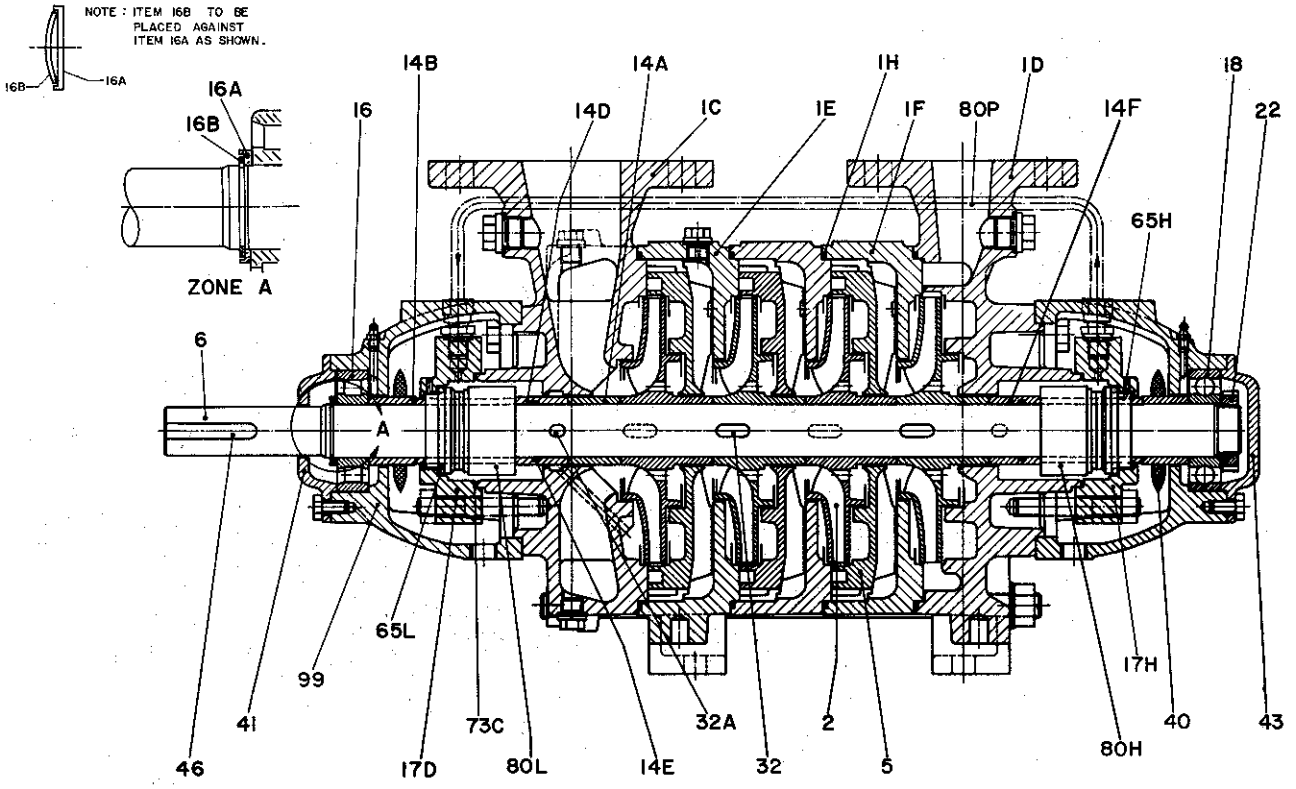


ZONE A



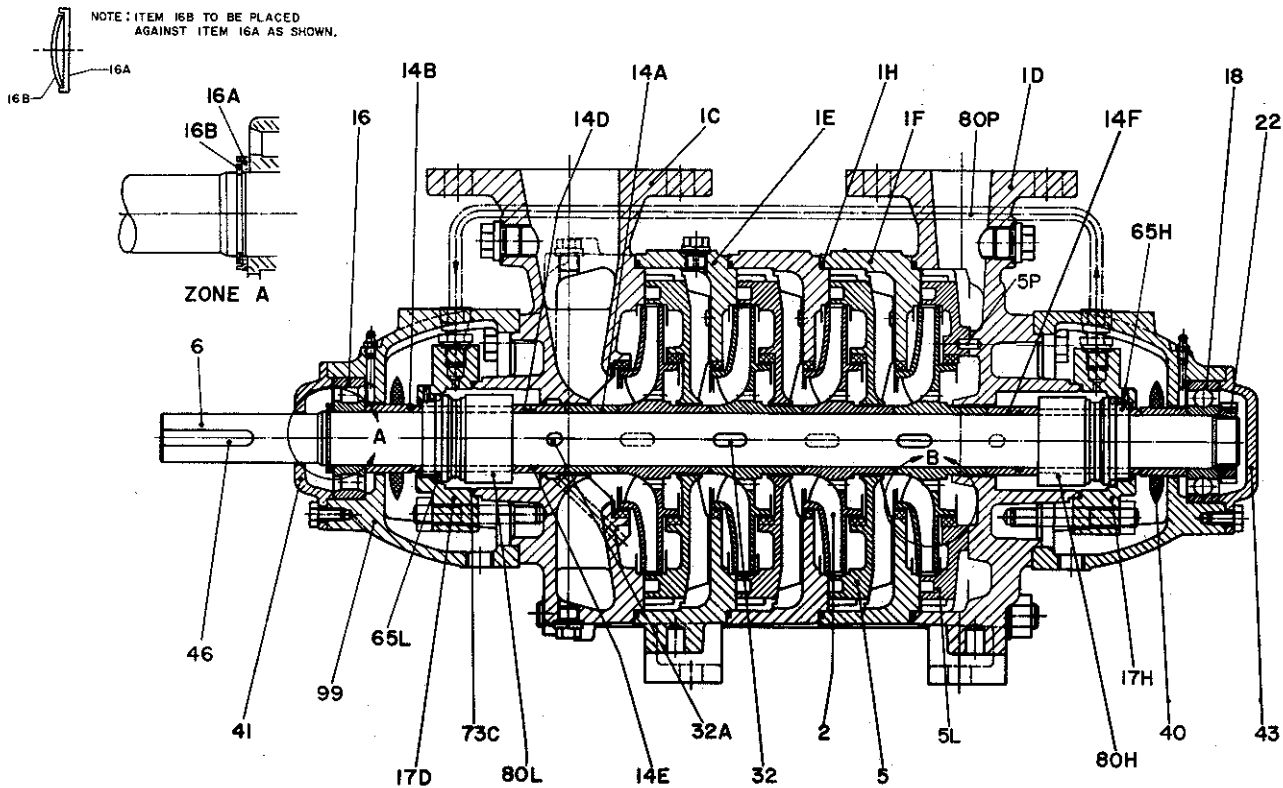
ZONE B
(TYPICAL EACH IMPELLER)

CROSS SECTIONAL DRAWING 4849226
Types TH25, TH32, TH40, TH50
with Mechanical Seals

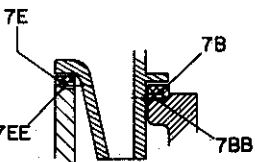


CROSS SECTIONAL DRAWING 4849291
Type TH65
with Mechanical Seals

NOTE: ITEM 16B TO BE PLACED AGAINST ITEM 16A AS SHOWN.



ZONE A



ZONE B
(TYPICAL EACH IMPELLER)



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