

8. Remove impeller key from the shaft.
9. If unit has mechanical seal, remove gland stud nuts. The gland is a solid ring and cannot be removed after unbolting. Carefully slide the gland off the gland studs and move back on shaft and shaft sleeve. Avoid contact with exposed lapped seal faces and keep them clean.

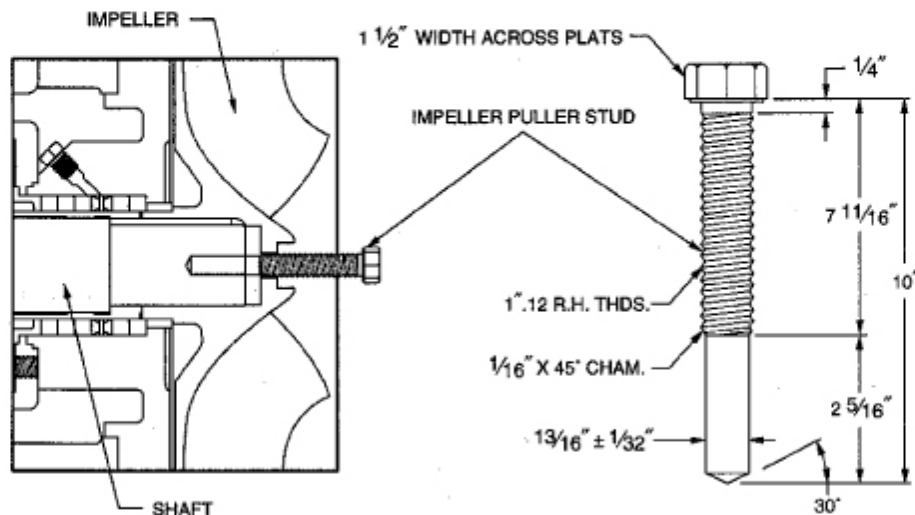


FIGURE 4 – Impeller Removal

10. Remove the adapter to stuffing box bolts. Pull the stuffing box cover from the frame adapter. (On some units, specifically the 18 and 22 inch units, tapped holes are provided in the frame adapter for the use of jacking bolts to assist disassembly of the stuffing box cover.) Do not allow the stuffing box cover to strike the shaft, shaft sleeve, or any mechanical seal part.
11. (a) If the pump has a PACKED STUFFING BOX, remove packing and lantern ring from the stuffing box cover.  
(b) If the pump has a MECHANICAL SEAL, the rotary portion of seal will slide off with the sleeve. Do not damage seal faces.
12. Scribe shaft at coupling hub (for proper positioning of hub engagement during reassembly) and remove hub.

To disassemble remainder of the liquid end; casing and suction sideplate, proceed as follows:

13. Disconnect suction and discharge flanges.
14. Remove casing hold-down bolts and move casing toward driver. If preferred, casing can be removed from bedplate for further disassembly.
15. Remove suction sideplate nuts.
16. Remove the suction sideplate by tightening the jacking screws evenly. Remove the sideplate-to-casing gasket.

To complete disassembly of the power end, proceed as follow:

17. Remove the bolts which hold the frame adapter to the bearing frame. Remove the frame adapter.
18. Remove the deflector from the shaft.
19. Remove the bolts which hold the inboard bearing end cover. The oil seal must be replaced at reassembly.
20. Tap the oil seal from the inboard bearing end cover.
21. Remove bearing housing bolts (21A). Impeller adjustment bolts with jam nuts (21B) can be used to assist in the removal of the shaft and bearing assembly from the bearing frame.
22. Slide the complete shaft assembly from back end of bearing frame. This includes the shaft, both bearings (radial and thrust), and bearing housing. O-rings must be replaced at reassembly.
23. Remove the inboard bearing using a bearing puller. The inboard bearing must be replaced at reassembly.
24. Remove the bolts which hold the bearing end cover to the bearing housing. Remove the bearing end cover. Be sure shaft is free of burrs so the oil seal will not be damaged, at reassembly.
25. Tap the oil seal from the coupling end bearing end cover. Replace the oil seal at reassembly.
26. Slide the bearing housing off shaft.
27. Straighten "tang" in lock washer and remove bearing lock nut and washer.
28. Remove coupling end bearing using a bearing puller. The thrust bearings must be replaced at reassembly.

## SECTION VI

# INSPECTION AND OVERHAUL

### 1. Impeller

Replace if impeller shows excessive erosion (especially on ejector vanes on back side of impeller), corrosion, extreme wear or vane breakage. "O" ring groove and impeller hub must be in good condition. Impeller has a push fit on shaft (.000" to .0015" loose). Check impeller balance.

### 2. Sideplate

To maintain maximum efficiency, the clearance between sideplate and impeller should be 0.015". Overall travel in casing is between 0.059" and 0.085". Sideplates should be inspected for erosion, pitting or excessive wear. Replacement is required when distance between impeller and suction sideplate cannot be held to 0.015" with the axial adjustment.

### 3. Shaft

Check for runout to see that the shaft is not bent. Bearing seats and oil seal areas must be in perfect condition and free of scratches and grooves. O.D. and finish in these areas must be within bearing manufacturer's specifications. Check that the keyway is free of corrosion. Replace shaft if necessary.

### 4. Shaft Sleeve

The shaft sleeve is a push fit and is bored: ("S" -0.000" to 0.002"); ("M" & "L" -0.001" to 0.003") larger than the shaft and should tap easily on the shaft. If the sleeve does not tap on easily, the bore and shaft should be inspected to see that they are free from foreign matter or burrs. The fit of the key in the keyway should also be checked to see that it is not causing binding. The key should have a sliding fit on the sides and should have clearance at the top. Sleeve surface in stuffing box must be smooth and free of grooves. If grooved, replace. "O" ring groove must be in good condition. The original diametric clearance between shaft sleeve and stuffing box bushing is 0.025" to 0.032". If this clearance has increased to more than 0.050", the shaft sleeve, and at times, the stuffing box bushing should be replaced.

### 5. Mechanical Seal

Lapped seal faces, gaskets, and shaft sealing members must be in perfect condition or excess leakage may result. Replace worn or damaged parts.

### 6. Ball Bearing

Always replace ball bearings whenever the bearing frame is dismantled. Replacement bearings must be proper size and type as specified in the Construction Details. New bearings should not be unwrapped until ready for use.

### 7. Oil Seals and Gaskets

Always replace oil seals, gaskets, and O-rings at reassembly. Seals are held by a press fit. The sizes are given in Table 5.

<b>Table 5</b>		
<b>COUPLING END/OB</b>		
<b>GROUP</b>	<b>LABYRINTH OIL SEAL INPRO (OPT)</b>	<b>NEOPRENE OIL SEALS</b>
S	2696389-000	9942361-000
M	2696388-000	9942879-000
L	2696392-000	9943339-000
<b>INBOARD/IB</b>		
<b>GROUP</b>	<b>LABYRINTH OIL SEAL INPRO (OPT)</b>	<b>NEOPRENE OIL SEALS</b>
S	2696390-000	9942450-000
M	2696391-000	9942997-000
L	2696393-000	9943409-000

Lips on seals should face out (away from bearings). One side of bored hole for oils seal is chamfered so that the seal will start easily when pressed in.

8. All parts should be clean before assembly. This is especially important at "O" ring grooves, threads, lock fits, gasket surfaces, and bearing areas. Any burrs should be removed with crocus cloth.

## SECTION VII

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### REASSEMBLY OF PUMP

This procedure covers reassembly of the pump after complete disassembly. Be sure all directions in Section VI Inspection and Overhaul have been followed.

1. Oil bearing seat on coupling end of shaft. Slight heating of bearing either by hot oil or induction would allow easy installation. Slide coupling end bearing (duplex, mounted back-to-back) on shaft as far as possible by hand. Place pipe or driving sleeve over shaft, making sure it rests against inner race only. Make sure bearing is "Square" on shaft. Press evenly until bearing is seated firmly against the shaft shoulder. Do not mark the shaft, especially where it contacts oil seal. The duplex bearing arrangement depends on the type of construction used by the manufacturer. Refer to the manufacturer's instructions packed with the bearings for duplex mounting arrangement.
2. Insert the bearing lock washer, pressing tange into shaft keyway until it is firmly against the bearing.
3. Oil shaft threads lightly and snug the bearing locknut against the lock washer. Tighten firmly with a spanner wrench. Seat tang securely into slot in locknut with drift pin. If necessary, tighten locknut slightly to match tange with slot. Do not loosen locknut to position.
4. Slide bearing housing with "O" ring in place, over impeller end of shaft and over outboard bearing.
5. Tap outboard oil seal in place on bearing end cover (coupling end).
6. Place bearing end cover end .006" white manila gasket over coupling end of shaft and fit into bearing housing. If oil seal is dry, oil lightly before sliding over shaft. Be sure to position "TOP" (cast on cover) in line with "TOP" on housing. Bolt end cover firmly to housing.
7. Oil inboard bearing seat on shaft. Slide inboard ball bearing on shaft as far as possible by hand. Place pipe or sleeve (such as the one shown in Item 1) over shaft, making sure bearing is seated firmly against shaft shoulder. Do not mark shaft, especially where it contacts the oil seal or in stuffing box area.
8. Place a small amount of "O" ring lubricant on inside of bearing frame at bearing housing and inboard bearing seats, on "O" ring, and on inboard oil seal. Slide shaft assembly into the bearing frame as far as possible. When the bearing housing is properly installed (oil return hole at the bottom), the word "TOP" located on the flange of the bearing housing will line up with the top of bearing frame. Be sure bearing housing "O" ring (496) is in place in groove on housing. Insert bearing housing bolts into bearing housing and screw about 1/2" into frame to hold shaft during further assembly.
9. Tap oil seal into the bearing end cover (front/inboard).
10. Slide gasket and inboard bearing end cover over shaft and bolt to bearing frame.
11. Slide deflector on shaft with flat side facing inboard, in until it rests against the bearing frame.

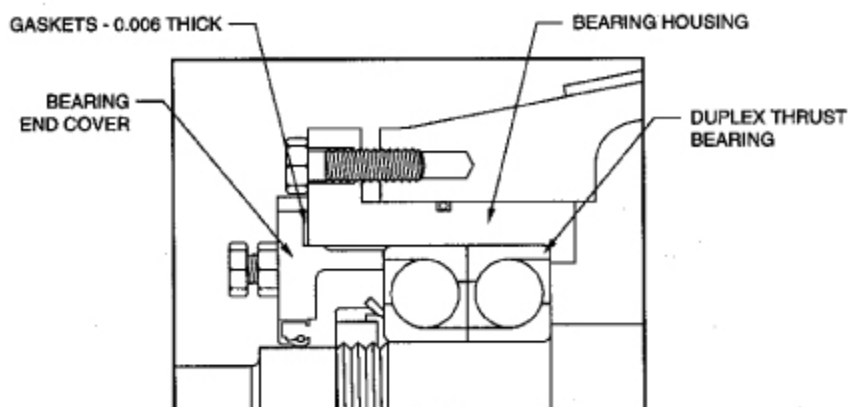


FIGURE 5

12. Bearing end play may be determined at this point as follows: Clamp dial indicator to the pump so that the button rests against the end of the shaft. Push the shaft back and forth as far as possible. Total end play must be at least 0.001" and not more than 0.008". If end play is less than 0.001" add coupling end bearing end cover gaskets made from 0.006" thick manila paper. If end play is greater than 0.008" remove gaskets. Because of matching tolerances, duplex thrust bearings may vary in width by up to 0.030". A correctly assembled pump may require as few as one, or as many as three 0.006" thick gaskets. Refer to Figure 5.
13. Install and position coupling hub at scribe mark on shaft.
14. Bolt bearing frame to frame adapter.
15. To install shaft sleeve and stuffing box cover:
  - (a) On units with a PACKED STUFFING BOX, tap stuffing box bushing into place. Lift stuffing box cover into position at impeller end of shaft. Guide stuffing box cover over shaft and sleeve to prevent contact to these surfaces. Bolt the stuffing box cover to the frame adaptor.
  - (b) On units with a MECHANICAL SEAL, refer to the order acknowledgement and seal drawing (supplied with the pump) to determine seal type and mounting dimensions.

THE FOLLOWING INSTRUCTIONS REFER TO PUMPS EQUIPPED WITH MECHANICAL SEALS. See Figure 6.

#### Setting Mechanical Seals.

- (a) With the bearing frame-shaft assembly completed, install shaft sleeve.
- (b) Carefully slide the stuffing box cover over the sleeve and bolt to the bearing frame. Install impeller with bearing cartridge pushed all the way forward. (See page 36) Set a clearance of .030" between impeller and back side of stuffing box cover.
- (c) Scribe the shaft sleeve at the face of the stuffing box cover. (See Figure 6)
- (d) Unbolt and remove the impeller and stuffing box cover. Remove sleeve.
- (e) For ease of installing rubber gaskets and to help avoid cutting of gaskets, lubricate prior to installation with lubricant compatible with media and gasket material. EXAMPLE: Only use silicone lubricant on ethylene propylene rubber compounds.

(f) Lapped seal faces must not be scratched or nicked during handling. Lint free tissues should be used to clean lapped faces prior to installation. Dirt and dust particles left on faces can scratch and cause unsatisfactory seal performance.

(g) Check seal assembly drawing before installing seal on shaft sleeve. Seal setting dimension (Installation Reference) is shown on the seal assembly drawing, and should be used to locate the seal on the sleeve together with the scribe mark made earlier.

(h) Install rotary part of the seal on the shaft sleeve and tighten set screws then install seal flange with stationary seat assembly and gland gasket. Carefully install this assembled unit over the shaft.

(i) Be sure gland gasket is in place and that pipe taps of the seal gland are in position as shown on the applicable assembly drawing. Then carefully slide the stuffing box cover over the shaft sleeve and seal assembly. Bolt the stuffing box cover to the frame adapter. Then bolt up seal flange progressively, tightening bolts using uniform torque. Be sure seal gland gasket is in place.

#### NOTE

**BE CAREFUL NOT TO DAMAGE SEAL ON UNITS WITH DOUBLE SEALS, MAKE SURE IN-BOARD STATIONARY SEAT IS PROPERLY POSITIONED.**

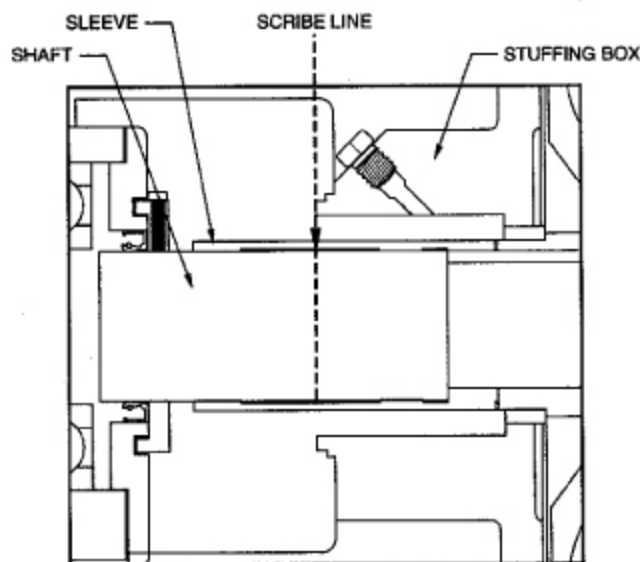


FIGURE 6

16. Place stuffing box cover-to-casing gasket against shoulder of stuffing box cover. Small amounts of "O" ring lube may be used on both sides of gasket to seal and secure gasket in place.
17. Lubricate shaft keyway and insert impeller key in shaft and shaft sleeve. Install impeller "O" ring replace if worn. Lubricate shaft and slide impeller on shaft as far as possible. Pull impeller on shaft the remainder of distance with impeller screw. Be sure impeller screw "O" ring is in good condition. Prevent shaft from rotating by using a spanner or strap wrench.

18. Place "O" ring in outer groove of suction sideplate. Install the sideplate-to-casing studs in tapped holes in sideplate. Place side plate to casing gasket into bottom of casing. Place suction sideplate in casing, making sure not to damage the sideplate "O" ring. Liberal amounts of "O" ring lube may be used to assist in sliding in place. Install and tighten four nuts on sideplate-to-casing studs.
19. Tighten casing hold-down bolts to sideplate.
20. Connect suction and discharge pipe (if in the system). Care should be taken to prevent excessive pump flange loading.
21. Slide the completely assembled "back-pull-out" unit into the casing. Tighten the frame adapter-to-casing bolts evenly to assure that gap between adapter and casing is even. Check with a feeler gauge at 4 points 90° apart around the adapter.
22. Install pedestal hold-down bolts.
23. Set impeller clearance as outlined in Appendix. Clearance between impeller and sideplate should be set at 0.015" to maintain optimum efficiency. Overall travel must be 0.059" to 0.084" dependent on tolerances. If not, check casing gasket to be sure it is 1/16" thick.
24. If unit requires stuffing box packing, refer to section II-Q and pack as directed. (Refer also to Fig. 7 for alternate methods of packing.)
25. Replace auxiliary piping.

## ADDITIONAL DETAILS

### 1. Stuffing Box

The standard stuffing box cover has four pipe taps for sealing or flushing liquid to the packing or mechanical seal. Two are used for in and out connections to the throat of the stuffing box for paper stock services with the lantern ring positioned next to the stuffing box throat bushing. Two are alternately used for evaporator or chemical services as in and out connections. Figure 7 shows a stuffing box and location of holes, and the holes used for evaporator services and paper stock service.

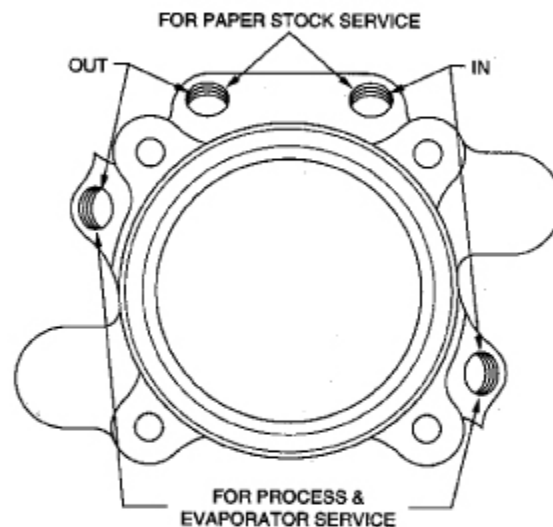


FIGURE 7

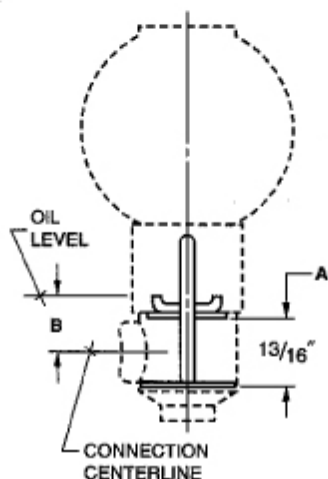
# APPENDIX

## OIL LUBRICATED BEARINGS

### NOTE

Pumps are not shipped from the factory with oil. Responsibility for filling the bearing frame with the proper type and amount of oil is the responsibility of the user.

Remove item (113A) oil fill plug/breather and fill frame with oil to the center of the sight glass. If a Trico oiler is used, follow instructions below in Figure 8.



1. Remove adjustment assembly from oiler.
2. Adjust bars to dimension "A".
3. Lock into position.
4. Replace adjustment assembly in oiler.

Pump Group	Oiler Size	A	B
S	8 oz	.1875	0.7
M	8 oz	.1875	0.5
L	8 oz	.1875	0.89

FIGURE 8 – OIL LUBRICATED BEARINGS, TRICO OILER ONLY

A high quality turbine oil with rust and oxidation inhibitors should be used. Under normal operating conditions, an oil of 300 SSU viscosity at 100° F should be used where pumping temperatures do not exceed 350° F (177°C). See table below for recommended oil types. Fill oiler bottle and replace in oiler housing. We recommend a breather to be installed in the location of the oil fill plug when a Trico oiler is used.

Change oil after 200 hours of operation for new bearings, then every 2000 hours or three months whichever occurs first.

### BEARING FRAME OIL APPX. CAPACITY

Frame	Pints	Liters
STP	6	2.8
MTP	8	3.8
LTP	10	4.7

## RECOMMENDED OIL MANUFACTURERS

Atlantic Richfield	DURO 68
Chevron	CHEVRON TURBINE OIL GST 68
Exxon	TERESSTIC 68
Texaco Inc.	Regal R&O 68
Mobil	DTE Heavy-Medium
Amoco Oil	Amoco Industrial Oil #68

## GREASE LUBRICATED BEARINGS

## NOTE

Grease lubricated ball bearings are optional on the ANSI series. These units can be identified by grease fittings located on the bearing frame. Pumps ordered with regreaseable bearings from the factory will contain some grease, but not a sufficient amount for placing the pump into continuous service. It is necessary to completely grease the bearings as described below before placing the pump on line. Failure to do this may result in repairs not covered by the product warranty.

- (a) Clean any dirt or foreign matter from the grease fittings. Remove grease relief plugs from bottom of frame. Pump grease through the fittings and into each bearing cavity until fresh grease comes out of the relief ports. REGREASE BEARINGS EVERY 2000 HOURS OF OPERATION OR 3 MONTHS, WHICHEVER OCCURS FIRST. For pumping temperatures less than 350° F, use a lithium based mineral oil grease of NLGI consistency equal to NO. 2. NEVER MIX GREASES OF DIFFERENT CONSISTENCIES OR OF DIFFERENT TYPES. WHEN CHANGING FROM ONE TYPE GREASE OR CONSISTENCY TO ANOTHER, ALWAYS REMOVE THE BEARINGS AND CLEAN OUT ALL THE OLD GREASE.

## ACCEPTABLE GREASE MANUFACTURERS

<b>NGLI GRADE 2</b>	<b>(350 Degrees F. MAX.)</b>
Mobil	Mobilux EP2
Exxon	Unirex N2
Sunoco	Multipurpose EP
SKF	LGMT 2
<b>NGLI GRADE 3</b>	<b>(500 Degrees F. MAX.)</b>
Exxon	Unirex 3
SKF	LGMT 3

# APPENDIX

## IMPELLER CLEARANCE ADJUSTMENT

If a gradual loss in head and/or capacity occurs, performance may be restored by adjusting the impeller. If performance cannot be restored by adjustment, the pump should be disassembled and impeller and casing inspected for wear. Impeller clearance is the measurement between the edge of the impeller vanes and the surface of the casing side plate. The following table should be used as a guide for setting the impeller clearance under various operating temperatures.

Temperature	Impeller Clearance
up to 200°F (93°C)	.015 in. (0.38mm)
201°F to 250°F (121°C)	.017 in. (0.43mm)
251°F to 300°F (149°C)	.019 in. (0.48mm)
300°F to 399°F (177°C)	.021 in. (0.53mm)
400°F to 450°F (218°C)	.023 in. (0.58mm)
451°F to 500°F (246°C)	.025 in. (0.64mm)

## FEELER GAUGE ADJUSTMENT OF IMPELLER CLEARANCE

- (a) LOCK OUT POWER SUPPLY TO MOTOR.
- (b) Remove coupling guard. Loosen jack bolts (370D) and jam nuts (423). Tighten bearing housing bolts (370C) evenly, while slowly rotating the shaft until the impeller just starts to rub on the casing side plate. Using a feeler gauge, set the gap between the four housing bolts (370C) and the bearing housing. SEE FIGURE 10. Set the gap according to the above table as required.

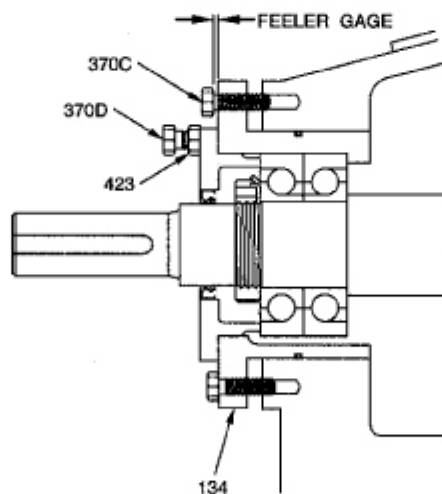
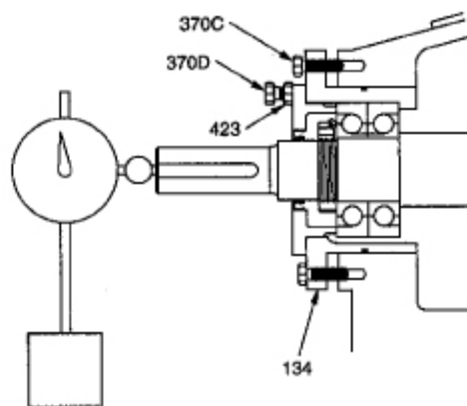


FIGURE 10

- (c) Tighten jacking bolts (370D) evenly, until bearing housing backs out and contacts the bearing housing bolts (370C). Tighten jam nuts (423) evenly. Rotate shaft to make sure that it turns freely.
- (d) Reinstall coupling guard.

**DIAL INDICATOR ADJUSTMENT OF IMPELLER CLEARANCE**

- (a) **LOCK OUT POWER SUPPLY TO MOTOR.**
- (b) Remove coupling guard and coupling.
- (c) Place a dial indicator with a magnetic mounting base on the surface of the pump baseplate. Position indicator against face of pump shaft. SEE FIGURE 11.



**FIGURE 11**

- (d) Loosen jacking bolts (370D) and jam nuts (423).
- (e) Tighten bearing housing bolts (370C) evenly, while slowly rotating the shaft until the impeller just starts to rub on the casing wear plate. Set dial indicator to zero.
- (f) Tighten the jacking bolts (370D) evenly, until they contact the bearing frame. Continue to tighten the jacking bolts evenly, about one flat at a time, drawing the bearing housing away from the frame until the dial indicator shows the proper clearance. SEE TABLE ON PAGE 36.
- (g) Tighten bearing housing bolts (370C) evenly, then tighten jam nuts (423) evenly. Make sure dial indicator reading does not move from the proper setting. Rotate shaft to make sure that it turns freely.
- (h) Reinstall coupling and coupling guard.

**ASSEMBLY CHECKS SHAFT END PLAY**

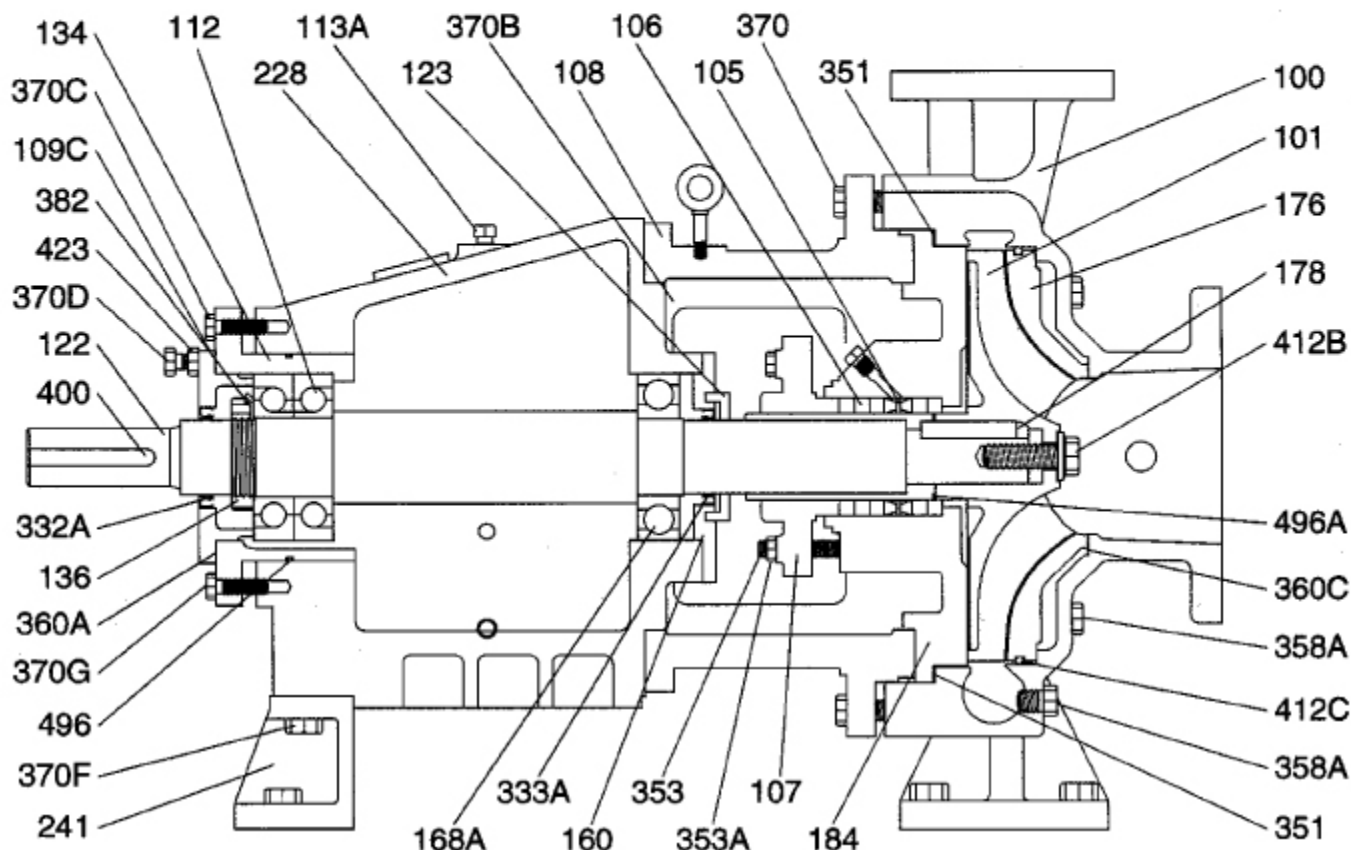
Frame	Double Row
<b>S</b>	0.0010 in (.026 mm)
	0.0015 in (.038 mm)
<b>M</b>	0.0013 in (.032 mm)
	0.0017 in (.044 mm)
<b>L</b>	0.0013 in (.032 mm)
	0.0017 in (.044 mm)

**BOLT TORQUE VALUES**

Type	Frame Size	Threads Dry	Threads Lubricated
Casing Bolts Item 370	S/M/L	45 Ft Lbs (60nm)	30 Ft Lbs (40nm)
Frame To Adapter Bolts Item 370 B	S/M/L	30 Ft Lbs (40nm)	20 Ft Lbs (27nm)
Bearing Cover Bolts Item 370G	S/M/L	83 In Lbs (9.4nm)	55 In Lbs (6.2nm)
Bearing End Cover Bolts Item 370G	S/M/L	12 Ft Lbs (16nm)	9 Ft Lbs (12nm)



**S FRAME Cross Sectional Drawing**

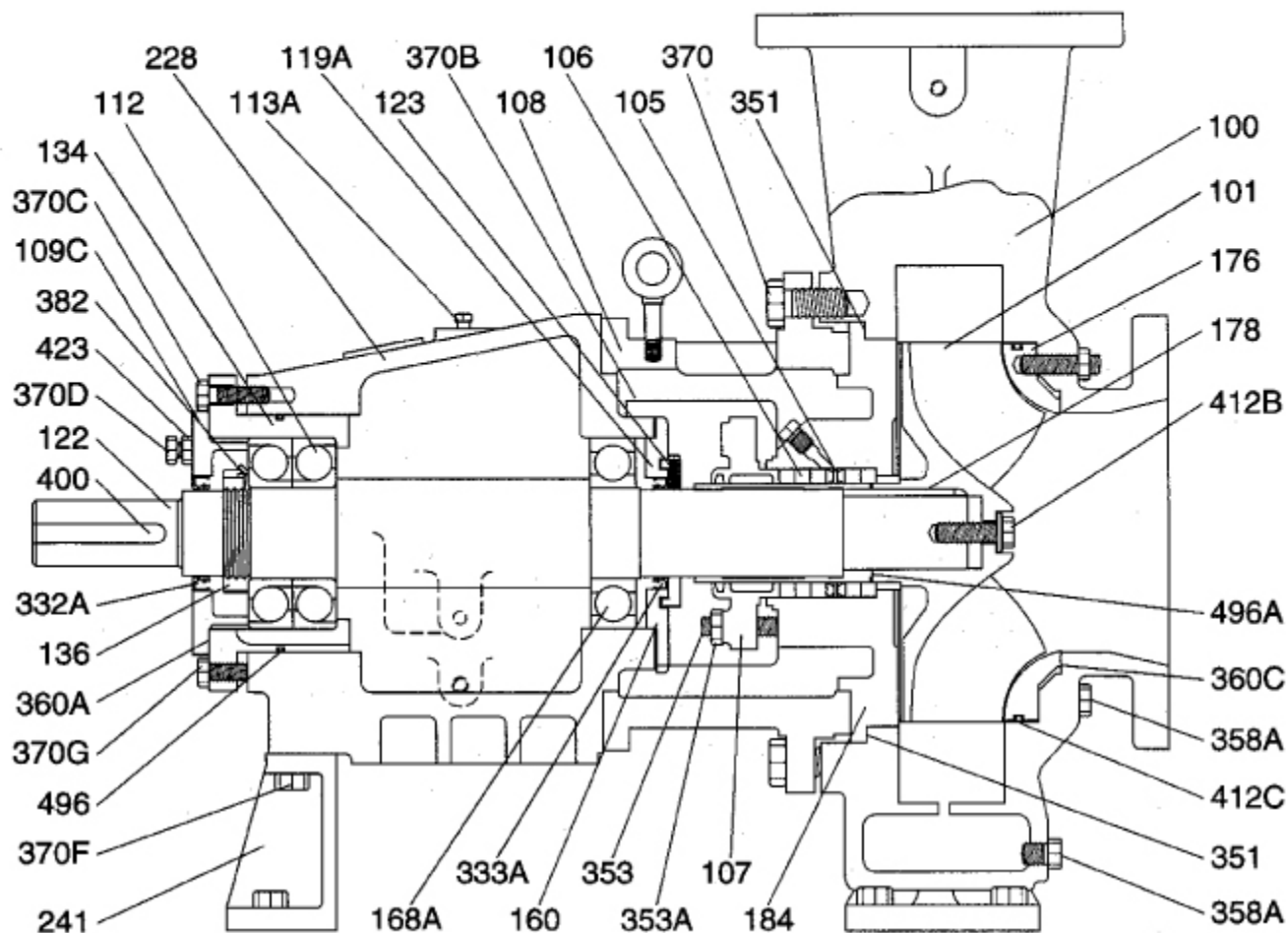


ITEM #	QTY	DESCRIPTION
100	1	Casing
101	1	Impeller
NA	1	Foot, Casing
NA	2	Bolt, Casing Foot
105	1	Ring, Lantern
106	1	Packing
107	1	Gland, Packing
108	1	Adapter
109C	1	Cover, Bearing, Outboard
112	1	Bearing, Outboard
113A	1	Plug, Oil Fill
NA	1	Pin, Sleeve
122	1	Shaft
123	1	Deflector
126	1	Sleeve, Shaft
134	1	Housing, Bearing, Outboard
136	1	Locknut, Bearing
160	1	Bearing Cover, Inboard
168A	1	Bearing, Inboard
178	1	Impeller Key
184	1	Cover, Stuffing Box
228	1	Frame
241	1	Foot, Frame
248A	1	Ring, Oil
250	1	Gland, Mechanical Seal
332A	1	Labyrinth, Outboard Frame
333A	1	Labyrinth, Inboard Frame

ITEM #	QTY	DESCRIPTION
351	1	Gasket, Case
358A	1	Plug, Casing Drain
353	4*	Stud, Gland
353A	4*	Nut, Gland Stud
360A	1	Gasket - Bearing End Cover - Coupling End
360C	1	Gasket, Sideplate to Casing
360Q	1	Gasket, Gland, Mechanical Seal
370	3	Bolt, Casing
370B	4	Bolt, Frame/Adapter
370C	3	Bolt, Bearing Housing
370D	3	Jack Bolt, Bearing Housing
370F	2	Bolt, Frame Foot to Frame
370G	6	Bolt, Bearing Cover
370H	2	Box Cover/Adapter Stud
382	1	Lock Washer, Bearing
400	1	Key, Coupling
408M	1	Plug, Oil Cooler Outlet (Not Shown)
412B	1	O-ring Impeller Screw
412C	1	O-ring Suction Sideplate
423	3	Jamnut, Bearing Housing Jack Bolt
496	1	Gasket, Bearing Housing/Frame
496A	1	O-ring, Impeller - Sleeve
-	1	O-ring
-	1	O-ring
-	1	O-ring
-	1	O-ring

\*Packing Gland has only 2 Studs & Nuts

## M FRAME Cross Sectional Drawing

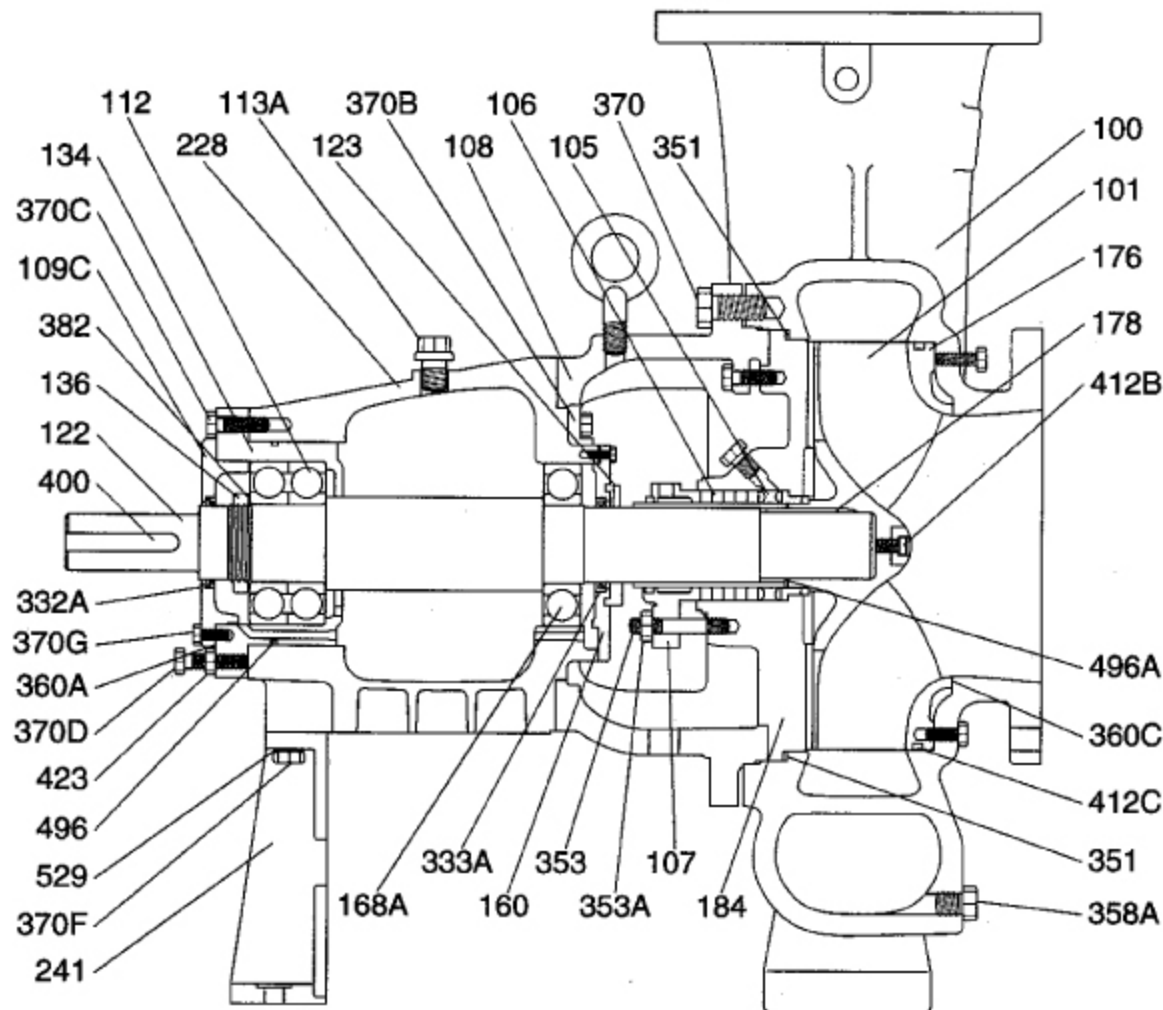


ITEM #	QTY	DESCRIPTION
100	1	Casing
101	1	Impeller
NA	1	Foot, Casing
NA	2	Bolt, Casing Foot
105	1	Ring, Lantern
106	1	Packing
107	1	Gland, Packing
108	1	Adapter
109C	1	Cover, Bearing, Outboard
112	1	Bearing, Outboard
113A	1	Plug, Oil Fill
NA	1	Pin, Sleeve
122	1	Shaft
123	1	Deflector
126	1	Sleeve, Shaft
134	1	Housing, Bearing, Outboard
136	1	Locknut, Bearing
160	1	Bearing Cover, Inboard
168A	1	Bearing, Inboard
178	1	Impeller Key
184	1	Cover, Stuffing Box
228	1	Frame
241	1	Foot, Frame
248A	1	Ring, Oil
250	1	Gland, Mechanical Seal
332A	1	Labyrinth, Outboard Frame
333A	1	Labyrinth, Inboard Frame

\*Packing Gland has only 2 Studs & Nuts

ITEM #	QTY	DESCRIPTION
351	1	Gasket, Case
358A	1	Plug, Casing Drain
353	4*	Stud, Gland
353A	4*	Nut, Gland Stud
360A	1	Gasket - Bearing End Cover - Coupling End
360C	1	Gasket, Sideplate to Casing
360Q	1	Gasket, Gland, Mechanical Seal
370	3	Bolt, Casing
370B	4	Bolt, Frame/Adapter
370C	3	Bolt, Bearing Housing
370D	3	Jack Bolt, Bearing Housing
370F	2	Bolt, Frame Foot to Frame
370G	6	Bolt, Bearing Cover
370H	2	Box Cover/Adapter Stud
382	1	Lock Washer, Bearing
400	1	Key, Coupling
408M	1	Plug, Oil Cooler Outlet (Not Shown)
412B	1	O-ring Impeller Screw
412C	1	O-ring Suction Sideplate
423	3	Jamnut, Bearing Housing Jack Bolt
496	1	Gasket, Bearing Housing/Frame
496A	1	O-ring, Impeller - Sleeve
-	1	O-ring
-	1	O-ring
-	1	O-ring
-	1	O-ring

## L FRAME Cross Sectional Drawing



ITEM #	QTY	DESCRIPTION
100	1	Casing
101	1	Impeller
NA	1	Foot, Casing
NA	2	Bolt, Casing Foot
105	1	Ring, Lantern
106	1	Packing
107	1	Gland, Packing
108	1	Adapter
109C	1	Cover, Bearing, Outboard
112	1	Bearing, Outboard
113A	1	Plug, Oil Fill
NA	1	Pin, Sleeve
122	1	Shaft
123	1	Deflector
126	1	Sleeve, Shaft
134	1	Housing, Bearing, Outboard
136	1	Locknut, Bearing
160	1	Bearing Cover, Inboard
166A	1	Bearing, Inboard
178	1	Impeller Key
184	1	Cover, Stuffing Box
228	1	Frame
241	1	Foot, Frame
248A	1	Ring, Oil
250	1	Gland, Mechanical Seal
332A	1	Labyrinth, Outboard Frame
333A	1	Labyrinth, Inboard Frame

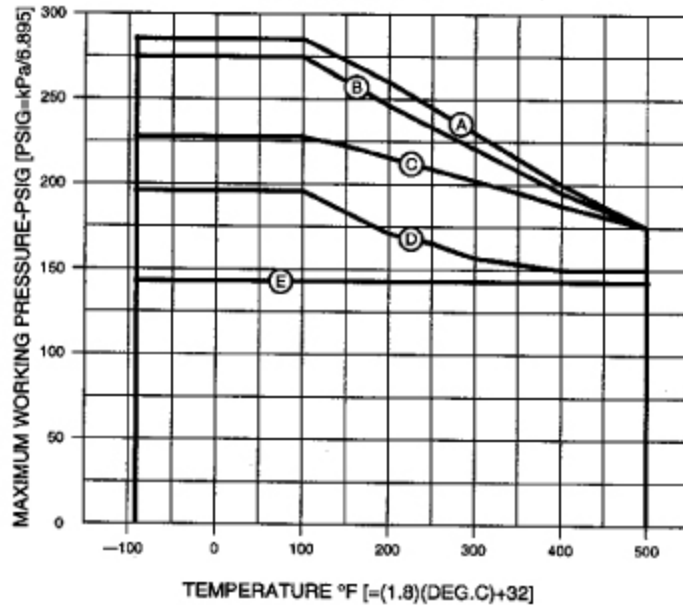
\*Packing Gland has only 2 Studs & Nuts

ITEM #	QTY	DESCRIPTION
351	1	Gasket, Case
358A	1	Plug, Casing Drain
353	4*	Stud, Gland
353A	4*	Nut, Gland Stud
360A	1	Gasket - Bearing End Cover - Coupling End
360C	1	Gasket, Sideplate to Casing
360Q	1	Gasket, Gland, Mechanical Seal
370	3	Bolt, Casing
370B	4	Bolt, Frame/Adapter
370C	3	Bolt, Bearing Housing
370D	3	Jack Bolt, Bearing Housing
370F	2	Bolt, Frame Foot to Frame
370G	6	Bolt, Bearing Cover
370H	2	Box Cover/Adapter Stud
382	1	Lock Washer, Bearing
400	1	Key, Coupling
408M	1	Plug, Oil Cooler Outlet (Not Shown)
412B	1	O-ring Impeller Screw
412C	1	O-ring Suction Sideplate
423	3	Jamnut, Bearing Housing Jack Bolt
496	1	Gasket, Bearing Housing/Frame
496A	1	O-ring, Impeller - Sleeve
-	1	O-ring
-	1	O-ring
-	1	O-ring
-	1	O-ring

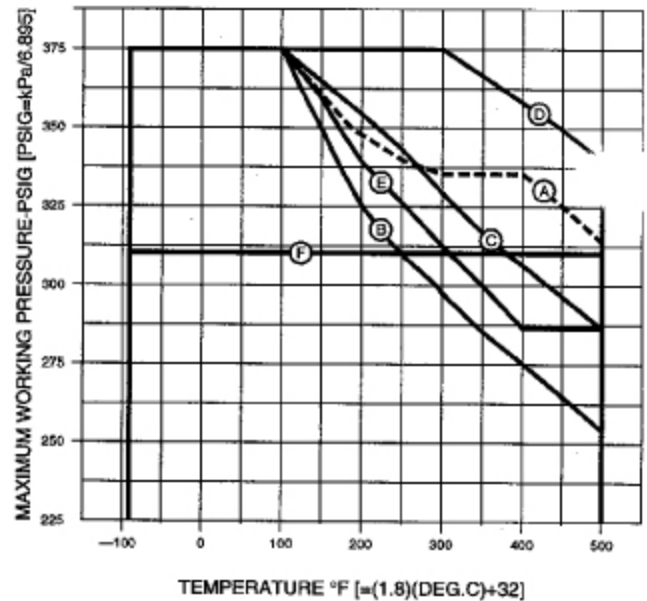
# Process Pumps Engineering Data

## PRESSURE / TEMPERATURE RATINGS

150 LB. FLANGES



300 LB. FLANGES



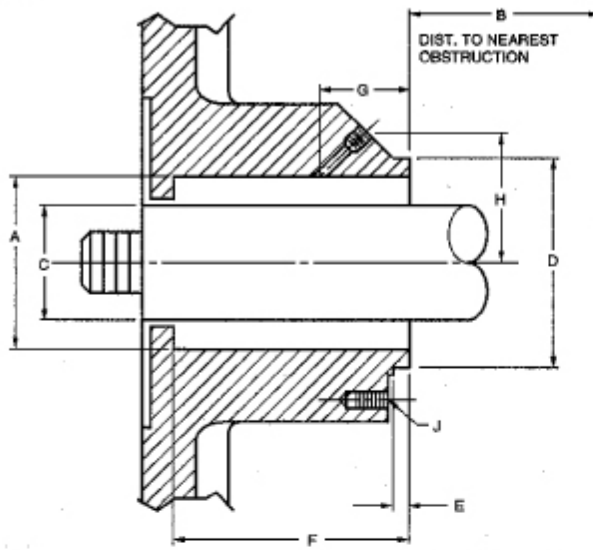
CURVE	MATERIAL
A	DUCT. IRON
A	CAST STEEL
A	CD4MCu
A	HAST. B
A	HAST. C
A	TITANIUM
B	316 S.S.
B	317 S.S.
C	ALLOY 20
D	MONEL
E	NICKEL

CURVE	MATERIAL
A	DUCT. IRON
A	CAST STEEL
A	316 S.S.
A	317 S.S.
A	ALLOY 20
A	HAST. B
B	HAST. C
B	CD4MCu
C	TITANIUM
D	MONEL
E	NICKEL

**CONTACT FACTORY FOR SUCTION PRESSURES OVER 160 PSIG.**

Process Pumps Engineering Data

Standard Stuffing Box Center



PUMP SIZE	BOX COVER								J			BOX CVR NPT	GLAND NPT
	A	B	C	D	E	F	G	H	STUDS		BOLT HOLE CIR.		
									SIZE	NO.			
S	4.00	3.22	3.00	4.748	.25	3.938	2.25	3.125	5/8	4	6.25	.5	.375
M	4.25	3.16	3.75	5.498	.25	3.938	2.25	3.50	5/8	4	7.00	.5	.375
L	5.75	3.27	4.75	6.498	.25	3.938	3.12	4.00	5/8	4	8.00	.5	.375

# Pump Trouble-Shooting

## Common Pump Operational Problems

Problem	Probable Cause	Remedy
Pump is noisy or vibrates.	Improper pump/driver alignment.	Align shafts.
	Partly clogged impeller causing imbalance.	Back-flush pump to clean impeller.
	Broken or bent impeller or shaft.	Replace as required.
	Foundation not rigid.	Tighten hold down bolts of pump and motor or adjust stilts.
	Worn bearings.	Replace.
	Suction or discharge piping not anchored or properly supported.	Anchor per Hydraulic Institute Standards Manual recommendations.
	Pump is cavitating.	System problem.
Pump not producing rated flow or head.	Air leak thru gasket.	Replace gasket.
	Air leak thru stuffing box.	Replace or readjust packing/mechanical seal.
	Impeller partly clogged.	Back-flush pump to clean impeller.
	Worn suction sideplate or wear rings.	Replace defective part as required.
	Insufficient suction head.	Ensure that suction line shutoff valve is fully open and line unobstructed.
	Worn or broken impeller.	Inspect and replace if necessary.
Pump starts then stops pumping.	Improperly primed pump.	Reprime pump.
	Air or vapor pockets in suction line.	Rearrange piping to eliminate air pockets.
	Air leak in suction line.	Repair (plug) leak.
No liquid delivered.	Pump not primed.	Reprime pump, check that pump and suction line are full of liquid.
	Suction line clogged.	Remove obstructions.
	Impeller clogged with foreign material.	Back-flush pump to clean impeller.
	Wrong direction of rotation.	Change rotation to concur with direction indicated by arrow on bearing housing or pump casing.
	Foot valve or suction pipe opening not submerged enough.	Consult factory for proper depth. Use baffle to eliminate vortices.
	Suction lift too high.	Shorten suction pipe.
Excessive leakage from stuffing box.	Packing gland improperly adjusted.	Tighten gland nuts.
	Stuffing box improperly packed.	Check packing and repack box.
	Worn mechanical seal parts.	Replace worn parts.
	Overheating mechanical seals.	Check lubrication and cooling lines.
Bearings run hot.	Shaft sleeves scored.	Remachine or replace as required.
	Improper alignment.	Re-align pump and driver.
	Improper lubrication.	Check lubricant for stability and level.
Motor requires excessive power.	Lube cooling.	Check cooling system.
	Head lower than rating. Pumps too much liquid.	Consult factory. Install throttle valve, trim impeller.
	Liquid heavier than expected.	Check specific gravity and viscosity.
	Stuffing packing too tight.	Readjust packing. Replace if worn.
Rotating parts bind.	Check internal wearing parts for proper clearances.	

## Ordering Spare Parts

To insure against possible long and costly downtime periods, especially on critical services, it is advisable to have spare parts on hand.

1. **For critical services:** It is recommended that a "back pull-out assembly" be kept on hand. This is a group of assembled parts which includes all parts except the casing and the coupling.
2. An alternative, though not as desirable as that stated above, can be used on noncritical services. This involves having on hand parts that are most likely to wear and can be used as needed. See list below for these recommended spares.

## Recommended Spare Parts

Shaft	Item 122	Rear Bearing Cover Gasket	Item 360A
Shaft Sleeve	Item 126	Bearing Lock Washer	Item 382
Outboard Bearing	Item 112	Bearing Lock Nut	Item 136
Inboard Bearing	Item 168A	Impeller	Item 101
Case Gasket	Item 351	Impeller/Sleeve O Ring	Item 496A
Front Bearing Cover Gasket	Item 360	Lantern Ring (packed box)	Item 105
Bearing Housing O-ring	Item 496	Impeller Screw O Ring	Item 412B
Sideplate Gasket	Item 360P	Sideplate O Ring	Item 412C

## Instructions for Ordering Spare Parts

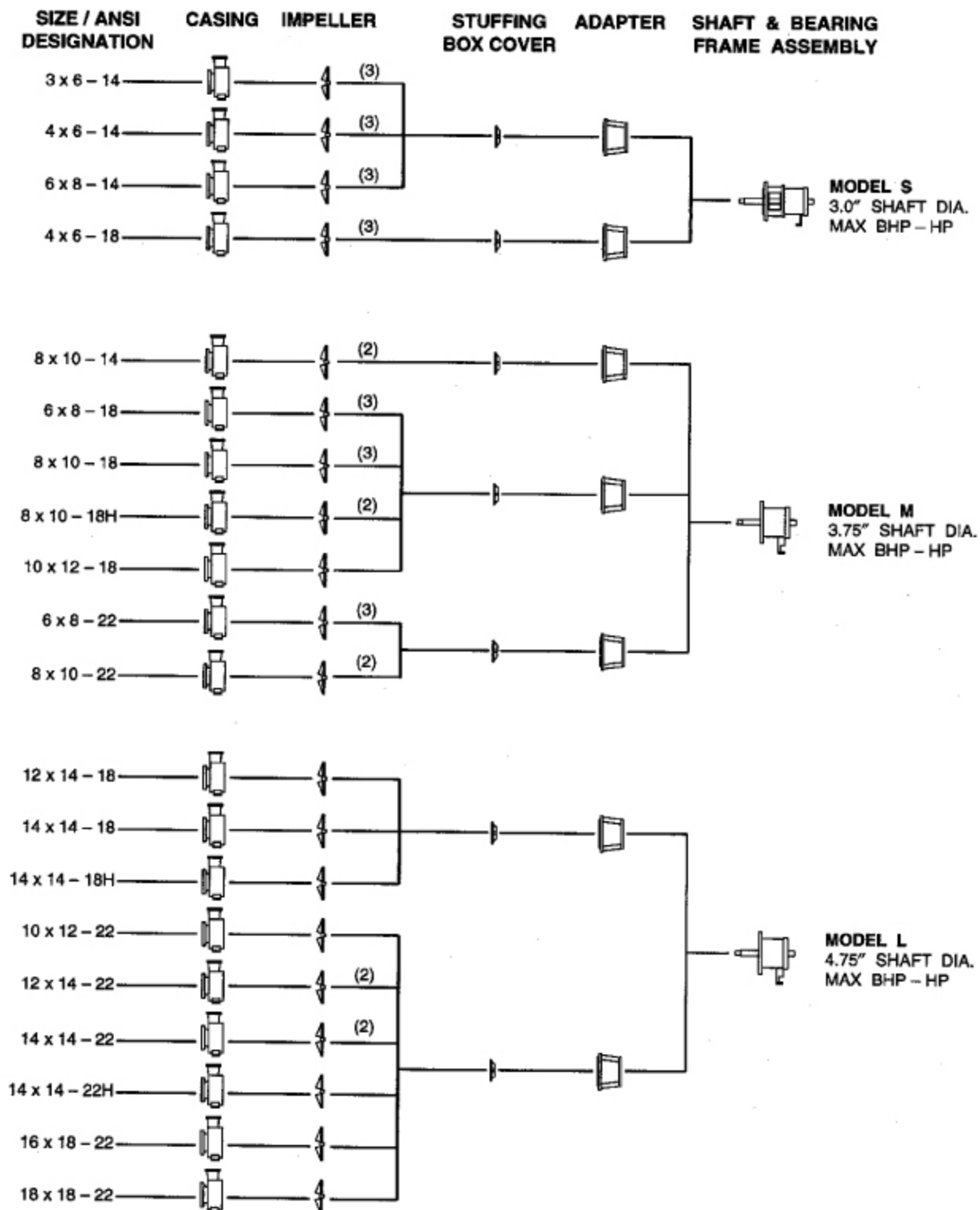
Repair orders will be handled with a minimum of delay. Contact your local authorized representative and provide the following:

1. Give model number, size of pump, and serial number. These can be obtained from the nameplate on the pump.
2. Write plainly the name, part number, and material of each part required. These names and numbers should agree with those on the sectional drawing on pages 39, 41, 42 and 43.
3. Give the number (quantity) of parts required.
4. Give complete shipping instructions.

### NOTICE:

Materials of construction, specifications, dimensions, design features and application information, where shown in this bulletin, are subject to change without notice by Sterling Fluid Systems (USA), Inc. at their option.

# Modular Interchangeability Chart



## S Exploded Isometric View

### Pump Sizes

3 x 6 - 14

4 x 6 - 14

6 x 8 - 14

4 x 6 - 18

