

**CASING-** Visually inspect for signs of wear, corrosion, or pitting. The casing should be replaced if wear exceeds  $Y_s$ " deep. Check gasket surface for signs of corrosion or irregularities.

**IMPELLER-** Visually inspect impeller vanes for wear, erosion, or corrosion damage. If vanes are worn more than  $Y_s$ " deep, or if they are bent, the impeller should be replaced.

**FRAME ADAPTER-** Visually inspect for cracks, warpage or corrosion damage. Replace if any of these signs appear.

**BEARING HOUSING-** Visually inspect for signs of wear or corrosion. Check for cracks and/or pits. Check tolerances as noted below. Replace if worn or out of tolerance.

**SEAL CHAMBER/BOX COVER-** Visually inspect for cracks, pitting, erosion, or corrosion. Check face of cover for wear, scoring or grooves. Replace if worn more than 1/8" deep.

**BEARING FITS  
INCHES (MM)  
BEARING FITS  
INCHES (MM)**

	<b>STP</b>	<b>MTP</b>	<b>LTP</b>	<b>XLTP</b>
Frame Inboard I.D.	2.8346 (72.000)	3.9370 (100.000)	4.7244 (120.000)	5.5118 (140.000)
	2.8353 (72.019)	3.9379 (100.022)	4.7253 (120.022)	5.5128 (140.025)
Bearing Inboard O.D.	2.8346 (72.000)	3.9370 (100.000)	4.7244 (120.000)	5.5118 (140.000)
	2.8341 (71.987)	3.9364 (99.985)	4.7238 (119.985)	5.5111 (139.982)
Shaft Inboard O.D.	1.3875 (35.013)	1.7722 (45.013)	2.1660 (55.015)	2.5597 (65.015)
	1.3871 (35.002)	1.7718 (45.002)	2.1655 (55.002)	2.5592 (65.002)
Bearing Inboard I.D.	1.3780 (35.000)	1.7717 (45.000)	2.1654 (55.000)	2.5591 (65.000)
	1.3775 (34.988)	1.7712 (44.988)	2.1648 (54.985)	2.5585 (64.985)
Shaft Outboard O.D.	1.1815 (30.011)	1.7722 (45.013)	1.9690 (50.013)	2.5597 (65.015)
	1.1812 (30.002)	1.7718 (45.002)	1.9686 (50.002)	2.5592 (65.002)
Bearing Outboard I.D.	1.1811 (30.000)	1.7717 (45.000)	1.9685 (50.000)	2.5591 (65.000)
	1.1807 (29.990)	1.7712 (44.988)	1.9680 (49.988)	2.5585 (64.985)
Bearing Housing I.D. Outboard	2.8346 (72.000)	3.9370 (100.000)	4.3307 (110.000)	5.5118 (140.000)
	2.8353 (72.019)	3.9379 (100.022)	4.3316 (110.022)	5.5128 (140.025)
Bearing O.D. Outboard	2.8346 (72.000)	3.9370 (100.000)	4.3307 (110.000)	5.5118 (140.000)
	2.8341 (71.987)	3.9364 (99.985)	4.3301 (109.985)	5.5111 (139.982)

## SHAFT RUNOUT (WITH SLEEVE) IN INCHES

	STP	MTP	LTP	XLTP
At Sleeve Journal	0.002	0.002	0.002	0.002
At Coupling Journal	0.002	0.002	0.002	0.002

### ASSEMBLY (See Isometric View, Pages 53 & 54)

#### **ROTATING ELEMENT AND BEARING FRAME, STP AND MTP FRAMES**

BEARING FRAME - INSPECT TAPPED CONNECTIONS FOR DIRT, CLEAN AND CHASE THREADS AS NECESSARY. USE THREAD SEALANT ON ALL THREADS AND FITTINGS.

- (a) Install oil fill plug (113A), oil sight glass (143), oil mist/grease plugs (408H), oil cooler inlet and outlet plugs (408L) and (408M).
- (b) Attach bearing frame foot (241) with bolts (370F).

#### **POWER END ASSEMBLY**

- (a) Install outboard bearing (112) on shaft. If bearings are grease lubricated install single shielded bearing with shield toward the impeller. Bearings can be pressed on the shaft with an arbor press, or if available, an induction heater can be used. Follow all instructions and recommendations of the heater manufacturer. When using a press, make sure that force is applied to the inner bearing race only.
- (b) Install bearing lock washer (382) on shaft. Place tang of lock washer in shaft keyway under bearing.
- (c) Thread locknut (136) onto shaft. Tighten nut until snug, with a spanner wrench, and bend any tang of lock washer over flat on nut. Slide bearing retaining snap ring (361A) over shaft, flat side toward the bearing.
- (d) Install inboard bearing (168A). If using a press, make sure force is applied on inner bearing race only. NOTE: If bearing is grease lubricated, it has a single shield. The bearing is installed with the shield away from the impeller.
- (e) Install new O-ring (496) on bearing housing (134). Apply thin coating of oil on outside of bearing and inside of bearing housing. Lightly lubricate shaft to assist with installation of labyrinth seal O-rings.
- (f) Slide coupling end of pump shaft through bearing housing. Press housing evenly, DO NOT FORCE, until bearing seats against shoulder in bearing housing. Support outer face of bearing isolator to prevent accidental separation of rotor from stator.
- (g) Install bearing snap ring (361A) in groove in bearing housing bore.

#### **NOTE**

Locate ends of retaining ring so that they do not obstruct the flow of oil through the return groove. Rotate shaft to make sure that it turns freely.

- (h) Apply thin film of lubricant to outside of bearing housing (134).

- (i) Apply thin film of lubricant to frame bore I.D. Install shaft assembly into bearing frame (228). Rotate shaft to make sure that it turns freely.
- (j) Install cap screws (370C), into bearing frame (228).
- (k) Install jack bolts (370D) and lock nuts (423). Hand tighten evenly.
- (l) On MTP frames, install new O-ring gasket in frame face (360D).

## **ASSEMBLY (See Isometric View, Pages 55 & 56)**

### ***ROTATING ELEMENT AND FRAME ASSEMBLY, LTP AND XLTP***

BEARING FRAME - INSPECT TAPPED CONNECTIONS FOR DIRT, CLEAN AND CHASE THREADS AS NECESSARY. USE THREAD SEALANT ON ALL THREADS AND FITTINGS.

- (a) Install oil fill plug (113A), oil sight glass (143), oil mist/grease plugs (408H), oil cooler inlet and outlet plugs (408L) and (408M).
- (b) Attach bearing frame foot (241) with bolts (370F).

### ***ROTATING ELEMENT-LTP FRAME***

- (a) If removed, install oil ring (248A) on shaft. OIL RING IS A PRESS FIT ONTO SHAFT. USE, PROPER SIZE DRIVE TOOL TO PREVENT DAMAGE.
- (b) Install bearing cover (109C) on shaft.
- (c) Install outboard bearings (112). NOTE, LTP FRAMES USE DUPLEX ANGULAR CONTACT BEARINGS. MAKE SURE BEARINGS ARE MOUNTED IN THE CORRECT ORDER, BACK TO BACK.
- (d) Install inboard bearing (168A). If using a press, make sure force is applied on inner bearing race only. NOTE: If bearing is grease lubricated, it has a single shield. The bearing is installed with the shield away from the impeller.
- (e) Lightly lubricate bearings with oil and coat the outside of outboard bearing (112) and bearing housing bore (134). Slide bearing housing (134) onto shaft and over outboard bearing. DO NOT FORCE.
- (f) Install bearing cover bolts (370G), check shaft so that it turns freely. Tighten bolts to 55 IN-LBS for Lubricated threads or 83 inch-lbs. for dry threads.
- (g) Install new O-ring for bearing housing (496).
- (h) Lightly lubricate outside surface of bearing housing (134) and inside diameter of frame bearing bore (228).
- (i) Install shaft and bearing assembly into bearing housing (228). Rotate shaft to see that it turns freely.
- (j) Install bearing cover bolts (370C), hand tighten only. Install jack bolts (370D) with lock nuts (423). and tighten only.

## ***ROTATING ELEMENT-XLTP FRAME***

- (a) Install outboard bearing (112) on shaft.
- (b) Install bearing lock washer (382) on shaft. Place tang of lock washer in shaft keyway. Thread locknut (136) onto shaft. Tighten nut until snug and bend tang of lock washer (382) over flat on nut. If it is necessary to adjust the position of the locknut so that the tang will lineup with the flat, always tighten the nut, never loosen it.
- (c) Lightly lubricate bearings with oil and coat the outside of outboard bearing (112) and bearing housing bore (134). Slide bearing housing (134) onto shaft and over outboard bearing. **DO NOT FORCE.**
- (d) Install gasket (360C), bearing cover (109C) and bolts. Check to see that shaft turns freely. Refer to Appendix, page 42, for bolt torque values.
- (e) Install inboard bearing (168A). If bearing is greaseable type, install with shield away from impeller. Lightly lubricate bearing with oil or grease as required.
- (f) Install new O-ring for bearing housing (496). Lubricate outside of bearing housing and inside diameter of frame bearing bore (228) with oil.
- (g) Install shaft and bearing assembly into frame (228). Rotate shaft to see that it turns freely.
- (h) Install bearing cover bolts (370C), hand tighten only. Install jack bolts (370D) with lock nuts (423), hand tighten only.
- (i) Install bearing frame foot (241), hand tighten bolts (370F).

## ***POWER FRAME CHECKS AND LIQUID END ASSEMBLY-ALL MODELS***

- (a) Place power frame in the horizontal position, support frame assembly so that it does not tip over. Check shaft end play by moving shaft forward and backward by hand. Dial indicator movement should be within tolerances listed in Appendix. If values are greater, disassemble power end for inspection. See troubleshooting, page 33.
- (b) Install shaft sleeve (126). Install impeller, (101) on shaft (122). Rotate shaft one full revolution, and check for shaft/sleeve run out. See tolerances listed in Appendix. Maximum allowable indicator runout is 0.002 inch. If values are greater, disassemble power end for inspection. See troubleshooting, page 33.
- (c) Attach dial indicator to shaft, place indicator against face of frame. Rotate shaft by hand so that indicator sweeps the entire fit for 360 degrees. Maximum indicator runout should be no more than 0.005 inch. If greater, disassemble and determine cause.
- (d) Lightly lubricate adapter O-ring (360D) and install in frame face. Install frame adapter (108) with bearing isolator seal (333A, MTP frame only) onto the power end assembly, align bolt holes and dowel pin holes. Install dowel pins (469B) and frame to adapter bolts (370B). See Appendix for bolt torques. Tighten evenly in a crisscross manner.
- (e) Attach dial indicator to shaft, place indicator against mating face of adapter. Rotate shaft 360 degrees. Total indicator runout should not exceed 0.005. With dial indicator still attached to shaft, position indicator on inside diameter of mating face. Rotate shaft again a full 360 degrees. Total indicator runout should not exceed 0.005 inch. If greater values are measured, disassemble and determine cause before proceeding with assembly.

## ***PACKED TYPE PUMPS***

- (a) Install stuffing box cover (184) with studs and nuts (370H, 423B)
- (b) Mount dial indicator on end of shaft and check seal chamber cover run out. Rotate shaft a full 360 degrees. Maximum dial indicator reading should not exceed 0.005 on any of the following readings:
  - (1) Outside diameter of the pilot fit.
  - (2) Face of gasket surface.
  - (3) Box cover face.
- (c) Apply a light coating of anti-seize compound to area of shaft under the sleeve. Install shaft sleeve (126). Be sure sleeve is seated against shoulder of shaft and that the anti-rotation pin is located in notch on sleeve shoulder.
- (d) Install impeller with 0-ring. Thread impeller on shaft until it seats against shaft sleeve face. Slide impeller wrench over shaft and coupling key. Tighten impeller, by raising wrench counterclockwise (viewed from impeller end) and slamming it down (clockwise) against the work bench. Repeat two or three times.
- (e) Attach dial indicator to flange of frame adapter. Position indicator on tip of impeller vane. Rotate shaft 360 degrees. Check impeller run out from vane tip to vane tip. Total indicator runout should be less than 0.005 inch.
- (f) Install packing in stuffing box. Stagger each ring joint 90 degrees. Two rings should be inserted into the bottom of the box, followed by the lantern ring (105) and then three more rings of packing. Make sure lantern ring is located at the flushing connection, otherwise no flushing will occur. Install packing gland halves (107), hand tighten evenly.

## ***MECHANICAL SEAL PUMPS***

- (a) Install seal chamber (184) with studs and nuts (370H, 423B).
- (b) Mount dial indicator on end of shaft and check seal chamber cover run out. Rotate shaft a full 360 degrees. Maximum dial indicator reading should not exceed .005 on any of the following:
  - (1) Outside diameter of the pilot fit.
  - (2) Face of gasket surface.
  - (3) Seal chamber cover face.
- (c) Install shaft sleeve. Apply a light coating of anti-seize compound to area of shaft under the sleeve. Install shaft sleeve (126). Be sure sleeve is seated against shoulder of shaft and that the anti-rotation pin is located in notch on sleeve shoulder.
- (d) Install impeller less 0-ring. Thread impeller on shaft until it seats against shaft sleeve face. Slide impeller wrench over shaft and coupling key. Tighten impeller, by raising wrench counterclockwise (viewed from impeller end) and slamming it down (clockwise) against the work bench. Repeat two or three times.
- (e) Attach dial indicator to flange of frame adapter. Position indicator on tip of impeller. Rotate shaft 360 degrees. Check impeller run out from vane tip to vane tip. Total indicator runout should be less than 0.005 inch.
- (f) Apply bluing solution to the shaft sleeve. Scribe a mark on the shaft sleeve at the face of the seal chamber/stuffing box cover. This will locate a reference point for the installation of the mechanical seal.
- (g) Remove impeller and shaft sleeve. Remove seal chamber cover.

- (h) Install mechanical seal stationary into mechanical seal gland, (250). Follow seal manufacturer's instructions. Slide seal gland with stationary seal seat over shaft and position gland back towards the adapter face.
- (i) Reinstall shaft sleeve. Follow the manufacturer's instructions and install the rotating seal assembly on the shaft sleeve/shaft.
- (j) Install seal chamber (184) with studs and nuts (370H,423B).
- (k) Install impeller with O-ring. Thread impeller on shaft until it seats against shaft sleeve face. Slide impeller wrench over shaft and coupling key. Tighten impeller, by raising wrench counterclockwise (viewed from impeller end) and slamming it down (clockwise) against the work bench. Repeat two or three times.
- (l) Install mechanical seal gland (250) with nuts, (353A). Tighten nuts evenly. Check shaft to see if it can be rotated by hand. If binding or rubbing occurs, determine cause and correct before proceeding. See chart below for possible causes.

### POWER FRAME Troubleshooting

Symptom	Cause
Excessive Shaft/Sleeve Runout	Sleeve Worn—Replace Shaft Bent/Twisted—Replace
Excessive Bearing Frame Flange Runout	Shaft Bent/Twisted—Replace Frame Flange Warped—Replace
Excessive Shaft End Play	Bearing Internal Clearance Too Great—Replace Bearings Snap Ring Loose Or Broken—Replace Or Reseat
Excessive Frame Adapter Runout	Adapter Eroded/Warped—Replace
Excessive Impeller Vane Tip Runout	Vane(S) Broken or Worn—Replace
Excessive Seal Chamber Runout	Seal Chamber Not Seated Seal Chamber Worn/Warped Seal Chamber Corroded—Eroded—Replace Cover

## INSTALLATION-BACK PULL OUT ASSEMBLY -ALL MODELS

### **WARNING**

**Proper methods to handle the back pull out assembly must always be used to avoid physical injury or damage.**

- (a) Inspect casing. Clean casing fit and install gasket (351) onto seal chamber/stuffing cover.
- (b) Loosen cap screws (390C) and jacking bolts (370D). Install back pull out assembly in casing.
- (c) Apply anti - seize compound to casing bolts (370). Install casing bolts hand tight. Torque casing bolts to values shown in Appendix.
- (d) Check lateral movement of impeller in casing. Acceptable range is between .030 inch and .065 inch. Clearance beyond these limits indicates defective parts, improper installation or excessive pipe strain. Determine cause and correct before proceeding.
- (e) Set impeller clearance as detailed in Appendix.
- (f) Install any auxiliary piping or flush plans.
- (g) Check shaft to see if it can be rotated by hand. If binding or rubbing occurs, determine cause and correct before proceeding.

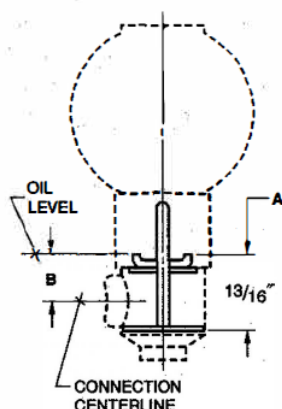
REFILL POWER FRAME WITH OIL, OR GREASE BEARINGS AS DESCRIBED IN THE PRELIMINARY START UP CHECK LIST. FOLLOW ALL INSTRUCTIONS IN START UP CHECK LIST AND PROCEED WITH PUMP START-UP.

## OILLUBRICATED 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 and fill frame with oil to the center of the sight glass. If a Trico oiler is used, follow instructions below in Figure A.



- Remove adjustment assembly from oiler.
- Adjust bars to dimension "A".
- Lock Into position.
- Replace adjustment assembly in oiler.

Pump Group	Oiler Size	A	B
STP, MTP, LTP	#3 (4 Ounce)	13/16"	1/2"
XLTP	#5 (8 Ounce)	13/16	1/2"

**Figure A. 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). Fill frame with oil to the center of the sight glass through oil fill plug (113A). Fill oiler bottle and replace in oiler housing. **We recommend a breather to be installed in the location of the oil fill plug.**

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

## BEARING FRAME OIL CAPACITY

Frame	Pints	Milliliters
STP	1.0	473
MTP	2.6	1250
LTP	3.0	1420
XLTP	7.4	3500

## 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 (see figure b). Pumps ordered with greaseable bearing 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

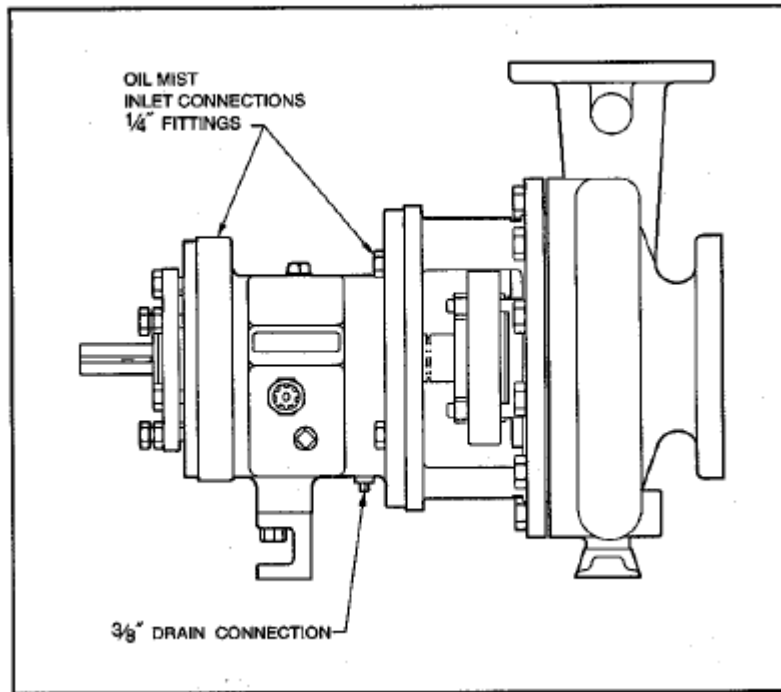
<b>NGLI GRADE 2</b>	<b>(350 Degrees F. MAX.)</b>
Mobil	Mobilux EP2
Exxon	Unirex N2
Sunoco	Multipurpose EP
SKF	LGMT 2

<b>NGLI GRADE 3</b>	<b>(500 Degrees F. MAX.)</b>
Exxon	Unirex 3
SKF	LGMT 3

## ***FIELD CONVERSION FROM FLOOD OIL TO OIL MIST BEARINGS***

There are several types of oil mist configurations available from various manufacturers. The following instructions are for conversion of flood oil lubrication to a continuous purge oil mist system.

- (a) Install oil mist inlet connections (1/4 inch at top inboard and outboard tapped connections on bearing frame. SEE FIGURE C.
- (b) Remove oil drain plug (408A) at bottom center of frame 1/2 inch NPT plug. Install drain connection for oil mist system.
- (c) Refer to oil mist manufacturer's system instructions for operation and adjustment.



**Figure C. Oil Mist system connection  
(MTP Frame Illustrated)**

## BEARING IDENTIFICATION MRC - SKF OR EQUAL

Inboard (Radial Bearing)		
Frame	Oil	Grease
STP	207S	207SF
MTP	309S	309SF
LTP	311S	—
XLTP	313S	313SF

Outboard (Thrust Bearing/Double Row)		
Frame	Oil	Grease
STP	5306	5360F
MTP	5309	5309F
LTP	7310 DUPLEX	—
XLTP	5313	5313F

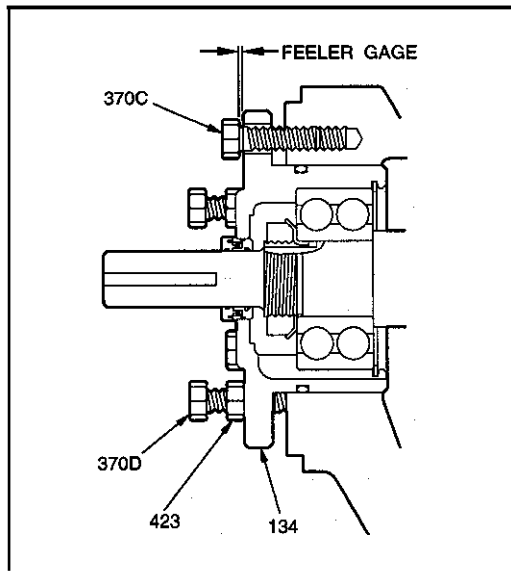
### ***IMPELLER CLEARANCE ADJUSTMENT***

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. 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)
301°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. Using a feeler gauge; set the gap between the three housing bolts (370C) and the bearing housing. Set the gap according to the table as required. SEE FIGURE D.

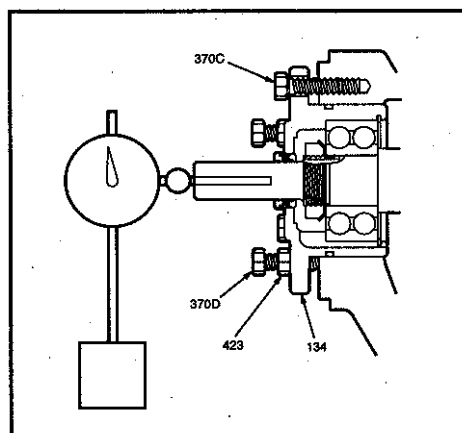


**Figure D.**

- (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 E.



**Figure E.**

- (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. 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, from .015 inch to .025 inch.
- (g) Tighten bearing housing bolts (370C) evenly, then tighten jacking bolts (370D) 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
STP	.0011 IN. (.028MM)
	.0019 IN. (.047MM)
MTP	.0013 IN. (.033MM)
	.0021 IN. (.054MM)
LTP	.0010 IN. (.026MM) DUPLEX
	.0015 IN. (.038MM) DUPLEX
XLTP	.0014 IN. (.036MM)
	.0023 IN. (.058MM)

### BOLT TORQUE VALUES

Type	Frame Size	Threads Dry	Threads Lubricated
Casing Bolts	STP 6 inch	45 Ft Lbs (60nm)	30 Ft Lbs (40nm)
	STP 8 inch	30 Ft Lbs (40nm)	20 Ft Lbs (27nm)
Frame To Adapter Bolts	STP	Not Applicable	
Bearing Cover Bolts			

Bearing End  
Cover Bolts

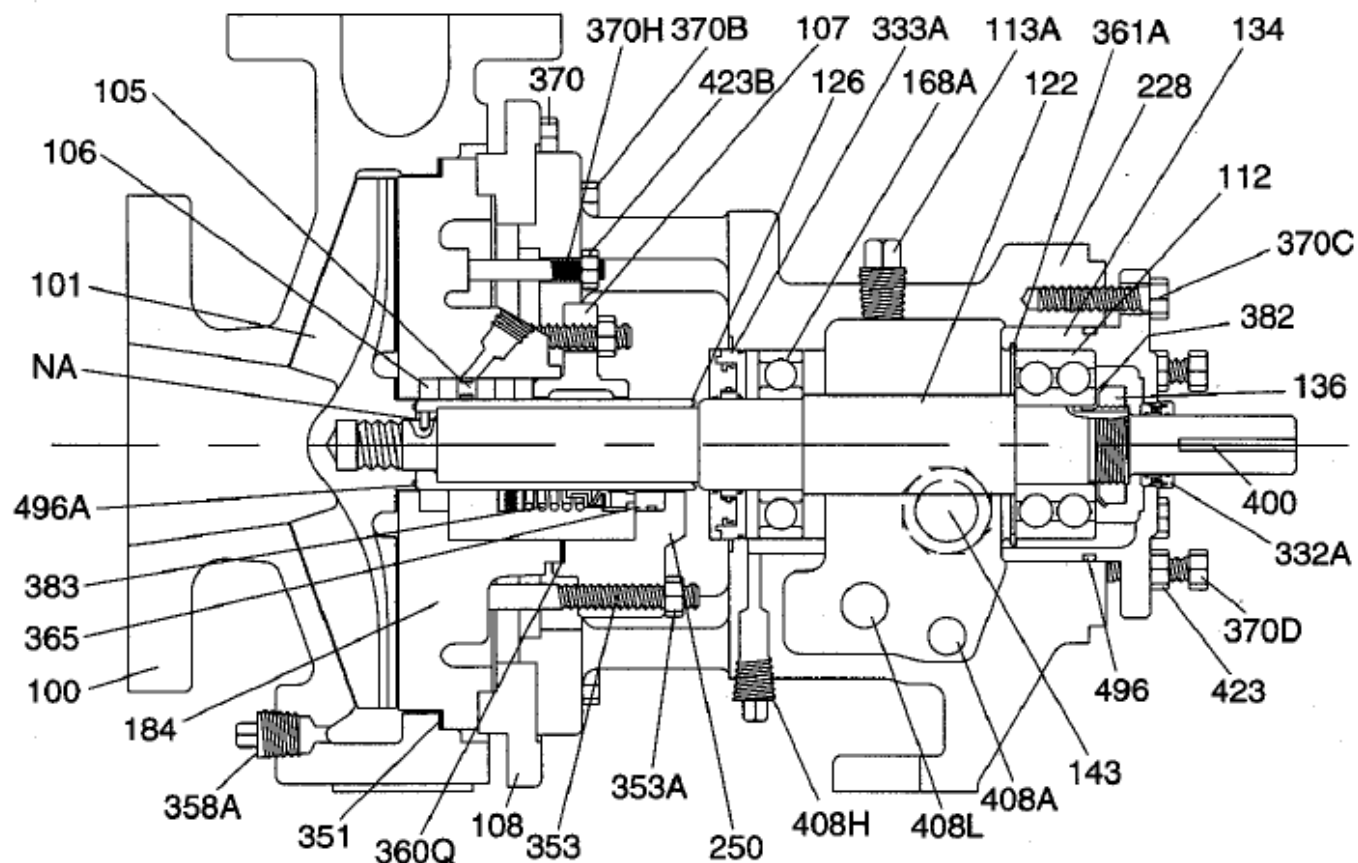
# PARTS LIST WITH MATERIALS OF CONSTRUCTION

ITEM #	QTY	DESCRIPTION	MATERIAL									
			DL	ALL	CD4MCu	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI
100	1	Casing	316SS	316SS	CD4	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI
370	□	Bolt, Casing	D.I.	316SS	CD4	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI
NA	1	Foot, Casing	STEEL	STAINLESS STEEL								
358A	1	Plug, Casing Drain	STEEL	SS	ALLOY 20	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI
101	1	Impeller	316SS	316SS	CD4	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI
122	1	Shaft	4140 STEEL	316SS	316SS	316SS						
184	1	Cover, Stuffing Box	316SS	316SS	CD4	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI
370H	2	Box Cover/Adapter Stud	STAINLESS STEEL									
423B	2	Nut, Box Cover/Adapter Stud	STAINLESS STEEL									
106	5	Packing	ARAMID - PTFE SYNTHETIC									
126	1	Sleeve, Shaft	316SS	ALLOY 20	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI	
NA	1	Pin, Sleeve	STAINLESS STEEL 420									
168A	1	Bearing, Inboard	STEEL - SINGLE ROW BALL									
250	1	Gland, Mechanical Seal	VARIES									
107	1	Gland, Packing	316SS	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI		
353	4*	Stud, Gland	STAINLESS STEEL									
353A	4*	Nut, Gland Stud	STAINLESS STEEL									
112	1	Bearing, Outboard	STEEL - DOUBLE ROW BALL									
228	1	Frame	STP - DUCTILE IRON - MTP, LTP, XLTP - CAST IRON									
241	1	Foot, Frame	CAST IRON									
408H	4	Plug, Frame Lubrication Port	STEEL									
408L	1	Plug, Oil Cooler Inlet	STEEL									
408A	1	Plug, Frame Drain	STEEL									
370F	2	Bolt, Frame Foot to Frame	STEEL									
529	2	Washer, Frame Foot	STEEL									
408M	1	Plug, Oil Cooler Outlet (Not Shown)	STEEL									
113A	1	Plug, Oil Fill	TEFLON									
126	1	Locknut, Bearing	STEEL									
105	1	Ring, Lantern	TEFLON									
134	1	Housing, Bearing, Outboard	CAST IRON									
370C	3**	Bolt, Bearing Housing	STEEL									
370D	3**	Jack Bolt, Bearing Housing	STEEL									
423	3	Jamnut, Bearing Housing Jack Bolt	STEEL									
408H	2	Plug, Bearing Housing Lubrication - XLTP Only	STEEL									
361A	1	Snap Ring, Bearing	STEEL									
109C	1	Cover, Bearing, Outboard	CAST IRON									
370G	6	Bolt, Bearing Cover	STEEL									
360C	1	Gasket - XLTP Only	VEGETABLE FIBER									
496A	1	Gasket, Shaft Sleeve	TEFLON									
400	1	Key, Coupling	STEEL									
248A	1	Ring, Oil - LTP Frame Only	STEEL									
365	1	Seal, Mechanical Stationary Element	VARIES									
382	1	Lock Washer, Bearing	STEEL									
108	1	Adapter	DUCTILE IRON									
370B	4	Bolt, Frame/Adapter	STEEL									
469B	2	Dowel Pin, Frame/Adapter	STEEL									
351	1	Gasket, Case	ARAMID FIBER WITH EPDM BINDER									
360Q	1	Gasket, Gland, Mechanical Seal	VARIES									
360D	1	Frame/Adapter - O-ring	BUNA N									
496	1	Bearing Housing/Frame - O-ring	BUNA N									
383	1	Seal, Mechanical Rotating Element	VARIES									
333A	1	Labyrinth, Inboard Frame	BRONZE / VITON									
332A	1	Labyrinth, Outboard Frame	BRONZE / VITON									
-	1	O-ring	VITON									
-	1	O-ring	VITON									
-	1	O-ring	VITON									
-	1	O-ring	VITON									
143	1	Gauge, Sight, Oil	STEEL / GLASS									

\*Packing Gland has only 2 Studs & Nuts      \*\*4 on XLTP Frames      □ Minimum 8 STP / Maximum 24 XLTP      subject to change without notice

MATERIALS OF CONSTRUCTION		
MATERIAL	CODE	SPECIFICATION
316 STAINLESS STEEL	086	CAST, ASTM A743, GRADE CF-BM
317 STAINLESS STEEL	653	CAST, ASTM A743, GRADE CG-BM
ALLOY20	654	CAST, ASTM A743, GRADE CN-7M
CAST IRON	040	ASTM A48, CLASS 30
CAST IRON	650	ASTM A48, CLASS 25
CD4MCu	507	ASTM A743, GRADE CD4MCu
DUCTILE IRON	596	ASTM A395, GRADE 60-40-18
DUCTILE IRON	680	ASTM A536, GRADE 65-45-12
HASTELLOYB	101	ASTM A494, GRADEN - 12MV, CLASS 1
HASTELLOYC	102	ASTM A494, GRADE CW-2M
MONEL	651	CAST, ASTM A494 M-35
NICKEL	485	ASTM A494, GRADE C2100
STEEL	075	4140 STEEL, ASTM A331-64
TITANIUM	652	CAST, ASTM 8367, GRADE C-3

# STP FRAME Cross Sectional Drawing

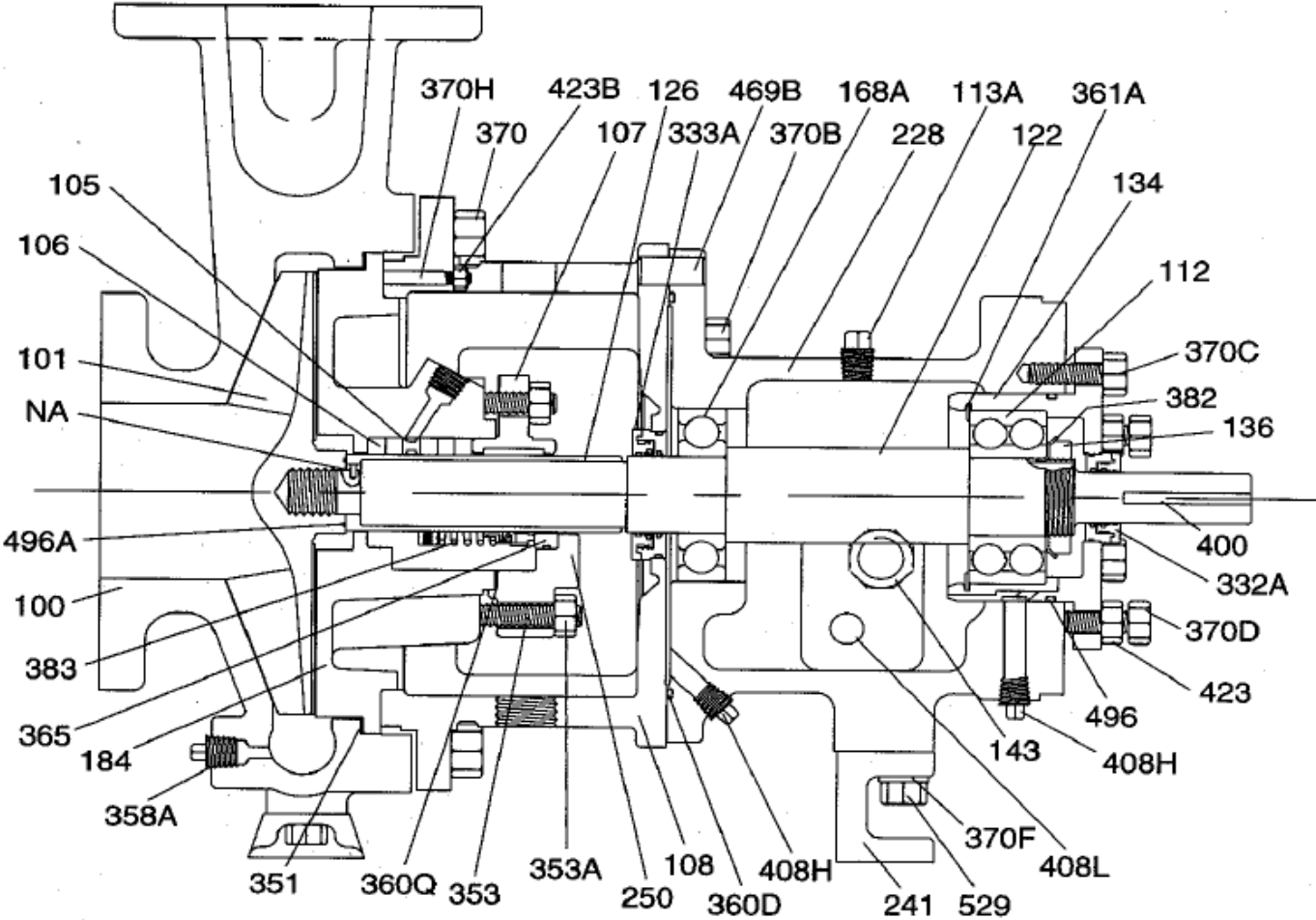


ITEM#	QTY	DESCRIPTION
100	1	Casing
370	8	Bolt, Casing
358A	1	Plug, Casing Drain
101	1	Impeller
122	1	Shaft
184	1	Cover, Stuffing Box
370H	2	Box Cover/Adapter Stud
4230	2	Nut, Box Cover/Adapter Stud
106	5	Packing
126	1	Sleeve, Shaft
NA	1	Pin, Sleeve
168A	1	Bearing, Inboard
250	1	Gland, Mechanical Seal
107	1	Gland, Packing
353	4•	Stud, Gland
353A	4•	Nut, Gland Stud
112	1	Bearing, Outboard
228	1	Frame
406H	4	Plug, Frame Lubrication Port
406L	1	Plug, Oil Cooler Inlet
406A	1	Plug, Frame Drain
408M	1	Plug, Oil Cooler Outlet (Not Shown)
113A	1	Plua, Oil Fill

ITEM#	QTY	DESCRIPTION
136	1	Locknut, Bearing
105	1	Ring, Lantern
134	1	Housing; Bearing, Outboard
370C	3	Bolt, Bearing Housing
370D	3	Jack Bolt, Bearing Housing
423	3	Jam nut, Bearing Housing Jack Bolt
361A	1	Retaining Ring, Bearing
496A	1	Gasket, Shaft Sleeve
400	1	Key, Coupling
365	1	Seal, Mechanical Stationary Element
362	1	Lock Washer, Bearing
108	1	Adapter 8 • Pumps Only
370B	4	Bolt Frame/Adapter
351	1	Gasket, Case
350Q	1	Gasket; Gland, Mechanical Seal
496	1	Gasket, Bearing Housing/Frame
363	1	Seal, Mechanical Rotating Element
333A	1	Labyrinth, Inboard Frame
332A	1	Labyrinth Outboard Frame
-	1	O-ring
-	1	O-ring
-	1	O-ring
143	1	Gauge; Sight, Oil

\*Packing Gland has only 2 Studs & Nuts

# MTP FRAME Cross Sectional Drawing

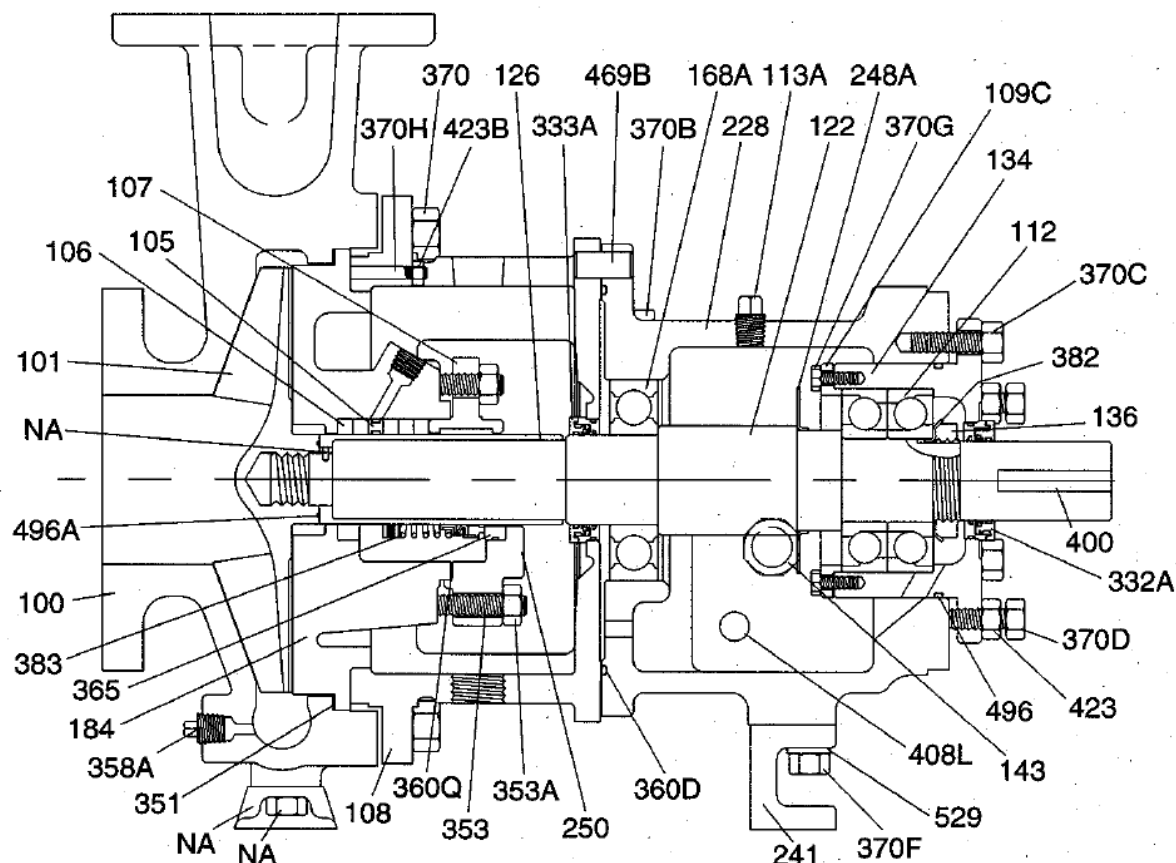


ITEM#	QTY	DESCRIPTION
100	1	Casing
370	3	Bolt, Casing
NA	1	Foot, Casing
358A	1	Plug, Casing Drain
NA	2	Bolt Casing Foot
101	1	Impeller
122	1	Shaft
184	1	Cover, Stuffing, Box
370H	2	Box Cover/Adapter Stud
423B	2	Nut, Box Cover/Adapter Stud
106	5	Packing
126	1	Sleeve, Shaft
NA	1	Pin, Sleeve
168A	1	Bearing, Inboard
250	1	Gland, Mechanical Seal
107	1	Gland, Packing
353	4*	Stud, Gland
353A	4*	Nut, Gland Stud
112	1	Bearing, Outboard
228	1	Frame
241	1	Foot, Frame
406H	4	Plug, Frame Lubrication Port
406L	1	Plug; Oil Cooler Inlet
408A	1	Plug, Frame Drain (Not Shown)
529	2	Bolt, Frame Foot to Frame
370F	1	Washer, Frame Foot

\*Packing Gland has only 2 Studs & Nuts

ITEM#	QTY	DESCRIPTION
406M	1	Plug, Oil Cooler Outlet (Not Shown)
113A	1	Plug, Oil Fill
136	1	Locknut, Bearing
105	1	Ring, Lantern
134	1	Housing, Bearing, Outboard
370C	3	Bolt Bearing Housing
370D	3	Jack Bolt, Bearing Housing
423	3	Jam Nut, Bearing Housing Jack Bolt
361A	1	Retaining Ring, Bearing
496A	1	Gasket, Shaft Sleeve
400	1	Key, Coupling
365	1	Seal, Mechanical Stationary Element
362	1	Lock Washer, Bearing
108	1	Adapter
370B	4	Bolt, Frame/Adapter
469B	2	Dowel Pin, Frame/Adapter
351	1	Gasket, Casing
360Q	1	Gasket; Gland, Mechanical Seat
360D	1	Gasket, Frame/Adapter
496	1	Gasket, Bearing Housing/Frame
383	1	Seal, Mechanical Rotating Element
333A	1	Labyrinth, Inboard Frame
332A	1	Labyrinth, Outboard Frame
-	1	O-ring
-	1	O-ring
-	1	O-ring
-	1	O-ring
143	1	Gauge; Sight, Oil

# LTP FRAME Cross Sectional Drawing

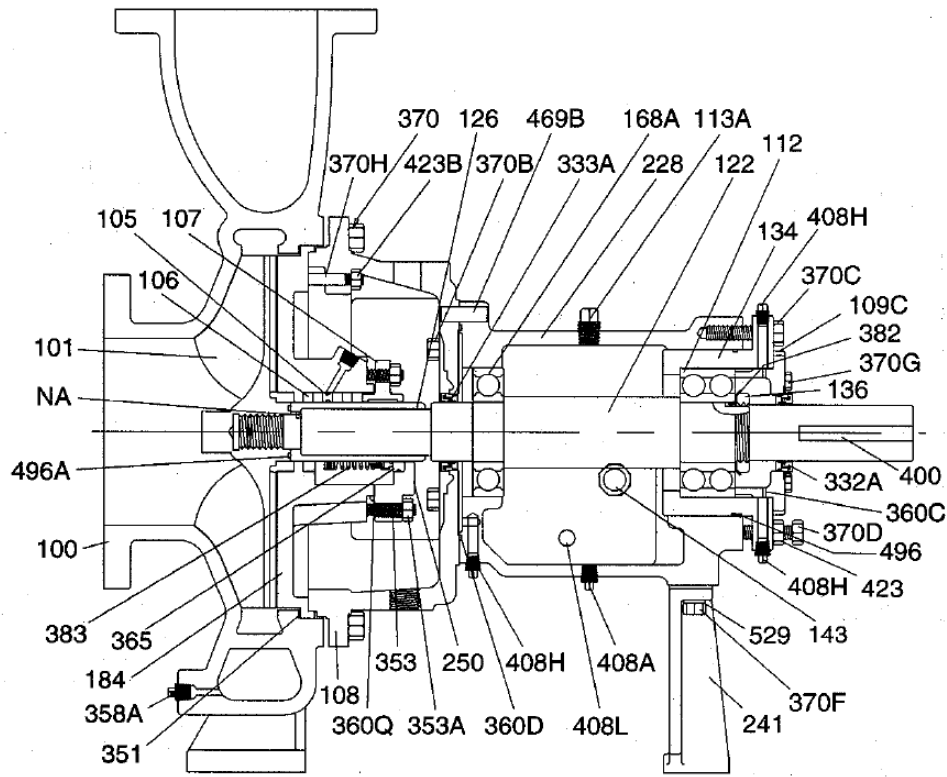


ITEM#	QTY	DESCRIPTION
100	1	Casing
370	3	Bolt, Casing
NA	1	Foot, Casing
358A	1	Plug, Casing Drain
NA	2	Bolt, Casing Foot
101	1	Impeller
122	1	Shaft
184	1	Cover, Stuffing Box
370H	2	Box Cover/Adapter Stud
423B	2	Nut, Box Cover/Adapter Stud
106	5	Packing
126	1	Sleeve, Shaft
NA	1	Pin, Sleeve
168A	1	Bearing, Inboard
250	1	Gland, Mechanical Seal
107	1	Gland, Packing
353	4*	Stud, Gland
353A	4*	Nut, Gland Stud
112	1	Bearing, Outboard
228	1	Frame
241	1	Foot, Frame
408H	4	Plug, Frame Lubrication Port (Not Shown)
408L	1	Plug, Oil Cooler Inlet
408A	1	Plug, Frame Drain (Not Shown)
370F	2	Bolt, Frame Foot to Frame
529	1	Washer, Frame Foot
408M	1	Plug, Oil Cooler Outlet (Not Shown)
113A	1	Plug, Oil Fill

Packing Gland has only 2 Studs & Nuts

ITEM#	QTY	DESCRIPTION
136	1	Locknut, Bearing
105	1	Ring, Lantern
134	1	Housing; Bearing, Outboard
370C	3	Bolt, Bearing Housing
370D	3	Jack Bolt, Bearing Housing
423	3	Jam Nut, Bearing Housing Jack Bolt
109C	1	Cover; Bearing, Outboard
370G	6	Bolt, Bearing Cover
496A	1	Gasket, Shaft Sleeve
400	1	Key, Coupling
248A	1	Ring, Oil.
365	1	Seal, Mechanical Stationary Element
382	1	Lock Washer, Bearing
108	1	Adapter
3708	4	Bolt, Frame/Adapter
469B	2	Dowel Pin, Frame/Adapter
351	1	Gasket, Case
3600	1	Gasket; Gland, Mechanical Seal
3600	1	Gasket, Frame/Adapter
496	1	Gasket, Bearing Housing/Frame
383	1	Seal, Mechanical Rotating Element
333A	1	Labyrinth, Inboard Frame
332A	1	Labyrinth, Outboard Frame
-	1	O-Ring
-	1	O-Ring
-	1	O-Ring
-	1	O-Ring
143	1	Gauge; Sight, Oil

# XLTP FRAME Cross Sectional Drawing



ITEM#	QTY	DESCRIPTION
100	1	Casing
370	4	Bolt, Casing
358A	1	Plug, Casing Drain
101	1	Impeller
122	1	Shaft
184	1	Cover, Stuffing Box
370H	2	Box, Cover/Adapter Stud
423B	2	Nut, Box Cover/Adapter Stud
106	5	Packing
126	1	Sleeve, Shaft
NA	1	Pin, Sleeve
168A	1	Bearing, Inboard
250	1	Gland, Mechanical Seal
107	1	Gland, Packing
353	4*	Stud, Gland
353A	4*	Nut, Gland Stud
112	1	Bearing, Outboard
228	1	Frame
241	1	Foot, Frame
406H	4	Plug, Frame Lubrication Port
408L	1	Plug, Oil Cooler Inlet
408A	1	Plug, Frame Drain
370F	2	Bolt, Frame Foot to Frame
529	1	Washer, Frame Foot
408M	1	Plug, Oil Cooler Outlet (Not Shown)
113A	1	Plug, Oil Fill
136	1	Locknut, Bearing

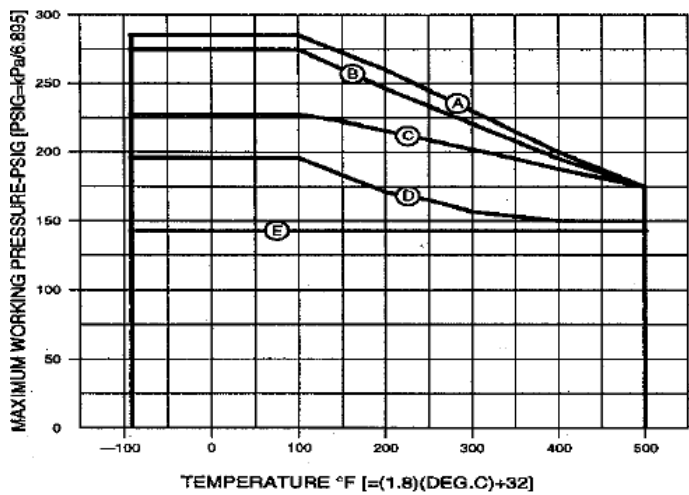
\*Packing Gland has only 2 Studs & Nuts

ITEM#	QTY	DESCRIPTION
105	1	Ring, Lantern
134	1	Housing; Bearing, Outboard
370C	3	Bolt, Bearing Housing
370D	3	Jack Bolt, Bearing Housing
423	3	Jam Nut, Bearing Housing Jack Bolt
408H	2	Plug, Bearing Housing Lubrication
109C	1	Cover; Bearing, Outboard
370G	6	Bolt, Bearing Cover
360C	1	Gasket
496A	1	Gasket, Shaft Sleeve
400	1	Key, Coupling
365	1	Seal, Mechanical Stationary, Element
382	1	Lock Washer, Bearing
108	1	Adapter
370B	4	Bolt, Frame/Adapter
469B	2	Dowel Pin, Frame/Adapter
351	1	Gasket, Case
360Q	1	Gasket; Gland, Mechanical Seal
360D	1	Gasket, Frame/Adapter
496	1	Gasket, Bearing Housing/Frame
383	1	Seal, Mechanical Rotating Element
333A	1	Labyrinth, Inboard Frame
332A	1	Labyrinth, Outboard Frame
-	1	O-ring
-	1	O-ring
-	1	O-ring
-	1	O-ring
143	1	Gauge; Sight, Oil

# ANSI PROCESS PUMPS ENGINEERING DATA

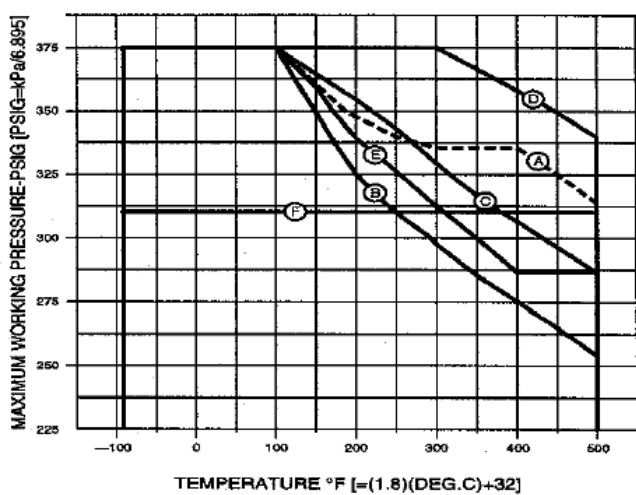
## PRESSURE/TEMPERATURERATINGS

150 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

300 LB. FLANGES

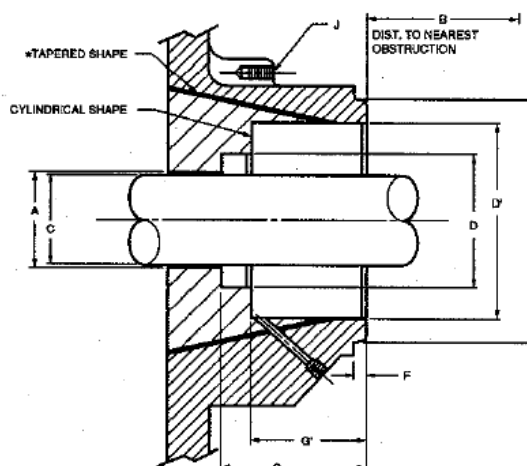


CURVE	MATERIAL
A	DUCT. IRON
A	CAST STEEL
A	316 S.S.
A	317 S.S.
A	ALLOY 20
A	HAST. B
B	HAST. C
B	CD4MCu
C	TITANIUM
D	MONEL
E	NICKEL

CONTACT FACTORY FOR SUCTION PRESSURES OVER 160 PSIG.

# Engineering Data

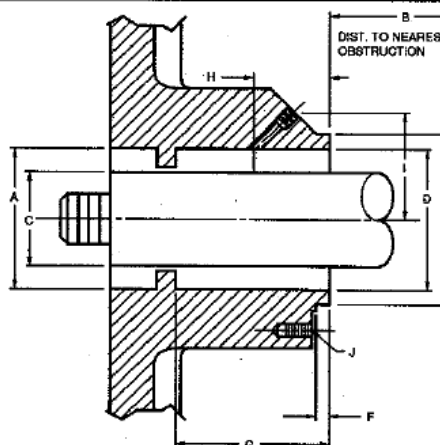
**ANSI Seal  
Chamber Cover  
Large/Taper Bore**



PUMP SIZE	BOX COVER									J			BOX CVR NPT	GLAND NPT
	A	B	C	D	D'	E	F	G	G'	STUDS		BOLT HOLE CIR.		
										SIZE	NO.			
STP	1.400	2.19	1.373	1.999	2.88	3.594	.19	2.12	1.69	.375	4	4.50	.25	
	1.405		1.375	2.003		3.597								
MTP	1.770	2.81	1.748	2.499	3.50	4.337	.25	2.62	2.12	.500	4	5.50	.38	
	1.780		1.750	2.503		4.340								
LTP	2.145	2.81	2.123	2.874	3.88	4.708	.25	2.62	2.12	.500	4	6.00	.38	
	2.155		2.125	2.878		4.711								
XLTP	2.520	2.85	2.498	3.374	4.50	5.447	.25	3.00	2.50	.625	4	6.75	.38	
	2.530		2.500	3.378		5.450								

\*TABLE DIMENSIONS: A, D, G AND G' ARE NOT APPLICABLE TO THE TAPERED DESIGN.

**Standard Stuffing  
Box Center**



PUMP SIZE	BOX COVER									J			BOX CVR NPT	GLAND NPT
	A	B	C	D	E	F	G	H	I	STUDS		BOLT HOLE CIR.		
										SIZE	NO.			
STP	1.400 1.405	2.19	1.373 1.375	1.999 2.003	2.392 2.395	.19	2.12	.97	1.81	.375	4	3.25	.25	.25
MTP	1.770 1.780	2.81	1.748 1.750	2.499 2.503	3.017 3.020	.25	2.62	1.56	2.50	.500	4	4.12	.38	.50
LTP	2.145 2.155	2.81	2.123 2.125	2.874 2.878	3.517 3.520	.25	2.62	1.56	2.63	.500	4	4.50	.38	.50
XLTP	2.520 2.530	2.85	2.498 2.500	3.374 3.378	4.371 4.374	.25	3.00	1.81	3.50	.625	4	5.38	.38	.50

# Pump Trouble-Shooting

## Common Pump Operational Problems

### 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 shifts.
	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.
	Shaft sleeves scored.	Remachine or replace as required.
Bearings run hot.	Improper alignment.	Re-align pump and driver.
	Improper lubrication.	Check lubricant for stability and level.
	Lube cooling.	Check cooling system.
Motor requires excessive power.	Head lower than rating. Pumps too much liquid.	Consult factory. Install throttle valve, cut 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.
  - (a). If pump is equipped with mechanical seal, the following parts should be on hand:
    - (1) Stuffing box packing.
    - (2) Stuffing box gland.
- 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	Bearing Housing Snap Ring	Item 361A
Shaft Sleeve	Item 126	Bearing Lock Washer	Item 382
Outboard Bearing	Item 112	Bearing Lock Nut	Item 136
Inboard Bearing	Item 168 A	Impeller	Item 101
Case Gasket	Item 351	Shaft Sleeve O-Ring	Item 496A
Frame/Adapter O-ring	Item 360D	Lantern Ring (packed box)	Item 105
Bearing Housing O-ring	Item 496	Bearing Cover Gasket (XLTP only)	Item 360C

## Instructions for Ordering Spare Parts

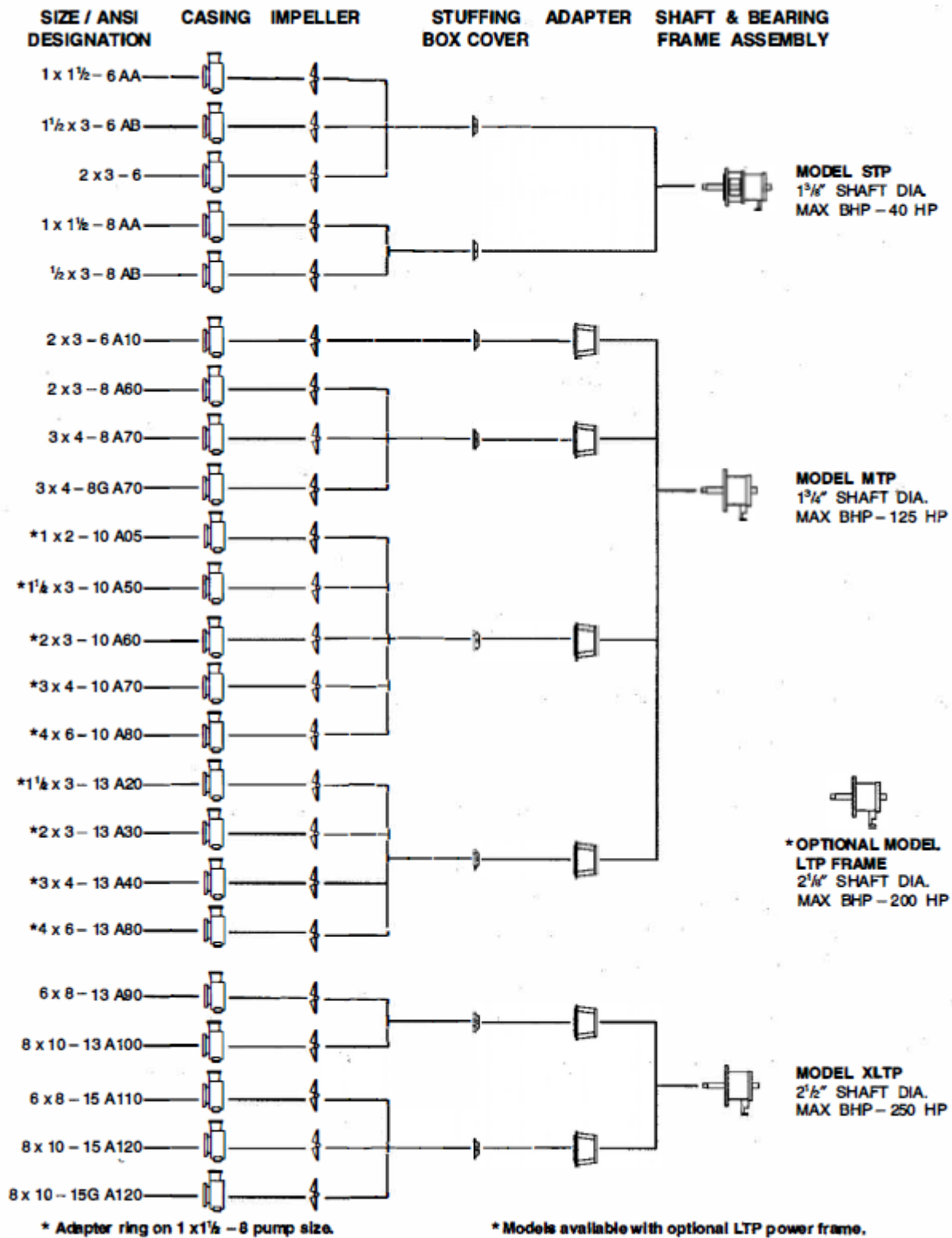
Repair orders will be handled with a minimum of delay. Contact your local authorized representative and provide the following:

- 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 43, 44, 45 and 46.
- 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 Peerless Pump Company at their option.

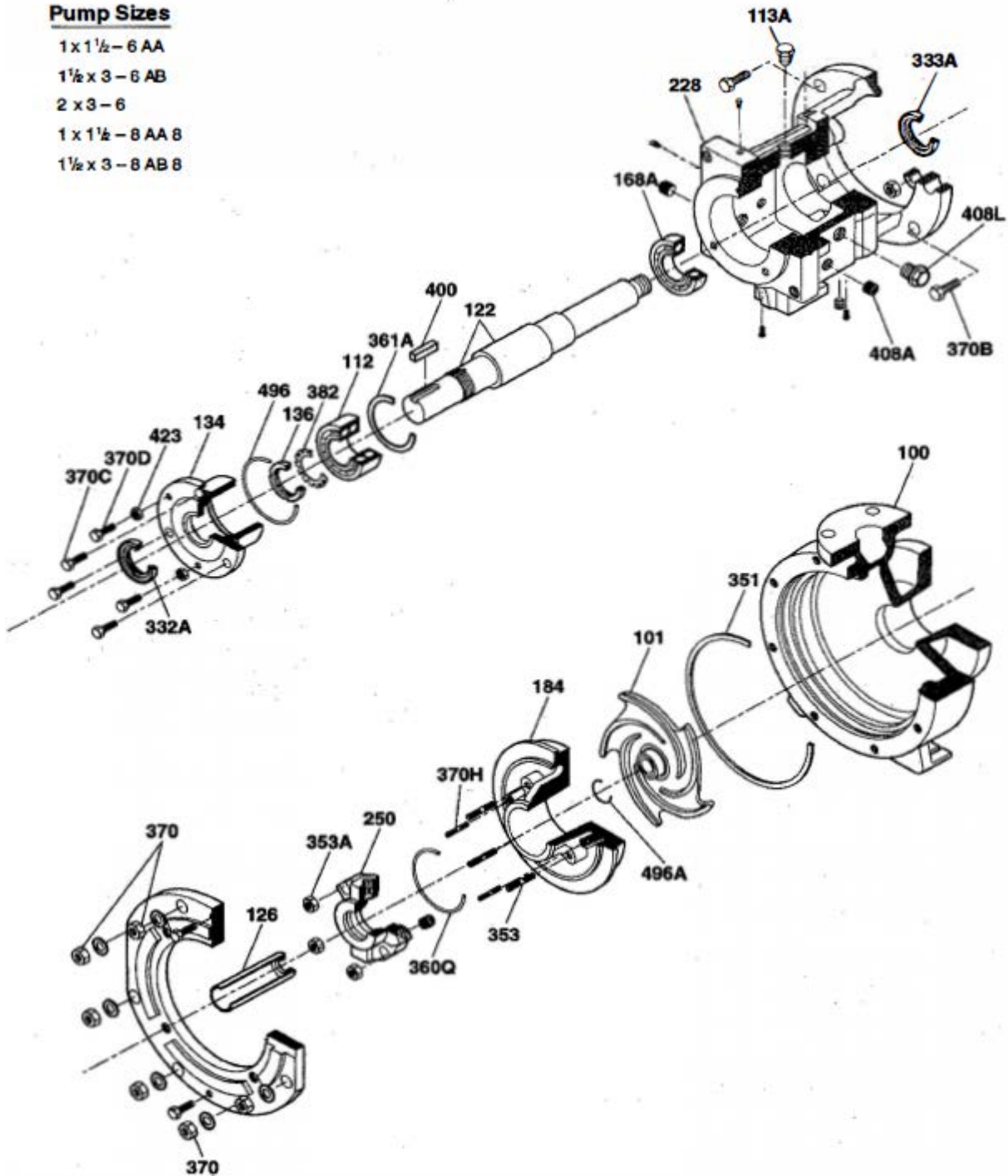
# Modular Interchangeability Chart



# STP Exploded Isometric View

## Pump Sizes

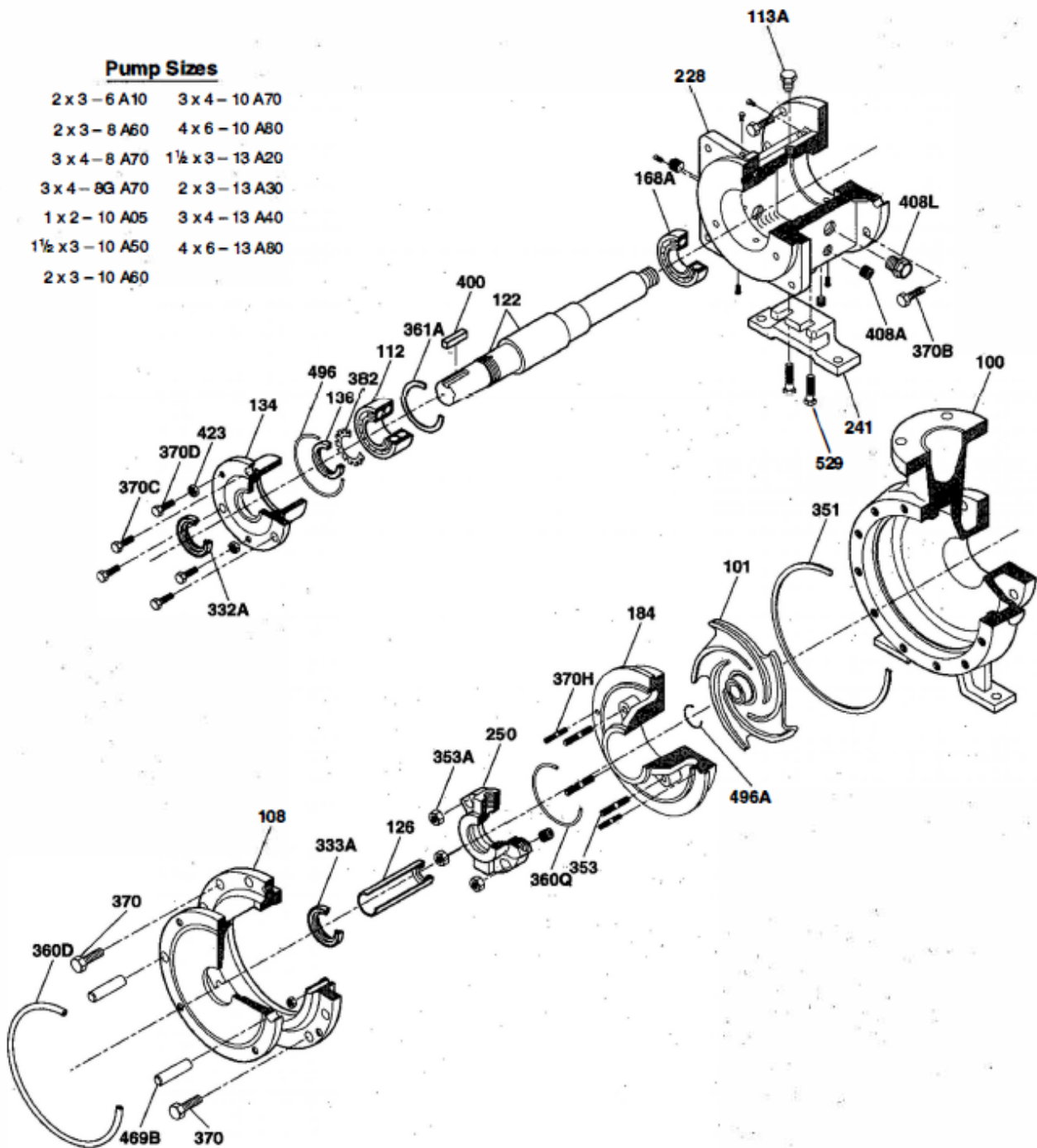
1 x 1 1/2 - 6 AA  
 1 1/2 x 3 - 6 AB  
 2 x 3 - 6  
 1 x 1 1/2 - 8 AA 8  
 1 1/2 x 3 - 8 AB 8



# MTP Exploded Isometric View

## Pump Sizes

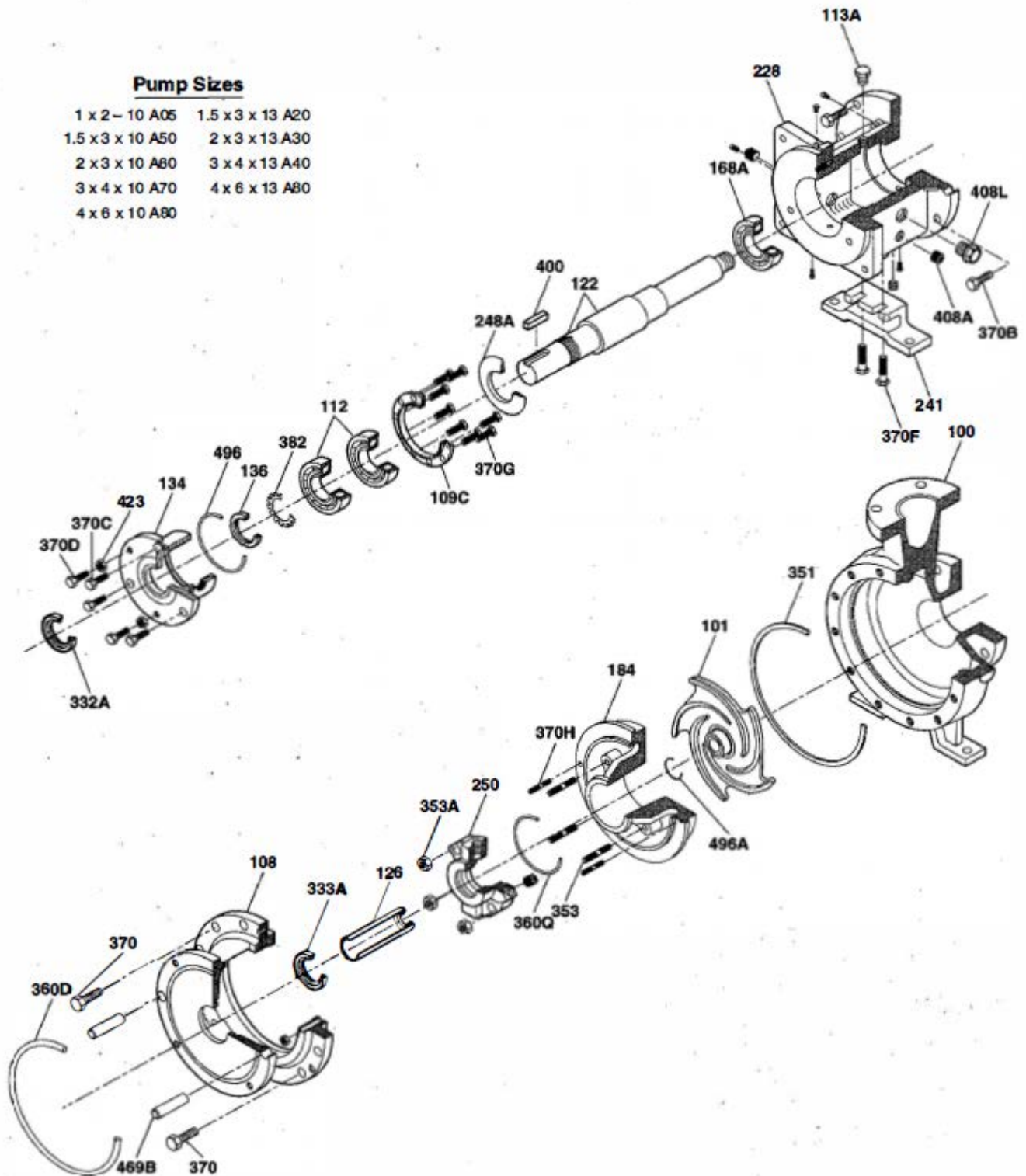
2 x 3 - 6 A10	3 x 4 - 10 A70
2 x 3 - 8 A60	4 x 6 - 10 A80
3 x 4 - 8 A70	1 1/2 x 3 - 13 A20
3 x 4 - 8G A70	2 x 3 - 13 A30
1 x 2 - 10 A05	3 x 4 - 13 A40
1 1/2 x 3 - 10 A50	4 x 6 - 13 A80
2 x 3 - 10 A60	



# LTP Exploded Isometric View

## Pump Sizes

1 x 2 - 10 A05	1.5 x 3 x 13 A20
1.5 x 3 x 10 A50	2 x 3 x 13 A30
2 x 3 x 10 A60	3 x 4 x 13 A40
3 x 4 x 10 A70	4 x 6 x 13 A80
4 x 6 x 10 A80	



XLTP · Exploded Isometric View

**Pump Sizes**

- 6 x 8 – 13 A90
- 8 x 10 – 13 A100
- 8 x 10 – 15 A120
- 6 x 8 – 15 A110
- 8 x 10 – 15G A120

