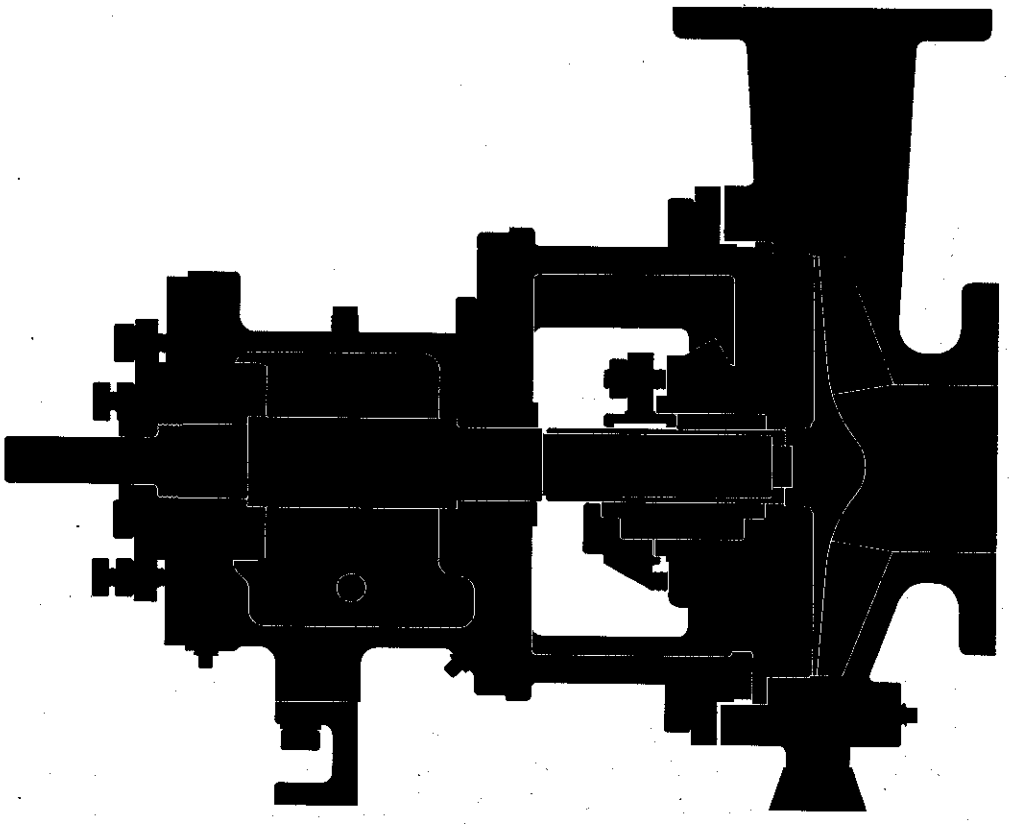
Sterling Fluid Systems (USA), Inc.

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL
ANSI STANDARD PROCESS PUMP
Series 8196



CUSTOMER _____

PO# _____

SERVICE _____

EQUIPMENT NUMBER _____

SERIAL NUMBER _____

PEERLESS PUMP® LaBour Taber

Peerless Pump Company
2005 Dr. Martin Luther King Jr. Street
Indianapolis, IN 46202
Phone: (317) 925-9661 • Fax: (317) 924-7388

Bulletin 4852840-B
November 1, 1997

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GENERAL

READ THIS ENTIRE BOOK before attempting to install, operate or repair this pump. Properly installed, your pump will give you satisfactory, dependable service. We urge that you carefully read these step-by-step instructions, to eliminate any problems of installation, operation or repair.

Failure to read and comply with installation and operating instructions will void the responsibility of the manufacturer and may also result in bodily injury as well as property damage.

This book is intended to be a permanent part of your pump installation and should be preserved in a convenient location for ready reference. If these instructions should become soiled, obtain a new copy from Sterling Fluid Systems (USA), Inc. Include pump model and/or serial number with your request.

WARRANTY

New equipment manufactured by Seller is warranted to be free from defects in material and workmanship under normal use and service for a period of one year from date of shipment; (Excluding Power Ends, which are covered for three (3) years). Seller's obligation under this warranty being limited to repairing or replacing at its option any part found to its satisfaction to be so defective provided that such part is, upon request, returned to Seller's factory from which it was shipped, transportation prepaid. This warranty does not cover parts damaged by decomposition from chemical action or wear caused by abrasive materials, nor does it cover damage resulting from misuse, accident, neglect, or from improper operation, maintenance, installation, modification or adjustment. This warranty does not cover parts repaired outside Seller's factory without prior written approval. Seller makes no warranty as to starting equipment, electrical apparatus or other material not of its manufacture, since the same are usually covered by warranties of the respective manufacturers thereof.

In the event, notwithstanding the terms of this agreement, it is determined by a court of competent jurisdiction that an express warranty has been given by Seller to Purchaser with respect to the head, capacity or other like performance characteristics of said equipment, Seller's liability for breach of the same shall be limited to accepting return of such equipment F.O.B. plant of manufacture, refunding any amount paid thereon by Purchaser (less depreciation at the rate of 15% per year if Purchaser has used equipment for more than thirty (30) days) and canceling any balance still owing on the equipment.

This warranty is expressly in lieu of any other warranties, expressed or implied, and Seller specifically disclaims any implied warranty of merchantability or fitness for a particular purpose.

INTRODUCTION

This instruction manual is intended to assist those involved with the installation, operation and maintenance of Sterling Fluid Systems (USA), Inc. ANSI Process Pumps. It is recommended that this manual be thoroughly reviewed prior to installing or performing any work on the pump or motor.

I-A. IMPORTANCE OF INSTRUCTIONS

The design, material and workmanship incorporated in the construction of Sterling Fluid Systems (USA), Inc. make them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is enhanced and extended by periodic inspection and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and correct methods of installing, operating, and maintaining these pumps. Thoroughly study Sections I, II, III and carefully follow the instructions for installation. Sections IV and V have answers to trouble and maintenance questions. Keep this instruction manual handy for reference. Further information can be obtained by contacting the local authorized distributor or the factory.

I-B. SPECIAL WARNINGS

Sterling Fluid Systems, (USA), Inc. will not be liable for any damages or delay caused by failure to comply with the provisions of this instruction manual. This pump is not to be operated at speeds, working pressures, discharge pressures, or temperatures higher than, nor used with liquids other than, stated in the original order acknowledgment without written permission of Sterling Fluid Systems, (USA), Inc.. For Pressure/Temperature limitations see page 46.

I-C. RECEIVING INSPECTION-SHORTAGES

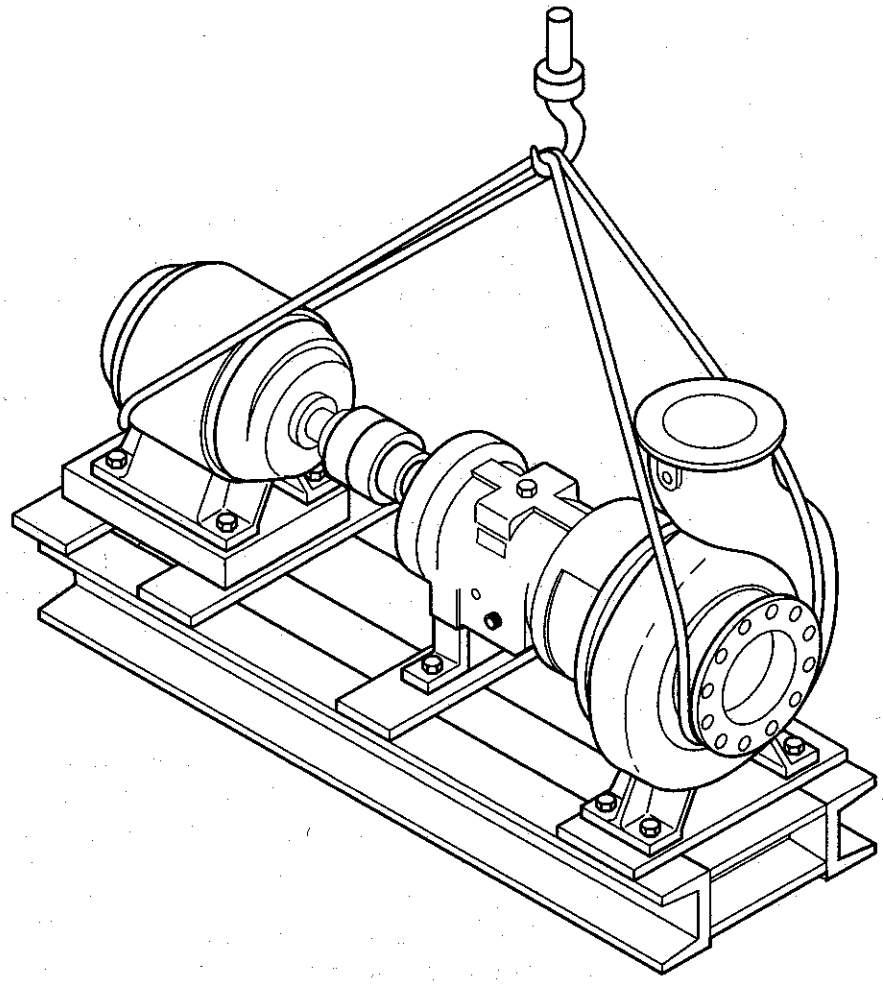
Care should be taken when unloading pumps. If shipment is not delivered in good order and in accordance with the Bill-of-Lading, note the damage or shortage on both receipt and freight bill. *MAKE ANY CLAIMS TO THE TRANSPORTATION COMPANY PROMPTLY.* Instruction sheets on various components as well as the Instruction Book for the pump are included in the shipment. *DO NOT DISCARD!*

I-D. PRESERVATION AND STORAGE

Sterling Fluid Systems (USA), Inc.'s normal domestic shipping and storage preparation is suitable for protecting the pump during shipment in covered trucks. It also provides protection during covered storage at the job site, and for a short period between installation and start-up. If the pump is to be idle and/or exposed to the elements for an extended period, either before or after installation, special precautions are required. One approach is to provide special preservatives and wrapping before shipment. However, after installation the protective wrappings will have been removed. Therefore, application of preservatives after installation is considered a good practice. Information about various long term preservation and storage options available can be obtained for the driver, coupling, mechanical seal, or other equipment supplied on your order. Contact the factory for further details.

I-E. HANDLING TECHNIQUES

Care should be used in moving pumps. Pumps should *not* be hoisted by eyebolts. These eyebolts are intended for removing the back pullout assembly for maintenance and inspection. An assembled pump should be hoisted using a sling under suction flange and under rear of bearing frame. Base plate mounted units should be hoisted using slings under suction flange of pump, and frame of motor as shown below.



INSTALLATION

II-A. LOCATION

Select a location for the pumping unit (pump, base plate, coupling and driver) which will:

(a) Be clean, well ventilated, properly drained and provide accessibility for inspection and maintenance (see outline drawing for dimension). Outdoor installations may require protection from the elements, particularly freezing.

(b) The suction supply system must provide the pump with Net Positive Suction Head (NPSH) equal to or greater than that required by the pump at any capacity over the expected operating range. Ask your representative for assistance if you do not understand how to calculate or measure suction supply system NPSH.

II-B. FOUNDATION

Concrete (reinforced as necessary or required) is most widely used for the foundation. In sufficient mass, it provides rigid support, which minimizes deflection and vibration. It may be located on soil, structural steel or building floors, provided the combined weight of the pumping unit and foundation does not exceed the allowable bearing load of the support. Allowable bearing loads of structural steel and floors can be obtained from engineering handbooks; building codes of local communities give the recommended allowable bearing loads for different types of soil.

II-C. FOUNDATION BOLTS

Before pouring the foundation, locate the foundation bolts by the use of a template frame and provide anchorage as shown in Figure 1. See the outline drawings furnished with each pump for the exact location of the foundation bolts. When pouring, allow for a grout thickness of ¾ to 1-½ inches between top of foundation and bottom of base. Roughen top surface to provide a good bond of the grout.

II-D. MOUNTING AND LEVELING THE UNIT

CAUTION

Use qualified personnel (riggers) to lift or move unit at any time. *Never* lift unit using hooks or slings on shafts. *Never* place eyebolts in tapped holes except for removal of a part to perform service work.

When the unit is received with the pump and the driver mounted on the base plate, it should be placed on the foundation and the coupling halves disconnected. The coupling should not be reconnected until the alignment operations have been completed. The base plate should be supported on rectangular metal blocks and shims or on metal wedges having a small taper. The support pieces should be placed close to the foundation bolts (Figure 2). On large units, small jacks made of cap screws and nuts are very convenient. In each case the supports should be directly under the part of the base plate carrying the greatest weight and spaced closely enough to give uniform support. A spacing of 24 inches is suggested on medium size units. A gap of about ¾ inches to 1-½ inches should be allowed between the base plate and the foundation for grouting.

Adjust the metal supports or wedges until the shafts of the pump and driver are level. Check the coupling faces as well as the suction and discharge flanges of the pump for horizontal or vertical position by means of a level. Correct the positions, if necessary, by adjusting the supports or wedges under the base plate as required.

IMPORTANT

Pumps and drivers mounted on a common base plate were accurately aligned before shipment. ***All base plates are flexible to some extent and, therefore,*** **must not** ***be relied upon to maintain the factory alignment.***

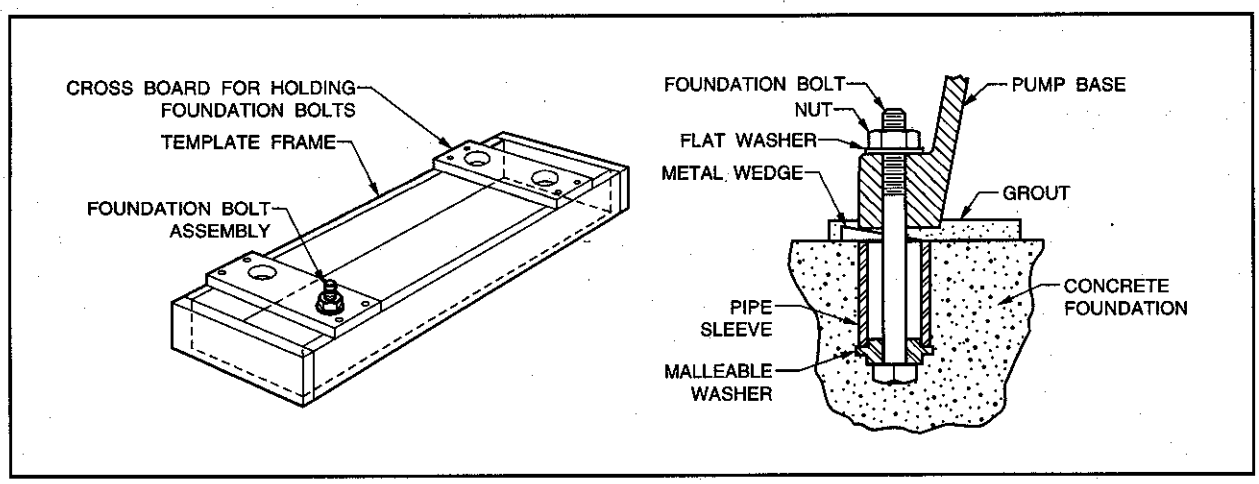


Figure 1. Foundation bolt location and anchorage

Realignment is necessary after the complete unit has been leveled on the foundation and again after the grout has set and foundation bolts have been tightened. The alignment must be checked after the unit is piped and rechecked periodically as outlined in the following paragraphs. To facilitate accurate field alignment, we do not dowel the pumps or drivers on the base plates before shipment.

II-E. ALIGNMENT

Reliable, trouble free and efficient operation of a pumping unit requires correct alignment of pump and driver shafts. Misalignment may be the cause of:

(a) Noisy pump operation
(b) Vibration
(c) Premature bearing failure
(d) Excessive coupling wear

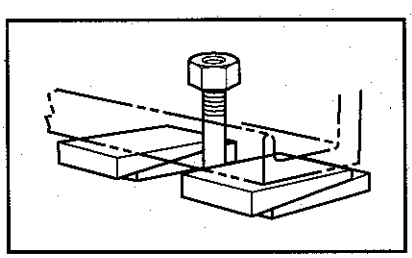


Figure 2. Adjusting wedges for mounting

Factors that may change the alignment of the pumping unit are:

(a) Settling of the foundation
(b) Springing of the base plate
(c) Piping strains
(d) Settling of the building
(e) Shift of pump or driver on the base

II-F. ALIGNMENT CHECK

The following checking procedure applies to a pumping unit consisting of a pump, flexible coupling and driver mounted on a common base plate. Check alignment as follows:

(a) Disconnect the coupling halves.
(b) Set the coupling flange gap to the dimension shown in "Mounting Each Half Spacer" for Falk (page 15), Table 3 for Wood's (page 17) or refer to "Allowable Shaft Engagements" for Rexnord (page 18).
(c) The preferred test for parallel and angular alignment may be made with a dial indicator mounted as shown in Figure 3. Proceed as follows:
    (1) Scribe the index lines on the coupling halves (as shown) or mark where the indicator point rests.
    (2) Set indicator dial to zero.
    (3) Slowly turn ***BOTH*** coupling halves so that index lines match, or indicator point is always on the mark.
    (4) Observe dial reading to determine whether pump or driver needs adjustment.
    (5) Acceptable parallel and angular alignment occurs when total indicator reading (complete turn) does not exceed limits specified by the coupling manufacturer. Refer to pages 15 - 21.

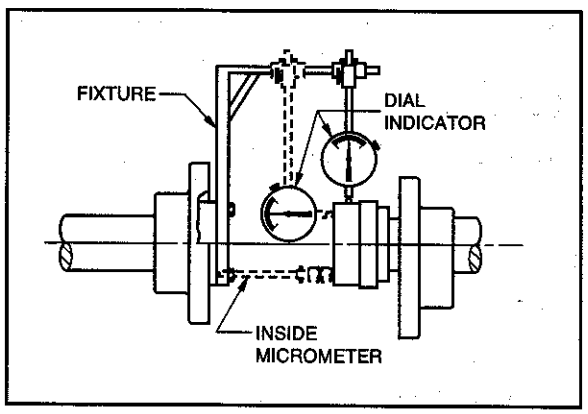


Figure 3. Testing alignment, dial indicator

(d) Test for parallel and angular alignment with a straight edge and feeler gauge as shown in manufacturer's instructions in Section II-N, O, P. With coupling halves stationary, make trials at four places 90° apart. Perfect alignment occurs when a straight edge is level across the coupling halves and the same gauge just enters between the halves, both conditions at all points.

When significant operating temperature differential will exist between the pump and driver (i.e. steam turbine drive with pump handling cold liquid), thermal growth will cause the hotter unit to rise. Compensate for this growth by initially setting the hotter unit 0.003 inch to 0.005 inch low. When both units are at normal operating temperature, a final check of coupling alignment must be made. Correct the alignment if necessary.

NOTE

Check for correct electric motor rotation as described in paragraphs (a) and (b) under paragraph II-M while coupling halves are disconnected.

II-G. ALIGNMENT ADJUSTMENT

Since all base plates are flexible, they may be distorted from transportation or handling. Therefore, it may be necessary to correct excessive parallel and angular misalignment by slightly shifting the leveling wedges under the base plate. Tap lightly (in or out) with a hammer. Recheck alignment after each shifting of a wedge.

(a) In some instances, for factory aligned pumping units, it may be necessary to change the shims under the pump or driver, or even relocate these factory-positioned units on the base plate. Make such changes only after it is certain that alignment cannot be obtained by shifting of the wedges.

(b) If wedges are shifted or shims changed a substantial amount to obtain proper alignment, recheck the piping alignment and level of the shafts.

NOTE

Pumping unit shafts must be level, have proper alignment and the piping must mate with the pump flanges without strain. All three conditions must be correct to provide proper performance and long life of the pumping unit

II-H. ALIGNMENT RECHECK

alignment, and correct as required, after:

(a) Mounting,

(b) The grout has hardened,

(c) Foundation bolts are tightened,

(d) Piping is connected,

(e) Pump, driver, or base plate is moved for any reason.

II-I. GROUTING

Unless otherwise specified on the unit outline drawing, the base plate must be completely filled with grout and the leveling wedges grouted in place. The product warranty *IS VOID if this instruction is not followed.*

When the alignment is correct, the foundation bolts should be tightened evenly, but not too firmly. The unit can then be grouted to the foundation. Foundation bolts should not be fully tightened until the grout is hardened, usually about 48 hours after pouring. Installation without grout completely filling the base plate is acceptable only when recommended by specific notation on the unit outline drawing.

Grouting that completely fills a base plate is also necessary for minimum vibration levels, since a very stiff base is uneconomical and unnecessary except for portable units. Grout compensates for unevenness in the foundation and base plate and distributes the weight of the unit uniformly over the foundation. It also prevents the unit from shifting after mounting and alignment. It is essential that the pumping unit be expertly grouted by use of non-shrinking grout. The mix required varies with the type of unit to be grouted, location and amount of grout. The instructions included with the non-shrinking grout package will provide the required information for the proper mix for individual applications. Grout the unit as follows:

(a) Build a form of plywood or thick planking around the foundation to contain the grout. Support adequately to prevent deformation.

(b) Soak the top of the concrete pad thoroughly with water before grouting. Remove all surface water before pouring.

(c) Pour the grout through the holes provided in the base plate or through open ends of steel channel base plates. While pouring, tamp liberally in order to fill all cavities and prevent air pockets.

NOTE

In pouring and tamping, the grout may trap air in some places. Drill small vent holes through the base surface.

(d) After the grout has thoroughly hardened, tighten the foundation bolts and connect the piping. ***Be certain piping does not strain pump flanges.***

(e) Check the alignment after the piping is connected and the foundation bolts are tightened.

(f) Connect the coupling halves.

(g) After the grout has thoroughly dried, apply an oil base paint to the exposed edges of the grout to prevent air and moisture from coming in contact with the grout.

NOTE

It is very important to support and restrain both the suction and discharge pipes near the pump to avoid application of the forces and moments to the pump casing. Failure to support the piping properly can cause excessive pipe strain on the casing which can affect alignment, cause vibration, and promote rapid wear of seals and bearings. Damage caused by pipe strain will void the warranty.

II-J. SUCTION PIPING–GENERAL

The suction piping, if not installed properly, is a potential source of faulty operation. To achieve best performance, provide for the following:

(a) Avoid using elbows close to the pump suction flange. A minimum of six pipe diameters of straight pipe should always be located between the elbow and suction inlet. If elbows are used they should be long radius type.

(b) Suction pipe should be a minimum one size larger than the suction flange. Suction pipe should terminate at the suction flange of the pump through an "eccentric reducer". Never install suction piping that is smaller in diameter than the pump suction flange.

(c) Suction throttling must never be attempted. This could cause cavitation and damage to the pump.

(d) If a strainer is installed in the suction piping, it must have a net free area of at least three (3) times the area of the suction pipe. It should be checked and cleaned periodically. The openings in the screen must be smaller than the sphere size allowed for the impeller. Contact factory for maximum sphere size.

(e) When the source of supply is feeding more than one pump, separate suction lines are recommended.

SUCTION LIFT INSTALLATIONS

(a) Suction lines, when operating under lift conditions must be kept absolutely free from air leaks.

(b) Suction piping should gradually slope upward toward the pump and all joints must be air tight.

(c) Available NPSH must be greater than the NPSH requirement of the pump.

(d) ***Piping should be cleaned mechanically and chemically, and flushed prior to installing the pump. A number of mechanical seal and seizure troubles are due to improperly cleaned systems.***

(e) A means of priming the pump (i.e. foot valve), must be provided.

FLOODED SUCTION/POSITIVE HEAD INSTALLATIONS

(a) The suction line must include an isolation valve to permit closing off of the source of supply so that pump inspection and maintenance can be performed. The valve should be installed a minimum of two pipe diameters from the pump suction flange.

(b) Piping should be level or slope gradually in a downward direction from the source of supply to avoid air pockets.

(c) Piping should never extend below the pump suction flange. The piping entrance at the source of supply should always be one to two sizes larger than the pump suction flange.

(d) In order to prevent eddies and vortices, the suction pipe must be adequately installed below the surface of the liquid. A minimum of three times the pipe diameter is recommended.

II-K DISCHARGE PIPING

(a) Check and isolation valves should be installed in the discharge line. The check valve must be placed between the pump and the isolation valve. This will protect the pump from reverse rotation and excessive back pressure. The isolation valve is used in priming, starting and when shutting down the pump. If increasers are used on the discharge side to increase the size of discharge piping, they should be placed between the check valve and pump. When expansion joints are used, they should be placed between the check valve and pump.

II-L. ENGINE DRIVEN UNITS

Safe and efficient operation of a pumping unit driven by an engine, whether diesel, or gasoline requires the installation to satisfy the following requirements:

(a) Be well ventilated in order to keep the ambient temperature as low as possible. Taking 60° F as a datum point, every 10° F rise in temperature reduces the horsepower of the engine by approximately 1%.

(b) Provide ample air for proper combustion.

(c) Provide the engine with an efficient exhaust system so that the combustion gases discharge with a minimum of back pressure.

(d) Provide for a fuel system of adequate capacity which meets the local codes.

(e) Provide ample accessibility to service engine.

(f) Provide correct rotation of the pump. Engine rotation is determined at the factory. No change of engine rotation can be made in the field.

It is recommended that the operator become familiar with the installation and service manual supplied by the engine manufacturer.

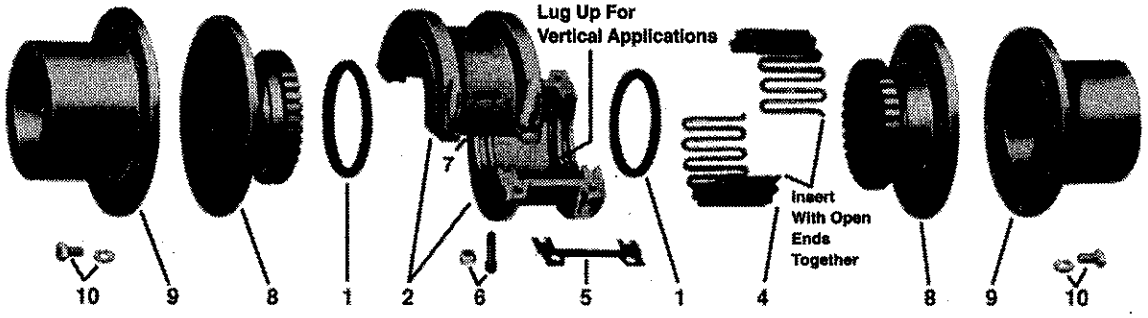
II-M. ELECTRIC MOTOR DRIVEN UNITS

For electric motor drives, connect power supply to conform with national and local codes. Line voltage and wire capacity must match the ratings stamped on the motor nameplate.

(a) Only when the coupling halves are disconnected, momentarily energize the motor to check that rotation is in the same direction as the arrow on the pump.

(b) If motor is three phase type, reverse rotation (if required) by interchanging any two of the three power leads. The rotation of most single phase motors is fixed by internal wiring and cannot be easily changed.

II-N. INSTALLATION FALK STEELFLEX® SPACER COUPLINGS



1. Seal (T10)
2. Cover (T10)
4. Grid
5. Gaskets (T10)
6. Cover Fasteners (T10)
7. Lube Plugs
8. T31 Spacer Hub (Specify length)
9. Flanged Shaft Hub (Specify bore and keyway)
10. Flange Fasteners

When ordering spare parts, give coupling size as stamped on coupling cover and hub.

INTRODUCTION - This manual applies to Sizes 20 thru 140T31 and 1020 thru 1140T331 Falk Steelflex Tapered Grid Spacer Couplings. Unless otherwise stated, information for Sizes 1020 thru 1140 applies to Sizes 20 thru 140 respectively, e.g. 1020 = 20, 1100 = 100, etc. The Type T31 Steelflex Spacer Assembly permits installation or removal (as shown in Steps A and B below) without disturbing either the driving or driven unit. These couplings are designed to operate in either the horizontal or vertical position without modification. However, for vertical applications, the match mark shown on Page 2, must be up. The performance and life of the couplings depend largely upon how you install and service them. Carefully follow the instructions in this manual for optimum performance and trouble free service.

PARTS IDENTIFICATION - All coupling parts have identifying part numbers as shown above. Parts are interchangeable between the 10 Series and 1000 series spacer couplings. However, to utilize the higher 1000 series ratings, the 1000T – Blue Grid, Spacer Hubs, Shaft Hubs and Hardware must be used. When ordering parts, always SPECIFY SIZE and TYPE shown on the COVER. Sizes 80 thru 140T10 covers have been manufactured with two and three ribs; DO NOT mix these cover halves.

LIMITED END FLOAT - When electric motors, generators, engines, compressors and other machines are fitted with sleeve or straight roller bearings, limited axial end float kits are recommended for protecting the bearings. Falk Steelflex couplings are easily modified to limit end float; refer to Manual 428-820 for instructions.

CAUTION: Remove the coupling cover, grid and gap disc before removing the Spacer T Hub(s) of limited end float couplings. Reassemble as instructed on Page 2.

LUBE FITTINGS - Cover halves have 1/8 NPT lube holes. Use a standard grease gun and lube fitting as instructed in Step 8 on Page 2.

LUBRICATION - Adequate lubrication is essential for proper operation of the coupling. Refer to Table 1 on Page 2 for the amount of lubricant required. It is recommended that the coupling be checked once a year and lubricant added if required. For extreme or unusual operating conditions, check more frequently.

CAUTION: Consult applicable local and national safety codes for proper guarding of rotating members. Observe all safety rules when installing or servicing couplings.

LUBRICATION SPECIFICATIONS - Refer to Manual 428-010 for recommended lubricants. The following specifications apply to lubricants for Falk couplings which are lubricated annually and operate within ambient temperatures of 0° to 150°F (-18° to +66°C). For temperatures beyond this range, consult the Factory.

Dropping Pint - 300°F(149°C) or higher.

Consistency - NLGI No. 2 with worked penetration value in the range of 250 to 300.

Separation and Resistance - Low oil separation rate and high resistance to separation from centrifuging.

Liquid Constituent - To possess good lubrication properties... equivalent to a high quality, well refined petroleum oil.

Inactive - Must not corrode steel or cause swelling or deterioration of synthetic seals.

Clean - Free from foreign inclusions.

Semi-Permanent Lubrication - Refer to Manual 428-012 for details.

INSTALLATION - Only standard mechanics tools, wrenches, a straight edge and feeler gauges are required to install Falk Steelflex couplings. Couplings Sizes 1020 thru 1090 are generally furnished for CLEARANCE FIT with set screws. Sizes 1100 and larger are furnished for an INTERFERENCE FIT without set screws. Heat hubs with interference fit in an oil bath to a maximum of 275°F (135°C) to mount. The oil flashpoint must be 350°F (177°C) or higher. Refer to Page 2 for detailed mounting instructions.

REMOVAL AND INSTALLATION OF SPACER ASSEMBLY (SEE LIMITED END FLOAT "CAUTION")

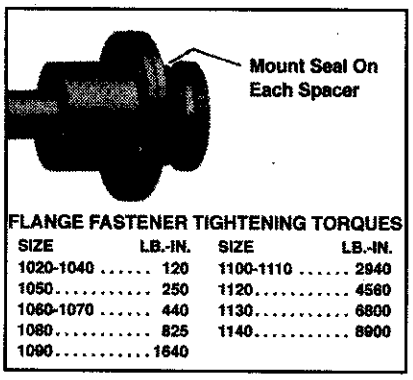
REMOVE SPACER ASSEMBLY - Remove pipe plugs and all but two fasteners opposite each other in each hub. Loosen these about one-quarter inch and tap them with a mallet to disengage Steelflex Spacer from the shaft hubs. Remove fasteners and Spacer.

INSERT SPACER ASSEMBLY - Do not allow them to protrude beyond flange face. Compress spacer to eliminate its gap, and insert into space between shaft hubs. Carefully engage the hub registers and then alternately tighten fasteners. Torque to specifications in Step 2 on Page 2.

INSTALLATION OF DISASSEMBLED TYPE T31 STEELFLEX COUPLINGS

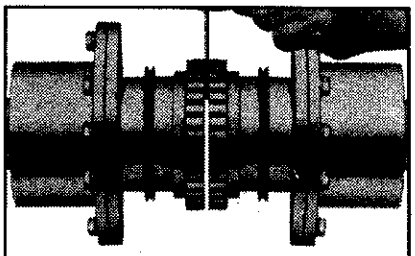
1. MOUNT SHAFT HUBS - Lock out starting switch of prime mover. Mount shaft hubs on their respective shafts so that hub face is flush with the end of the shaft. If hub is furnished for an interference fit, heat in an oil bath as instructed on Page 1. Position units for approximate distance between shaft ends with minimum angular and offset misalignment.

2. MOUNT EACH HALF SPACER - Stretch the seal and carefully roll it over hub teeth into position. Carefully position each half spacer on register of flanged hubs and fasten parts together. Torque fasteners to value specified below left.



FLANGE FASTENER TIGHTENING TORQUES

SIZE	LB.-IN.	SIZE	LB.-IN.
1020-1040	120	1100-1110	2940
1050	250	1120	4560
1060-1070	440	1130	6800
1080	825	1140	8900
1090	1640		



REQUIRED GAP

SIZE	GAP
1020-1090	.188"
1100-1110	.250"
1120-1140	.375"

3. GAP AND ANGULAR ALIGNMENT - Use a spacer bar equal in thickness to the gap as specified. Insert bar, as shown above right, to same depth at 90° intervals and measure clearance between bar and hub face with feelers. The difference in minimum and maximum measurements must not exceed the ANGULAR limit specified in Table 1.

4. OFFSET ALIGNMENT - Align so that a straight edge rests squarely (or within the limits specified in Table 1) on both hubs and also at 90° intervals. Check with feelers. The clearance must not exceed the OFFSET limit specified in Table 1. Tighten all foundation fasteners and repeat Steps 3 and 4. Realign coupling if necessary. NOTE: Use a dial indicator for more accurate alignment.

5. INSERT GRID - Pack gap and grooves with lubricant before inserting grid. When grids are furnished in two segments, install them so that all cut ends extend in the same direction. This will assure correct grid contact with the lug in the cover and permit cover installation. Spread the grid slightly to pass it over the coupling teeth and then seat it with a soft mallet. Pack additional grease between and around the grid and then wipe off the excess flush with top of grid.

6. COVER MATCH MARKS - Assemble the covers with the match marks on the same side. For vertical or inclined couplings, assemble the covers with the match marks (and lugs) UP, or on the high side.

7. INSTALL COVER - Align seals with cover grooves. Position covers per Step 6 and insert gaskets at both joints. For Sizes 1020 thru 1070, position nut in hex seats. Insert all fasteners and torque to value specified in Table 1. Insert pipe plugs.

8. LUBRICATION - Lubricate annually. Refer to Page 1 for recommended lubricant specifications and to Table 1 for amount of lubricant required. When lubricating, remove both pipe plugs and insert a standard lubrication fitting in one hole. When grease flows from the vent hole, replace both plugs. Wipe off excess grease.

Table 1 — INSTALLATION DATA

SIZE	Max Speed rpm	Operating Alignments Limits – Inches		Lube Wt (lb)	Cover Fastner Torque lb-in.
		Offset (Max)	Angular (Max)		
1020	3600	.005	.005	.06	100
1030	3600	.005	.005	.06	100
1040	3600	.005	.005	.12	100
1050	3600	.005	.005	.12	200
1060	3600	.010	.010	.19	200
1070	3600	.010	.010	.25	200
1080	3600	.010	.010	.38	200
1090	3600	.012	.012	.56	200
1100	2440	.012	.012	.94	260
1110	2250	.012	.012	1.1	260
1120	2025	.012	.012	1.6	650
1130	1800	.012	.012	2.0	650
1140	1650	.015	.015	2.5	650

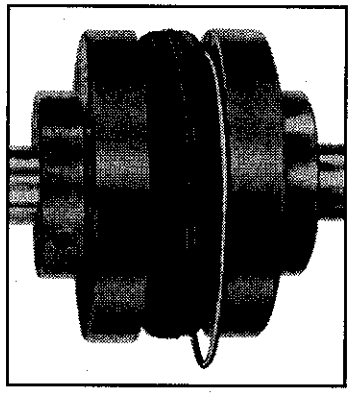
II-O. INSTALLATION WOOD'S SURE-FLEX® SPACER COUPLINGS

Sure-Flex flanges (outer metallic parts) and sleeves (inner elastometric members) come in many sizes and types. All rubber sleeves (EPDM) and Neoprene) have the same ratings for a given size and may be used interchangeably. Hytrel sleeves, however, has completely different ratings. **Rubber sleeves must not be substituted for Hytrel, or Hytrel for rubber.** First, determine the size and type of components being used. Remove all components from their boxes, and loosely assemble the coupling on any convenient surface. (Do not attempt to install the wire ring on the two-piece E or N sleeve at this time.)

1. Inspect all coupling components and remove any protective coatings or lubricants from bores, mating surfaces and fasteners. Remove any existing burrs, etc. from the shaft

2. Slide one coupling flange onto each shaft, using snug-fitting keys.

3. Position the flanges on the shafts so that each shaft extends into each flange a minimum length equal to the shaft diameter. Tighten one flange in its final position. Slide the other far enough away to install the sleeve. With a two-piece sleeve, do not move the wire ring to its final position; allow it to hang loosely in the groove adjacent to the teeth, as shown.



4. Slide the loose flange on the shaft until the sleeve is completely seated in the teeth of each flange. Tighten all fasteners to the values given in Table 2.

Table 2 FASTENER TORQUE VALUES (ft.-lbs.)

Coupling Size	TYPE J	TYPE S	TYPE SC	
	2 Setscrews at 90°	2 Setscrews at 90°	2 Setscrews at 90°	2 Setscrews at 90°
3	3	. . .	. . .	. . .
4	3	. . .	5 1/2	13
5	7	13	4	13
6	13	13	9	13
7	13	13	9	13
8	23	23	18	23
9	. . .	23	31	23
10	. . .	23	50	50
11	. . .	23	75	50
12	. . .	50	150	100
13	. . .	100	150	165
14	. . .	100	150	165
16	. . .	100	150	165

Coupling size is marked on flanges.

Different coupling sleeves require different degrees of alignment precision. Locate the earing failure (D) Excessive coupling wear

SURE-FLEX® SPACER COUPLINGS, continued

5. Check parallel alignment by placing a straightedge across the two coupling flanges and measuring the maximum offset at various points around the periphery of the coupling. DO NOT rotate the coupling. If the maximum offset exceeds the figure shown under "Parallel" in Table 3, realign the coupling.

6. Check angular alignment with a micrometer or caliper. Measure from the outside of one flange to the outside of the other at intervals around the periphery of the coupling. Determine the maximum and minimum dimensions. DO NOT rotate the coupling. The difference between the maximum and minimum must not exceed the figure given under "Angular" in Table 3. If a correction is necessary, be sure to recheck the parallel alignment. (Note: For maximum life, keep misalignment values as near to zero as possible.)

NOTE: Periodically check elastomeric coupling sleeves for any visible evidence of deterioration. If deterioration is apparent, the coupling sleeve must be replaced.

Table 3 MAXIMUM ALLOWABLE MISALIGNMENT

Sleeve Size	G DIMENSION	TYPES JES, JNS, E & N		TYPE H & HS*	
		PARRALLEL	ANGULAR	PARRALLEL	ANGULAR
3	3/8	.010	.035	–	–
4	5/8	.010	.043	–	–
5	3/4	.015	.056	–	–
6	7/8	.015	.070	.010	.016
7	1	.020	.081	.012	.020
8	1-1/8	.020	.094	.015	.025
9	1-7/16	.025	.109	.017	.028
10	1-5/8	.025	.128	.020	.032
11	1-7/8	.032	.151	.022	.037
12	2-5/16	.032	.175	.025	.042
13	2-11/16	.040	.195	.030	.050
14	3-1/4	.045	.242	.035	.060
16	4-3/4	.062	.330	–	–

(Dimension are inches)

NOTE: Values shown above apply if the actual torque transmitted is more than 1/4 the coupling rating. For lesser torque, reduce the above values by 1/2. *Type H sleeves (orange) should not be used as direct replacements for EPDM or Neoprene sleeves (black) or with J or B flanges.

7. If the coupling employs the two-piece sleeve with the wire ring, force the ring into its groove in the center of the sleeve. It may be necessary to pry the ring into position with a blunt screwdriver.

8. Check safety codes and install protective guards or shields as required.

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II-P. INSTALLATION REXNORD REX OMEGA SPACER TYPE COUPLINGS

WARNING

- Because of the possible danger to person(s) or property from accidents which may result from improper use or installation of products, it is extremely important to follow the proper installation and operational procedures.
- All rotating power transmission products are potentially dangerous and can cause serious injury. They must be properly guarded incompliance with OSHA standards for the speeds and applicaitons in which they are used. It is the reponsibility of the user to provide proper guarding.
- Failure to secure capscrews properly could cause coupling component(s) to become dislodged during operation; resulting in personal injury. **Do not start motor or job without the complete coupling being properly secured to driving and driven equipment shafts.**
- Before installing this coupling on any system containing sleeve bearings, herringbone gear sets or other devices sensitive to axial thrust, consult Rexnord.
- It is the reponsibility of the user to consider the coupling's stiffness (available from Rexnord) as it relates to the drive system frequency.

STEP 1: Inspect both driving and driven shafts and hub bores making sure they are free from dirt and burrs. Be sure the keys fit shafts properly. Mount both hubs to the shafts securing only one hub; the other hub should be loose for minor adjustment of spacing. Where tapered bushings are used, follow bushing manufacturer's instructions. If hub is bored for an interference fit, we recommend heating the hub in water, oil bath or an oven and quickly positioning it on the shaft. Do not spot heat hub as it may cause distortion.

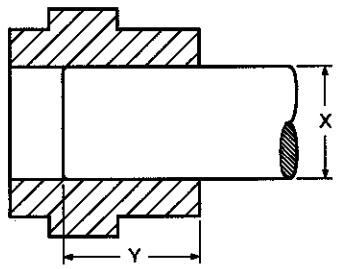
STEP 2: Place half of the elastomer element around hubs and secure with self-locking capscrews. The elastomer element will space the other hub. It is important to have capscrew properly tightened. See Table 1 below for recommended capscrew torques and instructions. Now secure the other hub to the shaft.

STEP 3: Mount other half of the elastomer element to hubs. Be sure to secure rings to the spacer element if provided. Tighten all capscrews to the recommended capscrew torques in Table 1 and your done!

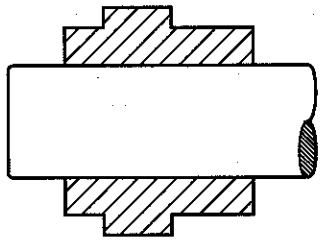
HELPFUL HINT: If the capscrew holes in the element do not line up properly with the hubs due to equipment misalignment, rotate the shafts (if possible) slightly as you install each capscrew. On larger coupling sizes, first install the capscrews that are located in the center of the half element.

ALLOWABLE SHAFT ENGAGEMENTS

Shafts can be flush with the hub (not shown), recessed below the face of the hub, or extended beyond the hub face.



Dimension Y should be equal to, or greater than, .8 times dimension X.



The shaft may extend beyond the hub, as long as there is sufficient keyway length available.

TABLE 1

RECOMMENDED CAPSCREW TORQUES FOR PROPER INSTALLATIION – IMPORTANT – Capscrews have self-locking patches which should *not* be reused more than twice. Capscrews can be further used with application of a thread-locking adhesive. *Do Not Lubricate Capscrew Threads*	CPLG SIZE	TORQUE - DRY		
		IN. LBS.	FT. LBS.	Nm
	2 3 4 5 10	204	17	23
	20 30 40 50	360	30	40
	60 70 80	900	75	100
	100 120	3240	270	370
	140	7080	590	800

EQUIPMENT ALIGNMENT

Although Omega couplings can withstand gross misalignment, care should be taken for best possible alignment to assure optimum performance. The caliper/straightedge alignment procedure is described below. If greater alignment accuracy is desired, a dial indicator method is recommended. There are occasions when equipment manufacturers require more specific alignment tolerances, in which case, the manufacturer's recommendations should be followed.

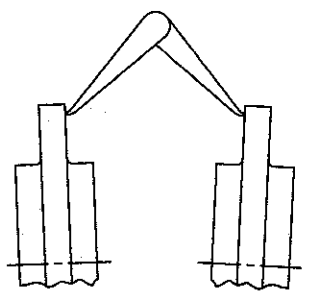
1. To correct for angular misalignment, use calipers to check the gap between hubs. Adjust or shim equipment until the gap is the same at all points around the hubs.

2. To correct parallel offset, place a straightedge across the hub flanges in two places at 90° to each other. Adjust or shim equipment until the straightedge lays flat on both sides.

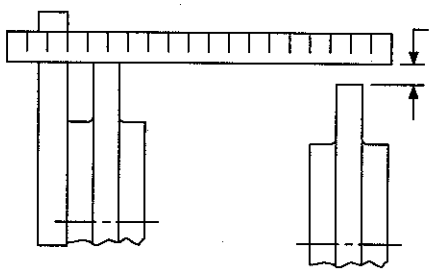
3. Tighten down connected equipment and recheck alignment.

4. Install elastomer element, tightening all capscrews to the values shown in Table 1 as described on the reverse side.

5. If practical, recheck and tighten capscrews after several hours of operation.



ADJUST FOR ANGULAR MISALIGNMENT



ADJUST FOR PARALLEL OFFSET

II-Q. STUFFING BOX

1. **Packing:** Stuffing box packing is installed at the factory. Gland bolt nuts should be installed finger tight only. Packing cannot run dry, it must be lubricated. If the pumpage is clean, cool fluid, it may be used through a bypass off the discharge to the lantern ring connection to lubricate the packing. If the pumpage is dirty or hot, it is not suitable to lubricate the packing. An external source must be utilized, unless the bypass is equipped with proper separator, filter, and/or cooling system. This must also be piped into the lantern ring connection (refer to packing recommendations).

2. **Mechanical Seals:** When mechanical seals are supplied, they are installed and adjusted at the factory. They must not run dry or come into contact with abrasives in the pumpage. Connect recirculation, flush, and/or cooling lines as required, following instructions on the seal drawing supplied. On the cartridge type seals installed at the factory, the centering clips are removed. Follow instructions on the seal drawing supplied.

PACKING RECOMMENDATIONS

1. General Service Packing – This is an Aramid-PTFE synthetic packing. It is best suited for cold water and general service applications. It has a PH range of 0 to 12 and a maximum operating temperature of 500 degrees F. This packing is similar to Crane type 1345 or equal.

2. Chemical and Solvent Packing – This is a PTFE-Synthetic packing. It is used for severe chemi cal and solvent applications. It has a PH range of 0 to 14 and a maximum operating tempera ture of 500 degrees F. This packing is similar to Crane type C1065 or equal.

3. High Pressure and Temperature Packing – Often called Graphoil, it is used in high pressure and temperature applications. It has a PH range of 0 to 14 and a maximum operating tempera ture of 750 degrees F.

PACKING SIZE

The following is a list of the standard packing size for all process pump models.

Frame Size	Packing Size	Approx. Length	No. of Rings	Lantern Ring Width
STP	5/16 x 5/16	4.75	5	7/16
MTP	3/8 x 3/8	5.75	5	5/8
LTP	3/8 x 3/8	7.0	5	5/8
XLTP	7/16 x 7/16	8.0	5	5/8

OPERATION

III-A. START-UP CHECK LIST

(a) Checking shaft rotation

1. With power off and locked out, remove spacer between coupling hubs.
2. Restore power, and momentarily energize motor to determine rotation. Motor shaft must rotate in direction of arrow on the pump bearing frame.
3. Shut off power and lock out.
4. Check impeller clearance. Pumps assembled at the factory are set at .015 inch clearance. Do not rely on factory setting which could be affected by piping connections, or if high temperature liquids are to be pumped, the impeller setting must be corrected. See appendix for adjustment procedure.
5. Reinstall coupling spacer. Make sure coupling hubs are secured to the shafts. Lubricate coupling as required per manufacturer's instructions. RECHECK ALIGNMENT.
6. Install coupling guard.

(b) Bearing Lubrication

Oil Lubrication: PUMPS ARE NOT SHIPPED FROM THE FACTORY WITH OIL.

1. Remove item 113A (oil fill plug) and fill frame with oil to the center of the sight glass. A high quality turbine oil with rust and oxidation inhibitors should be used. See Appendix for oil recommendations and instructions for filling frame with oil when Trico oilers are installed.

Pure Oil Mist Lubrication: The power frames have, as standard, drilled and tapped connections for oil mist systems. The connections are located on the top of the bearing frame. Follow instructions from the manufacturer of the oil mist generator system. If you are already using flood oil lubrication, instructions for converting to oil mist are located in the Appendix.

Grease Lubrication: Pumps shipped from factory contain some grease but it is not sufficient for placing the pump into continuous service. Refer to instructions in the appendix.

Greased for Life Bearings: These bearings are greased and permanently sealed by the bearing manufacturer.

See appendix for recommended lubrication schedules.

(c) Shaft Sealing - Refer to section II-Q page 20.

WARNING

Never allow pump to run dry, or operate pump without liquid in the seal chamber. Seal faces must always be lubricated. Operating a pump without liquid in the casing or seal chamber, even for a few moments, can cause seal failure, pump damage and or personal injury.

(D) **Priming:** A centrifugal pump must be primed before it can be operated. If run dry, damage can occur to close-clearance rotating parts and will destroy mechanical seals. If not primed properly, it will not deliver fluid. Prime in one of the following methods:

1. If system has suction pressure, slowly open the suction valve. Open air vents on the pump casing and suction and discharge piping until fluid runs out. Rotate shaft a few times if possible to evacuate any trapped air in the impeller passages. Close all vent valves.
2. If the system has suction lift and there is a foot valve in the suction pipe, fill the pump casing and suction pipe with the liquid to be pumped. At the same time let any trapped air escape.
3. If the system has a suction lift but no foot valve, use a vacuum pump or ejector operated by air, steam, water, engine exhaust, etc., to evacuate the air from the pump case and suction pipe. Connect the ejector to the gauge connection at the top of the discharge nozzle, if provided.

(E) **Starting the Pump:** Turn the pump shaft by hand to ensure that the rotating element is free. If the rotating element rubs or binds, check for any abnormal piping strain or other loads on the pump causing misalignment. A slight drag from the mechanical seal is normal.

1. Check that the voltage and frequency on the motor nameplate match the current supply. Be sure the motor is wired for correct voltage. Check that all thermal overload relays are of the proper size and "set" for operation.
2. **Be sure the valve in the suction line is open.** Never use the suction line valve to control flow. The discharge valve should be closed or partially open. See that all pipe connections are tight. Make sure all flushing and cooling lines are open.
3. **Restore power supply and start the pump motor/driver.** As soon as pump reaches full speed, slowly open the discharge valve.

WARNING

Do not operate the pump below minimum rated flow levels or against a closed discharge valve for prolonged periods of time. This can cause increased vibration levels which will affect seal and bearing life. It can also cause cavitation damage to the internal surfaces of the pump.

4. If hot liquid is pumped, control opening of discharge valve to allow pump temperature to stabilize before reaching full capacity. Observe the operation of the pump. If excessive vibration or noise is evident, the unit should be stopped immediately and a thorough check made of the installation to determine the cause. Correct any fault before restarting the pump.
5. Listen for rubbing or binding which may have been caused by piping strains. If present, shut down the pump immediately. Investigate and correct the cause before restarting the pump.
6. Check the packing/mechanical seal for proper operation. Packing should have a leakage rate between 40 to 60 drops per minute. Never force the packing into a leakproof position since this will create excessive friction and premature damage to the packing and shaft or shaft sleeve. If leakage is excessive, tighten the gland bolts evenly, about 1/4 turn at a time. Allow the packing to seat in its new position. Packing must be "run-in" and this could take several hours or days to achieve the desired results.

   Mechanical seals are installed and adjusted at the factory. No further adjustment is required except for a short run-in period.

7. After the pump has been operating for a sufficient length of time to bring it up to operating temperatures, the final alignment should be checked. Once the pump has reached operating temperature, stop the pump, lock out the power source, and immediately remove coupling guard. Disconnect coupling and check the alignment. Make any necessary adjustments at this time. Reconnect coupling and replace coupling guard.

WARNING

NEVER RUN PUMP WITHOUT THE COUPLING GUARD. DISREGARD OF THIS WARNING CAN RESULT IN SERIOUS PERSONAL INJURY OR DEATH.

(F) Pump Shutdown: Slowly close discharge valve and shut off power to the motor. Lock out motor power supply to prevent accidental restart when performing inspection or routine maintenance.

PREVENTIVE AND CORRECTIVE MAINTENANCE

A planned program of routine inspection and preventive maintenance can increase the service life of your pump. Maintenance records should be kept for each pump in a data base which will be beneficial in developing long term maintenance planning. Regular check ups of the following items will help keep your pump running trouble free and keep costly downtime to a minimum.

IV-A. DAILY/WEEKLY ROUTINE INSPECTION AND MAINTENANCE

(a) Observe oil level and condition through sight glass or Trico oiler if provided. Oil level should be visible and at the level indicated on the sight glass. Slight foaming under operation is normal. Contaminated oil should be changed immediately.

(b) Grease lubricated bearings should be re-greased at start-up and approximately every 2000 hours of operation. Refer to Appendix, page 36, for recommended grease manufactures.

(c) Check mechanical seal chamber for leaks. Mechanical seals should not leak. Visible signs of leakage should be investigated immediately.

(d) Visually inspect pump and piping for leaks. Inspect all tapped and plugged connections. Check for unusual noise or vibrations. Check for high bearing temperatures.

(e) Periodically, check foundation bolts, pipe supports and pump to motor alignment.

(f) If performance deteriorates, refer to troubleshooting, Appendix.

STP/MTP POWER FRAMES

V-A. DISASSEMBLY AND REASSEMBLY INSTRUCTIONS

REQUIRED TOOLS

Torque Wrenches* (ft. lbs)	Dial Indicator
Impeller Wrench, Part # 96A3038 F-056	Micrometer
Allen Wrenches	Snap Ring Pliers
Open End Wrenches 9/16", 3/4", 7/8", 15/16"	Feeler Gauges
Induction Bearing Heater	Drift Punch
Spanner Wrench	Hoist

WARNING

Proper methods to handle pump components must always be used to avoid physical injury or damage to parts.

Lock out power supply to motor, close off suction and discharge valves. Drain liquid from casing and flush if required. Carefully, disconnect all accessory piping, remove coupling guard and disconnect coupling. Remove complete pump assembly or back pull out, (power frame with adapter, box cover and impeller attached), by removing frame adapter to casing bolts, (item 370). Using suitable lifting device, place pump, or back pull out assembly, on clean work surface of adequate strength to support the weight.

STP/MTP PUMP FRAMES

(a) Secure pump/back pull out assembly, to work bench.

(b) Drain oil from bearing frame by removing oil drain plug (408A). Replace drain plug and dispose of used oil in an environmentally appropriate manner.

(c) Scribe line on pump shaft at end of coupling hub and proceed to remove hub from shaft.

(d) Remove impeller (101), do not apply heat. Use impeller shaft wrench #96A3038F-056 for STP and MTP frames. For LTP and XLTP frames use a spanner wrench or other suitable tool that will not mark the shaft. Slide wrench over shaft (122) and key (400). Turn impeller clockwise (viewed from impeller end of shaft), to raise wrench off of work bench. Abruptly, turn impeller counterclockwise to impact wrench against workbench or block of wood. Repeat as necessary until impeller loosens on shaft threads. Spin off impeller and discard O-ring seal (496A).

REMOVAL OF STUFFING BOX COVER-MECHANICAL SEAL PUMPS

(e) Remove seal gland stud nuts (353A). Separate seal gland (250), and slide gland toward bearing isolator (333A).

Remove seal chamber stud nuts (423B).

To remove seal chamber (184), slide chamber forward and off of pump shaft.

(f) Remove mechanical seal rotary (non-cartridge type) from pump shaft sleeve by loosening set screws and sliding assembly off of pump sleeve.

(g) Slide shaft sleeve forward and remove from shaft (126).

(h) Slide seal gland with stationary seat and O-ring gasket off of pump shaft.

REMOVAL OF STUFFING BOX COVER-PACKED PUMPS

(i) Remove packing gland studs (353) and nuts (353A).

(j) Remove stuffing box cover stud nuts (423B).

(k) Remove box cover by sliding cover forward and off of pump shaft.

(l) Remove packing rings (106) and lantern ring (105).

(m) On MTP, LTP and XLTP pump models, remove frame adapter (108) from power frame as follows:

1. Remove dowel pins (469B)
2. Remove frame to adapter bolts (370B)
3. Separate adapter from frame and discard O-ring gasket (360D)
4. **DO NOT REMOVE LABYRINTH SEAL ASSEMBLY FROM FRAME ADAPTER.**

POWER END DISASSEMBLY–STP AND MTP MODELS

(a) Remove cap screws (370C), loosen jam nuts (423). Tighten jack bolts (370D) evenly. Bearing housing will begin to back out of frame.

(b) Slide shaft assembly, with bearing, housing out of bearing frame.

(c) Remove all jack screws and nuts, items (370D) and (423).

(d) Remove and discard bearing housing O-ring (496).

(e) Using snap ring pliers, remove bearing retaining ring, (361A).

(f) Remove bearing housing (134) from shaft by tapping the shaft with a rubber mallet, driving the thrust bearings and shaft assembly through the housing.

DO NOT ATTEMPT TO REMOVE THE LABYRINTH SEALS, (333A) and (332B). THESE ARE ONE PIECE ISOLATORS THAT ARE NOT DESIGNED FOR FIELD DISASSEMBLY. UNLESS DAMAGED, THE ISOLATOR O-RINGS DO NOT REQUIRE SERVICE OR REPLACEMENT.

(g) Remove bearing lock nut (136) and lock washer, (382).

(h) Using an arbor press, remove inboard and outboard bearings. Slide snap ring off shaft after bearings have been removed.

(i) Complete disassembly of bearing frame (228). Remove oil fill plug, (113A), oil sight glass (408N), Oil mist/grease plugs four (4), (408H). Remove oil cooler inlet and outlet plugs, (408L) and (408M). On MTP models, remove frame foot attachment bolts (370F).

POWER END DISASSEMBLY–LTP FRAMES

(a) Remove bearing housing bolts (370C), loosen jam nuts (423). Tighten jack bolts (370D) evenly. Bearing housing will begin to back out of frame.

(b) Slide shaft assembly, with bearing, housing out of bearing frame.

(c) Remove all jack screws and nuts, items (370D) and (423). Remove bearing housing O-ring (496).

(d) Remove bearing cover screws (370G) and remove cover.

(e) Remove bearing housing (134) from shaft by tapping the shaft with a rubber mallet, driving the thrust bearings and shaft assembly through the housing.

DO NOT ATTEMPT TO REMOVE THE LABYRINTH SEALS, (333A) and (332B). THESE ARE ONE PIECE ISOLATORS THAT ARE NOT DESIGNED FOR FIELD DISASSEMBLY. UNLESS DAMAGED, THE ISOLATOR O-RINGS DO NOT REQUIRE SERVICE OR REPLACEMENT.

(f) Remove bearing lock nut (136) and lock washer, (382).

(h) Using an arbor press, remove inboard and outboard bearings. Remove bearing cover. **DO NOT REMOVE OIL RING (248A) FROM SHAFT UNLESS IT IS DAMAGED.**

POWER END DISASSEMBLY–XLTP FRAMES

(a) Remove bearing frame foot bolts (370F), and remove foot (241).

(b) Remove bearing housing bolts (370C), loosen jam nuts (423). Tighten jack bolts (370D) evenly. Bearing housing will begin to back out of frame.

(c) Slide shaft assembly, with bearing housing, out of bearing frame.

(d) Remove all jack screws and nuts, items (370D) and (423). Remove bearing housing O-ring (496).

(e) Remove bearing cover bolts (370G) and bearing cover (109C). Discard)-ring gasket (360C). **DO NOT REMOVE LABYRINTH SEAL.**

(f) Using an arbor press, remove inboard bearing (168A).

(g) Remove bearing housing (134), by sliding housing over the bearing and removing housing from impeller end of shaft.

(h) Remove bearing locknut (136) and lock washer (382).

(i) Press outboard bearing (112) off of shaft.

PARTS INSPECTION

ALL PARTS MUST BE INSPECTED BEFORE REASSEMBLY TO INSURE THAT THE REBUILT PUMP WILL PERFORM PROPERLY. EACH PART SHOULD BE EXAMINED FOR SIGNS OF FATIGUE, EXCESSIVE WEAR AND CRACKS. REPLACE ANY WORN PARTS IF THEY DO NOT MEET THE FOLLOWING TOLERANCE STANDARDS.

BEARING FRAME AND FOOT - Visually inspect for cracks, roughness, rust or scale. Check machined surfaces for pitting or erosion. BEARING FRAME - INSPECT TAPPED CONNECTIONS FOR DIRT, CLEAN AND CHASE THREADS AS NECESSARY. Remove all loose or foreign material. Inspect lubrication passages to be sure that they are open. Inspect inboard bearing frame bore.

SHAFT AND SLEEVE - Visually inspect, check for grooves or pitting. Check bearing fits and shaft runout. Replace shaft and sleeve if worn, or if tolerances are outside the limits listed below.

CASING- Visually inspect for signs of wear, corrosion, or pitting. The casing should be replaced if wear exceeds ⅛" 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 ⅛" 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)

	STP	MTP	LTP	XLTP
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 snap 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 IN-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). Hand 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 line up 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 regreaseable 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 if 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 indictor 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 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.

(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, other wise no flushing will occur. Install packing gland haves (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 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.

(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.

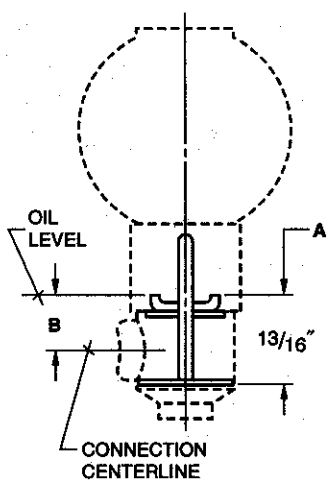
REFILL POWER FRAME WITH OIL, OR GREASE BEARINGS AS DESCRIBED IN THE PRELIMINARY START UP CHECK LIST. FOLLOW ALL INSTRUCTIONS IN START UP CHECK LIST AND PROCEED WITH PUMP START-UP.

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



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
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 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

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

NGLI GRADE 3	**(500 Degrees F. MAX.)**
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 (¼) 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 ⅜ inch NPT plug. Install drain connection for oil mist system.

(c) Refer to oil mist manufacturer's system instructions for operation and adjustment.

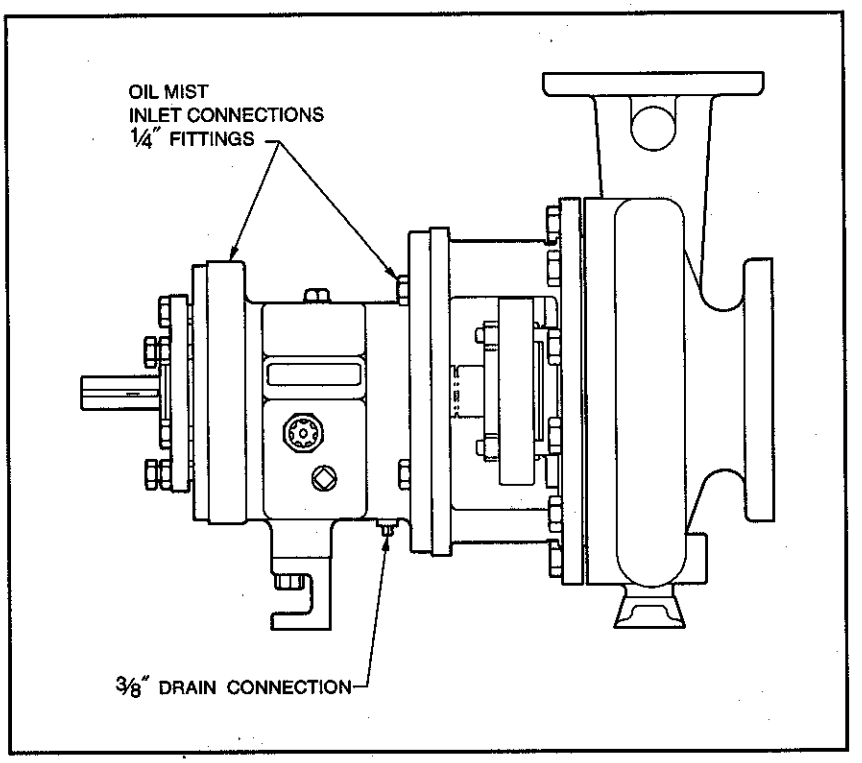


Figure C. Oil mist system connections (MTP Illustrated)

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.

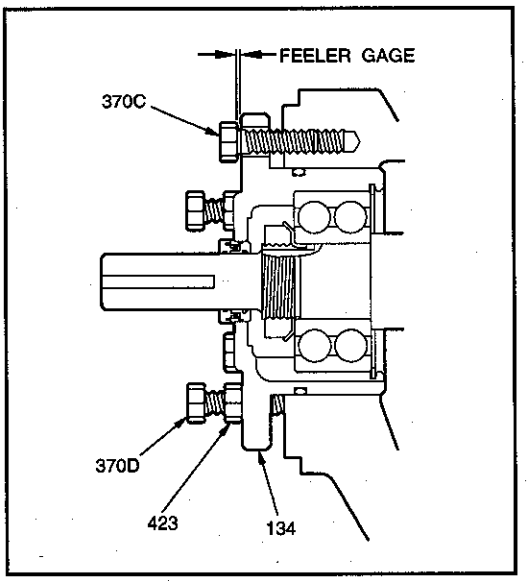


Figure D.

(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.

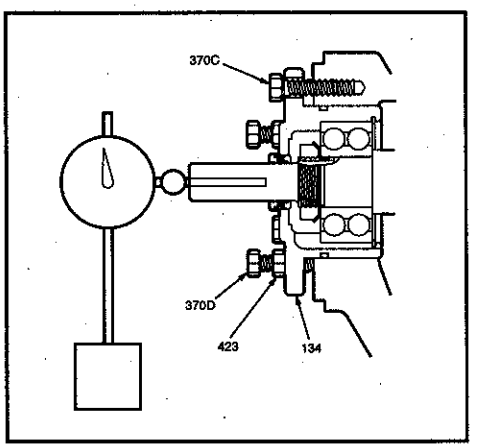


Figure E.

(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 STP 8 inch	45 Ft Lbs (60nm) 30 Ft Lbs (40nm)	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

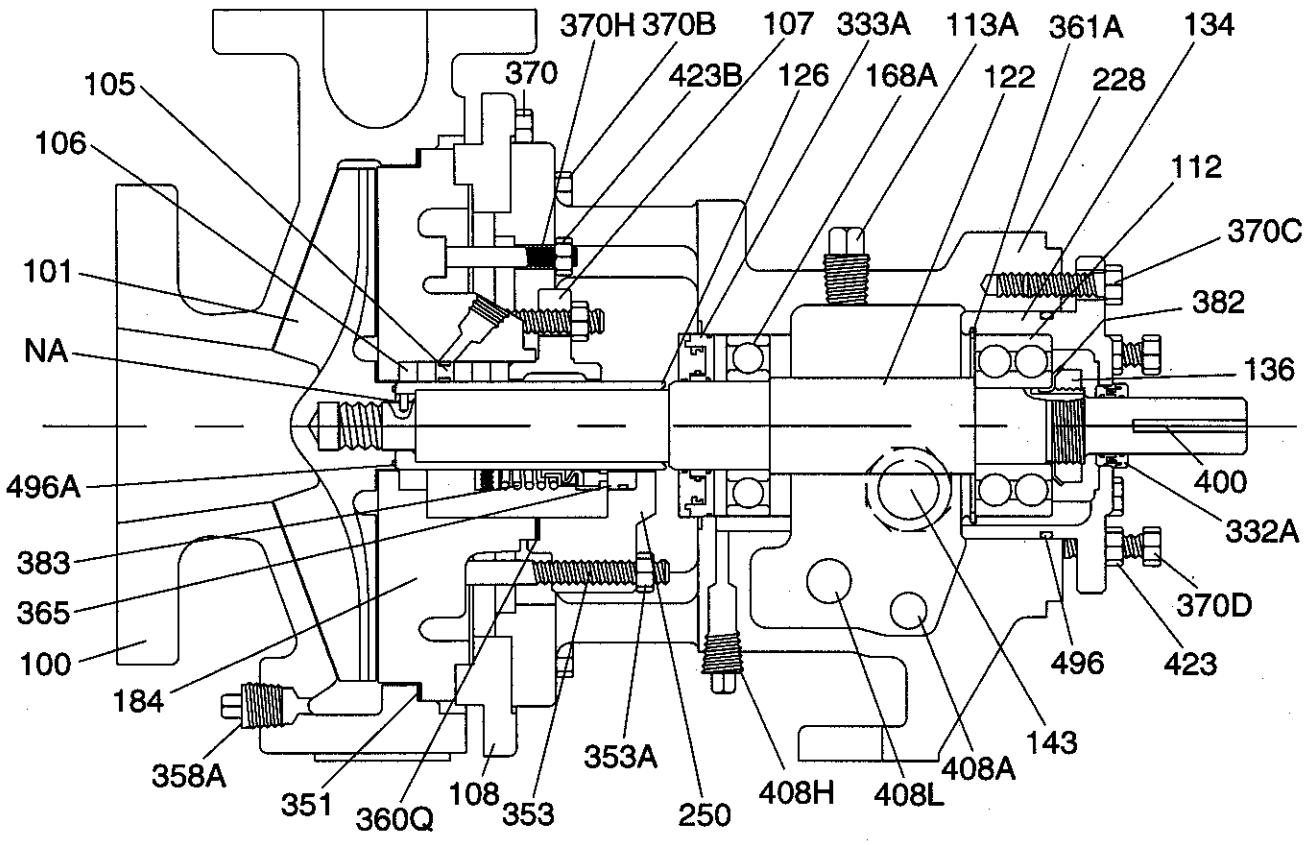
ITEM #	QTY	DESCRIPTION	MATERIAL									
			DI ~~316SS~~	ALL 316SS	CD4MCu	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI
100	1	Casing	D.I.	316SS	CD4	ALLOY 20	317SS	MONEL	NICKEL	HAST B	HAST C	TI
370	□	Bolt, Casing	STEEL	STAINLESS STEEL								
NA	1	Foot, Casing	CAST IRON									
358A	1	Plug, Casing Drain	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						
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									
136	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-8M
317 STAINLESS STEEL	653	CAST, ASTM A743, GRADE CG-8M
ALLOY 20	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
HASTELLOY B	101	ASTM A494, GRADE N - 12MV, CLASS 1
HASTELLOY C	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 B367, GRADE C-3

STP FRAME Cross Sectional Drawing

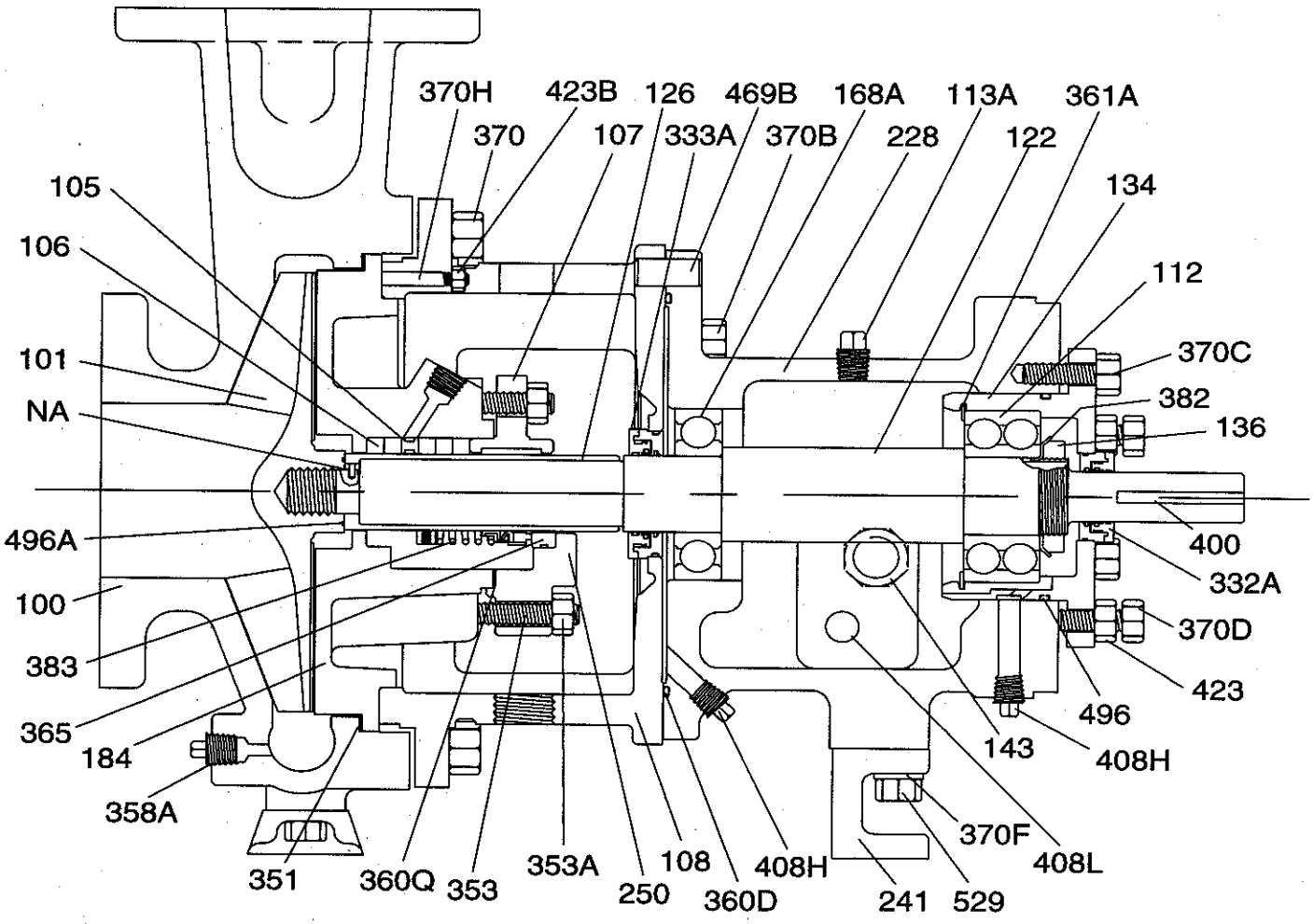


ITEM #	QTY	DESCRIPTION
100	1	Casing
370	8	Bolt, Casing
358A	1	Plug, Casing Drain
101	1	Impeller
122	1	Shaft
184	1	Cover, Stuffing Box
370H	2	Box Cover/Adapter Stud
423B	2	Nut, Box Cover/Adapter Stud
106	5	Packing
126	1	Sleeve, Shaft
NA	1	Pin, Sleeve
168A	1	Bearing, Inboard
250	1	Gland, Mechanical Seal
107	1	Gland, Packing
353	4*	Stud, Gland
353A	4*	Nut, Gland Stud
112	1	Bearing, Outboard
228	1	Frame
408H	4	Plug, Frame Lubrication Port
408L	1	Plug, Oil Cooler Inlet
408A	1	Plug, Frame Drain
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	Jamnut, Bearing Housing Jack Bolt
361A	1	Snap Ring, Bearing
496A	1	Gasket, Shaft Sleeve
400	1	Key, Coupling
365	1	Seal, Mechanical Stationary Element
382	1	Lock Washer, Bearing
108	1	Adapter 8" Pumps Only
370B	4	Bolt, Frame/Adapter
351	1	Gasket, Case
360Q	1	Gasket; Gland, Mechanical Seal
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

MTP FRAME Cross Sectional Drawing

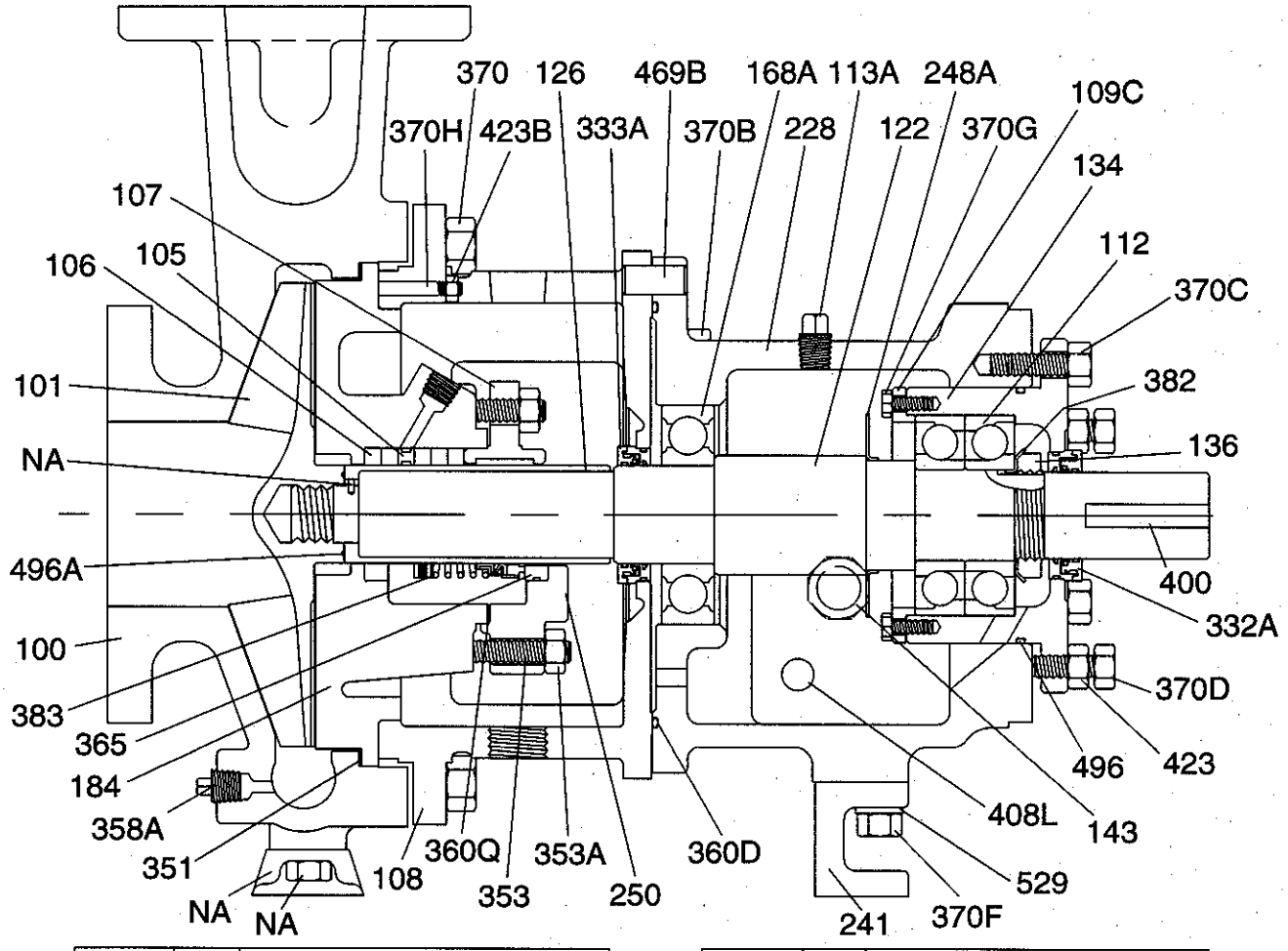


ITEM #	QTY	DESCRIPTION
100	1	Casing
370	3	Bolt, Casing
NA	1	Foot, Casing
358A	1	Plug, Casing Drain
NA	2	Bolt, Casing Foot
101	1	Impeller
122	1	Shaft
184	1	Cover, Stuffing Box
370H	2	Box Cover/Adapter Stud
423B	2	Nut, Box Cover/Adapter Stud
106	5	Packing
126	1	Sleeve, Shaft
NA	1	Pin, Sleeve
168A	1	Bearing, 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
408H	4	Plug, Frame Lubrication Port
408L	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
408M	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	Jamnut, Bearing Housing Jack Bolt
361A	1	Snap Ring, Bearing
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

LTP FRAME Cross Sectional Drawing

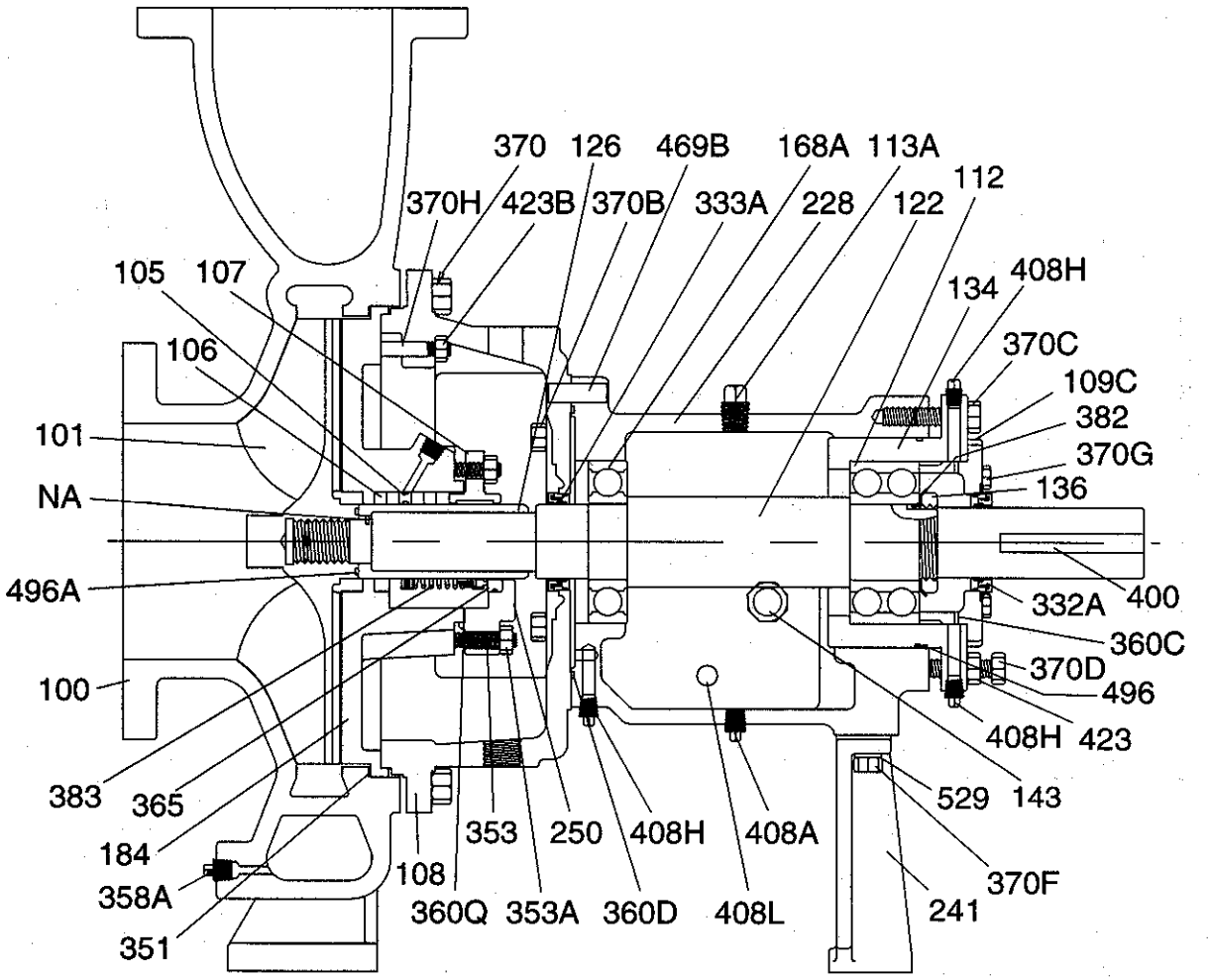


ITEM #	QTY	DESCRIPTION
100	1	Casing
370	3	Bolt, Casing
NA	1	Foot, Casing
358A	1	Plug, Casing Drain
NA	2	Bolt, Casing Foot
101	1	Impeller
122	1	Shaft
184	1	Cover, Stuffing Box
370H	2	Box Cover/Adapter Stud
423B	2	Nut, Box Cover/Adapter Stud
106	5	Packing
126	1	Sleeve, Shaft
NA	1	Pin, Sleeve
168A	1	Bearing, 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

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	Jamnut, 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
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

***Packing Gland has only 2 Studs & Nuts**

XLTP FRAME Cross Sectional Drawing



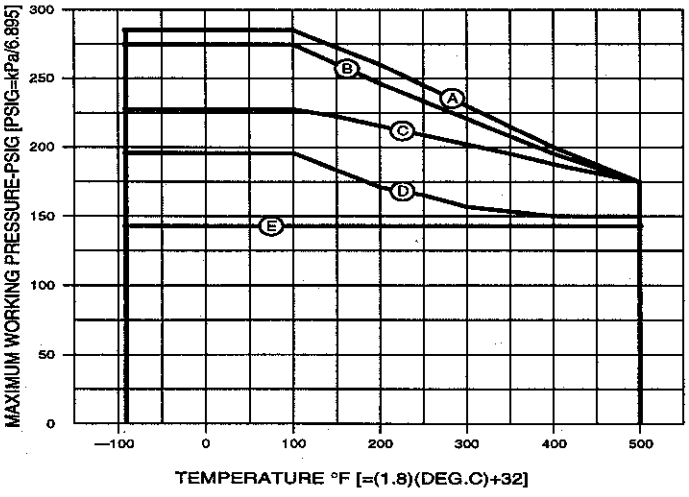
ITEM #	QTY	DESCRIPTION
100	1	Casing
370	4	Bolt, Casing
358A	1	Plug, Casing Drain
101	1	Impeller
122	1	Shaft
184	1	Cover, Stuffing Box
370H	2	Box Cover/Adapter Stud
423B	2	Nut, Box Cover/Adapter Stud
106	5	Packing
126	1	Sleeve, Shaft
NA	1	Pin, Sleeve
168A	1	Bearing, Inboard
250	1	Gland, Mechanical Seal
107	1	Gland, Packing
353	4*	Stud, Gland
353A	4*	Nut, Gland Stud
112	1	Bearing, Outboard
228	1	Frame
241	1	Foot, Frame
408H	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	Jamnut, 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

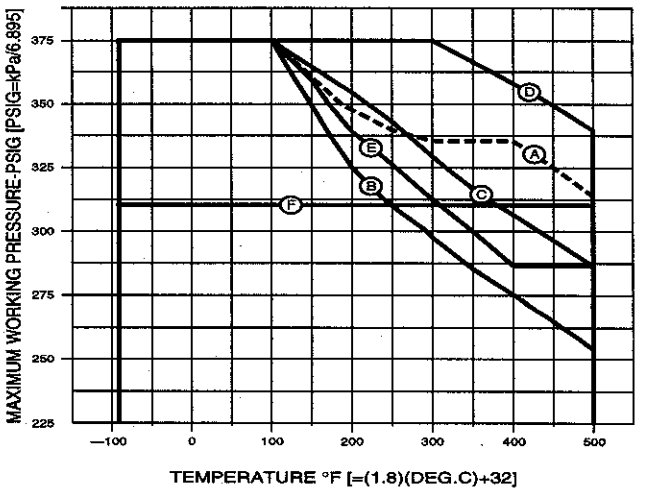
PRESSURE / TEMPERATURE RATINGS

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

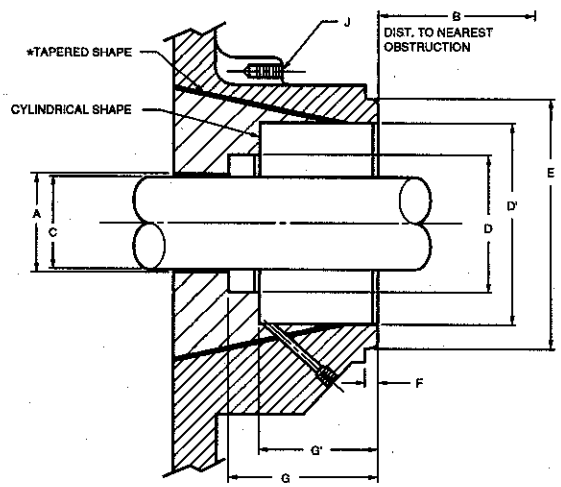


CURVE	MATERIAL
A	DUCT. IRON
A	CAST STEEL
A	316 S.S
A	317 S.S
A	ALLOY 20
A	HAST. B
B	HAST. C
B	CD4MCu
C	TITANIUM
D	MONEL
E	NICKEL

CONTACT FACTORY FOR SUCTION PRESSURES OVER 160 PSIG.

Engineering Data

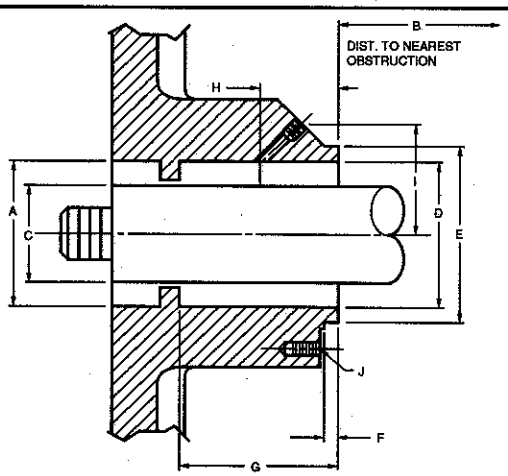
ANSI Seal Chamber Cover Large/Taper Bore



PUMP SIZE	BOX COVER									J			BOX CVR NPT	GLAND NPT
	A	B	C	D	D'	E	F	G	G'	STUDS SIZE	STUDS NO.	BOLT HOLE CIR.		
STP	1.400 1.405	2.19	1.373 1.375	1.999 2.003	2.88	3.594 3.597	.19	2.12	1.69	.375	4	4.50	.25	.25
MTP	1.770 1.780	2.81	1.748 1.750	2.499 2.503	3.50	4.337 4.340	.25	2.62	2.12	.500	4	5.50	.38	.50
LTP	2.145 2.155	2.81	2.123 2.125	2.874 2.878	3.88	4.708 4.711	.25	2.62	2.12	.500	4	6.00	.38	.50
XLTP	2.520 2.530	2.85	2.498 2.500	3.374 3.378	4.50	5.447 5.450	.25	3.00	2.50	.625	4	6.75	.38	.50

*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 SIZE	STUDS NO.	BOLT HOLE CIR.		
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

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.
	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 168A	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

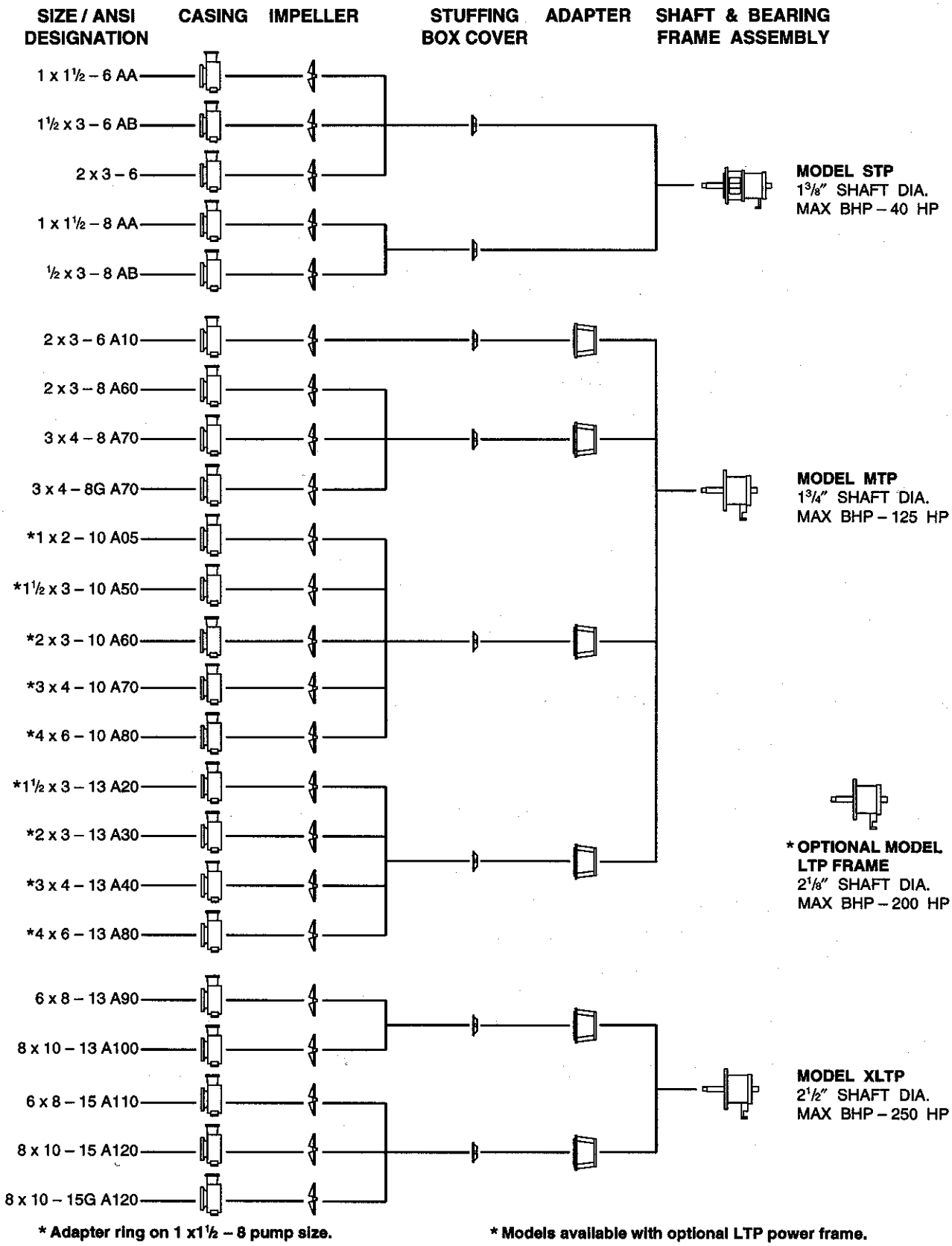
Repair orders will be handled with a minimum of delay. Contact your local authorized representative and provide the following:

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 Sterling Fluid Systems (USA), Inc. at their option.

Modular Interchangeability Chart



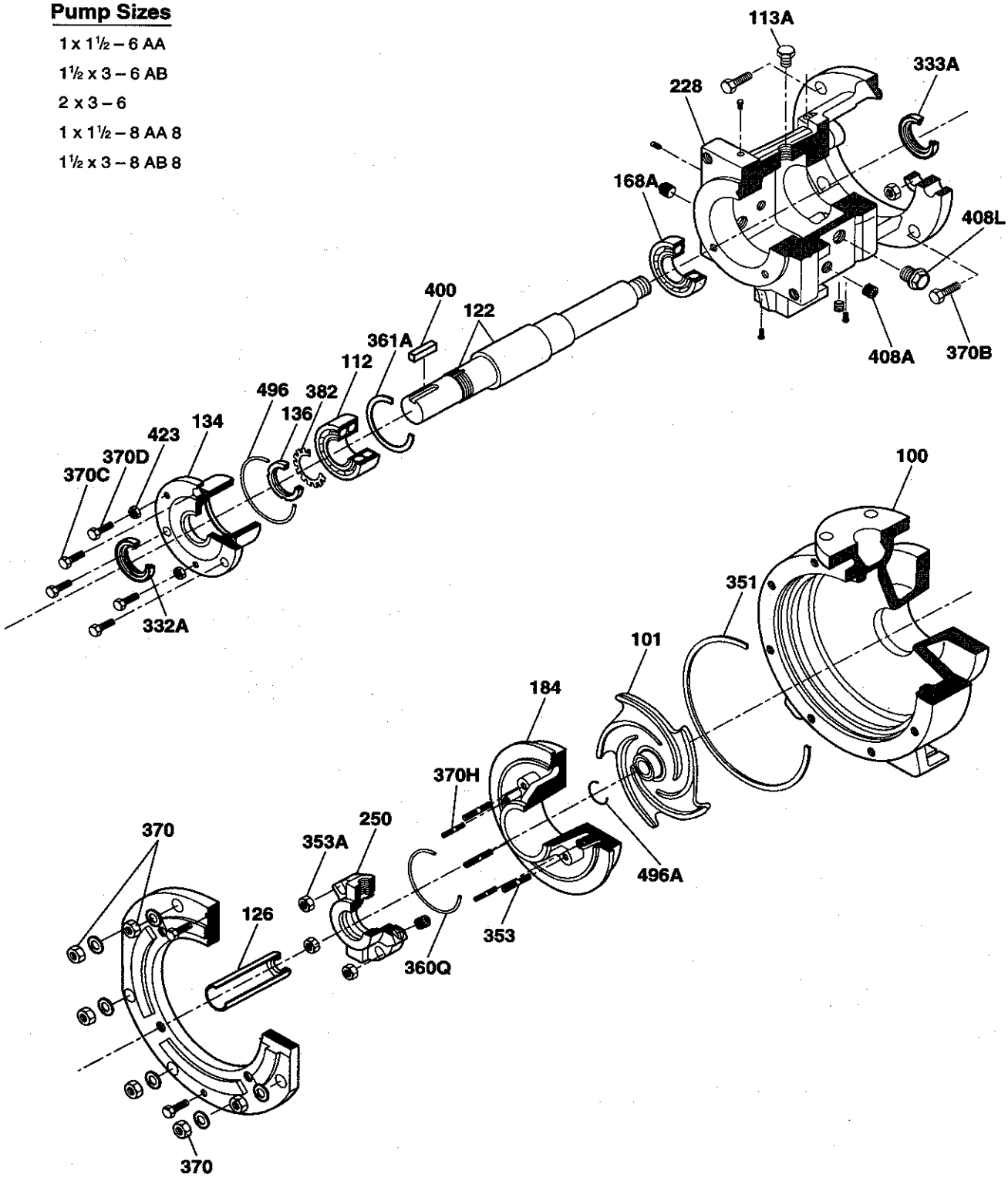
*** Adapter ring on 1 x1½ – 8 pump size.**

*** Models available with optional LTP power frame.**

STP Exploded Isometric View

Pump Sizes

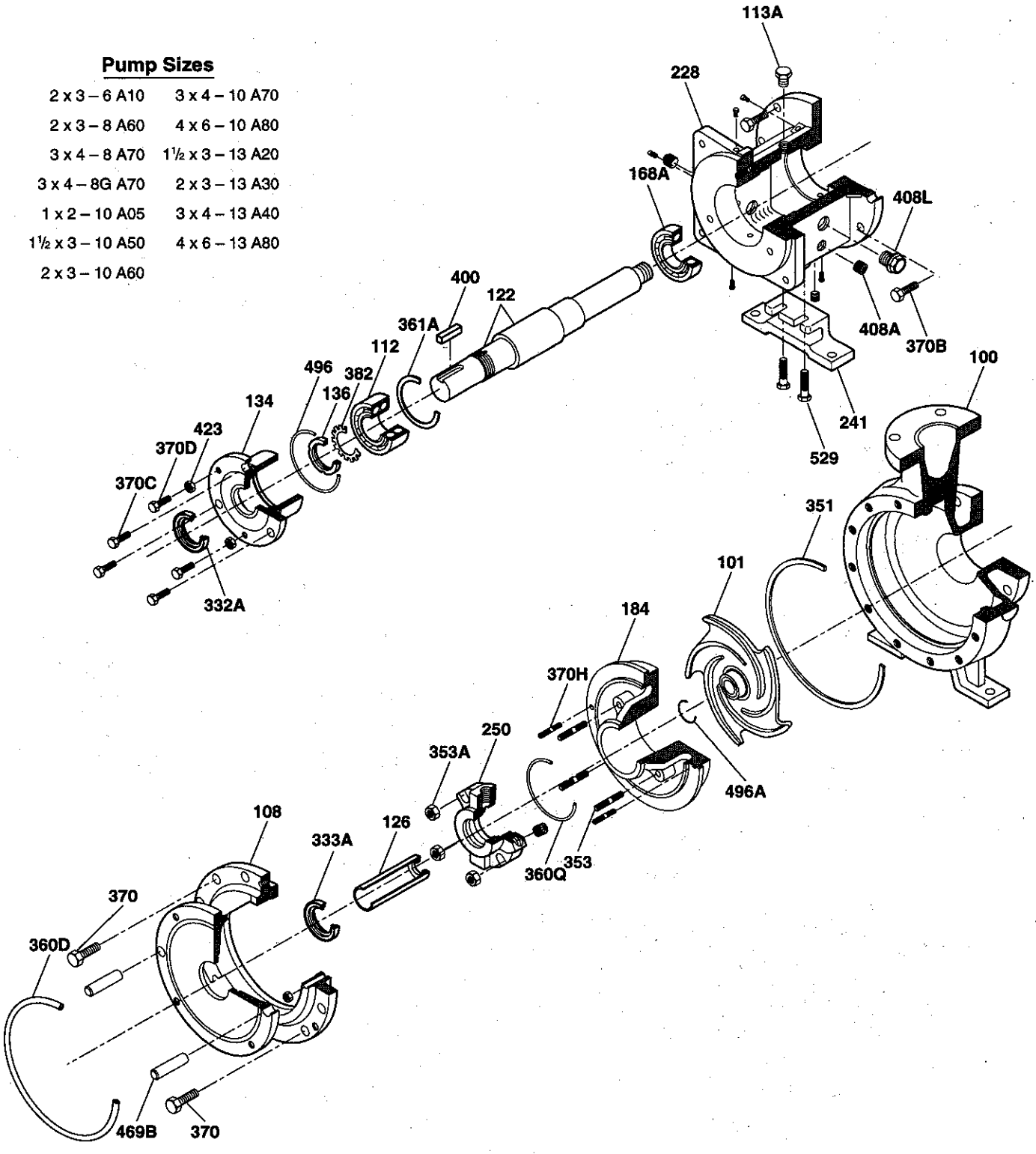
1 x 1½ – 6 AA
1½ x 3 – 6 AB
2 x 3 – 6
1 x 1½ – 8 AA 8
1½ x 3 – 8 AB 8



MTP Exploded Isometric View

Pump Sizes

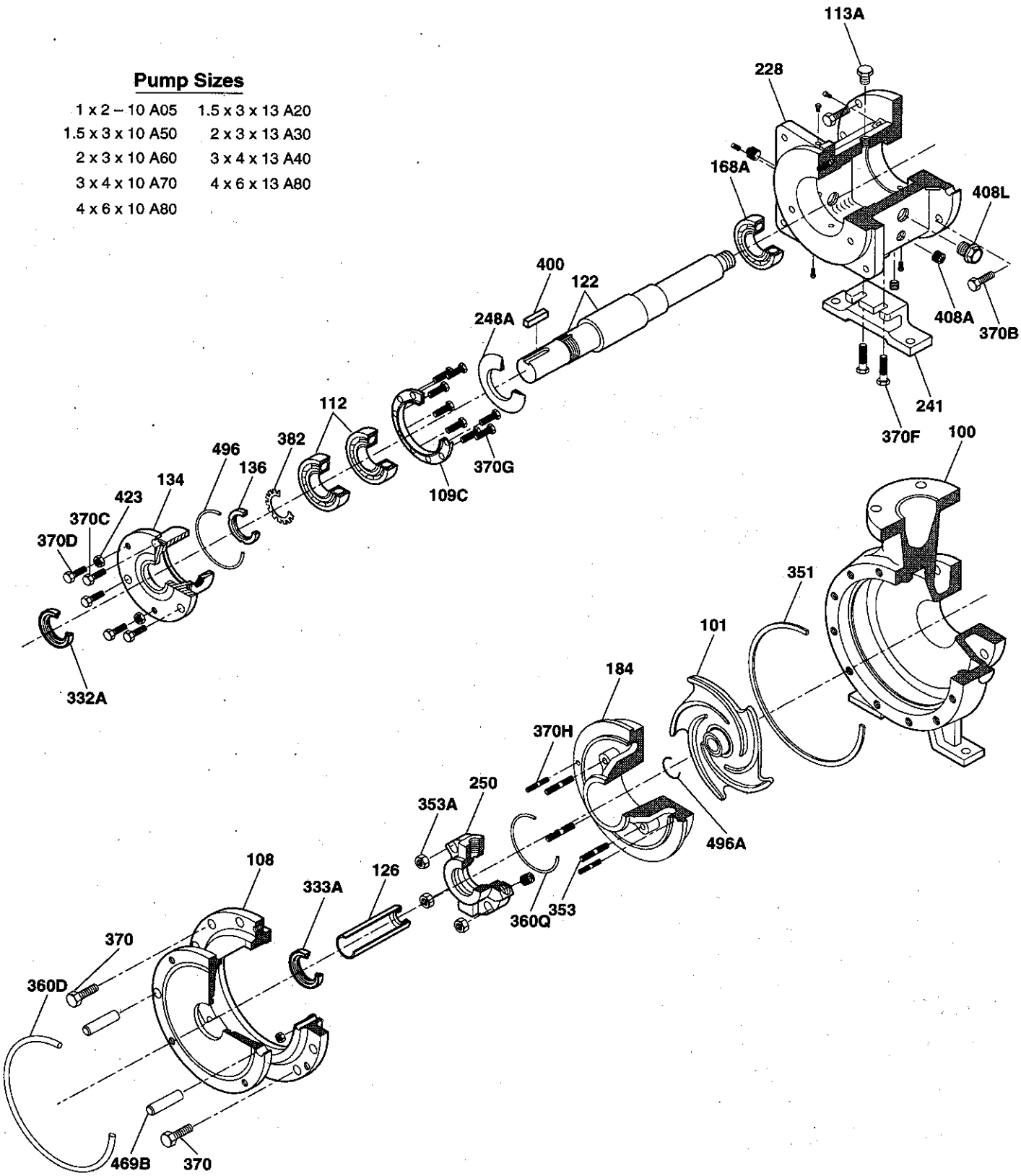
2 x 3 – 6 A10	3 x 4 – 10 A70
2 x 3 – 8 A60	4 x 6 – 10 A80
3 x 4 – 8 A70	1½ x 3 – 13 A20
3 x 4 – 8G A70	2 x 3 – 13 A30
1 x 2 – 10 A05	3 x 4 – 13 A40
1½ x 3 – 10 A50	4 x 6 – 13 A80
2 x 3 – 10 A60	



LTP Exploded Isometric View

Pump Sizes

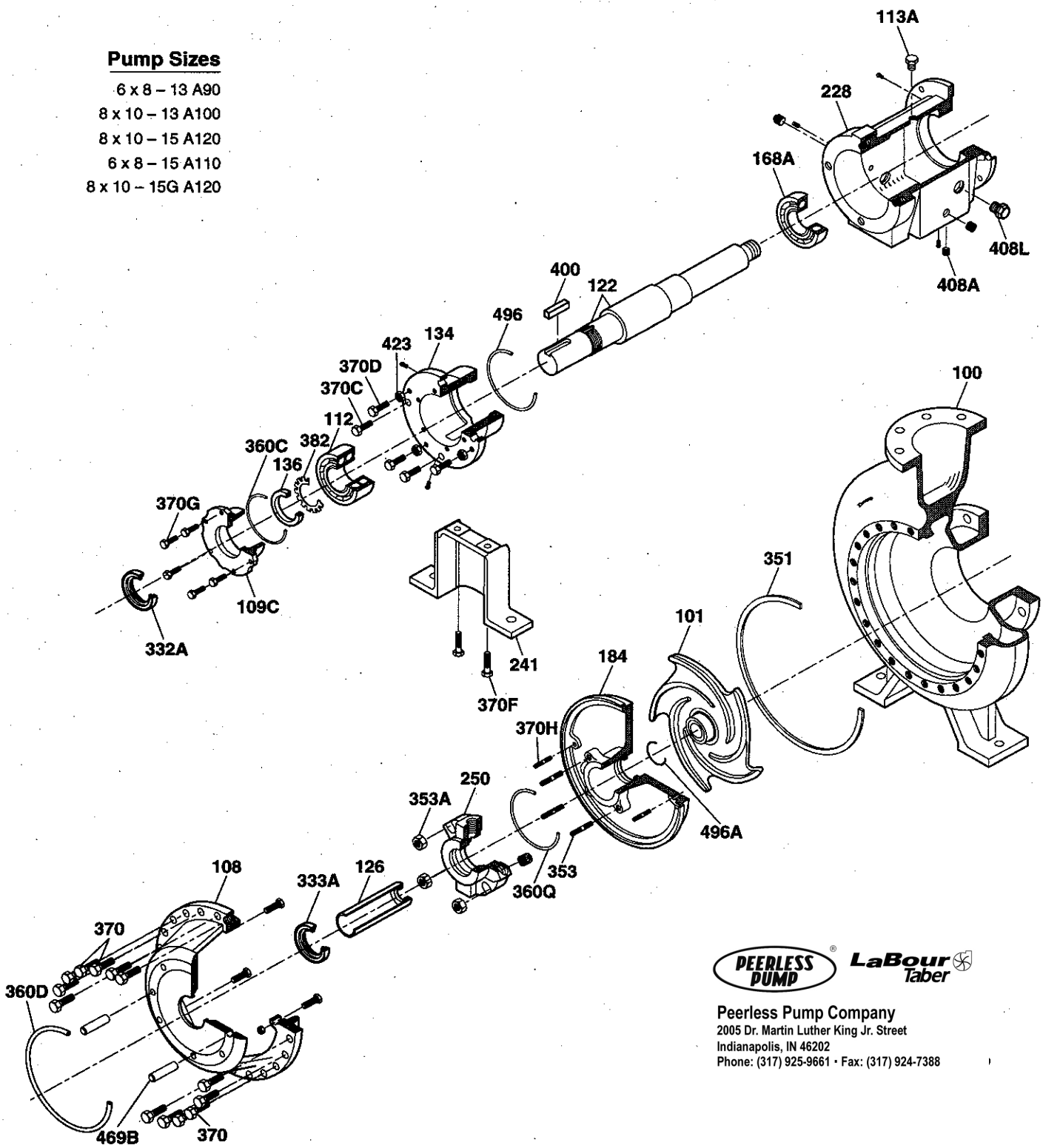
1 x 2 – 10 A05	1.5 x 3 x 13 A20
1.5 x 3 x 10 A50	2 x 3 x 13 A30
2 x 3 x 10 A60	3 x 4 x 13 A40
3 x 4 x 10 A70	4 x 6 x 13 A80
4 x 6 x 10 A80	



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



PEERLESS PUMP® LaBour Taber

Peerless Pump Company
2005 Dr. Martin Luther King Jr. Street
Indianapolis, IN 46202
Phone: (317) 925-9661 • Fax: (317) 924-7388