

SERIES 8796 INSTALLATION, OPERATION, AND MAINTENANCE MANUAL SELF-PRIMING PROCESS PUMP

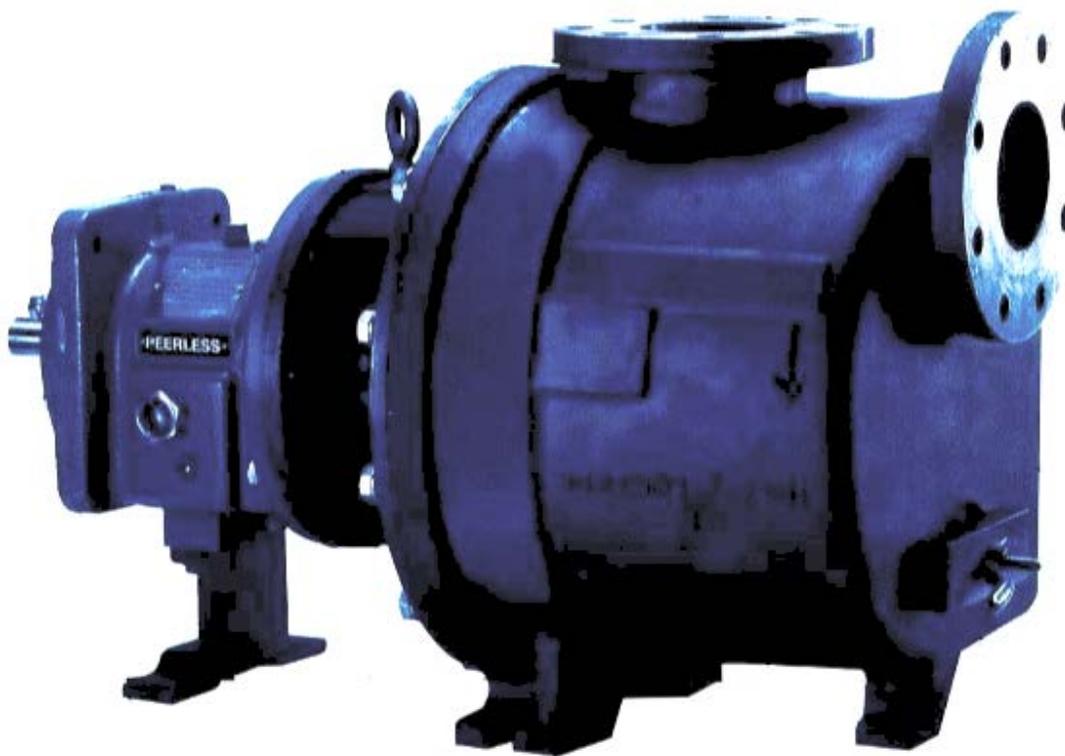


TABLE OF CONTENTS

SECTION I	GENERAL	Page
I	General and Warranty	3
I-A	Introduction and Importance of Instructions	4
I-B	Special Warnings	4
I-C	Receiving Inspection-Shortages	4
I-D	Preservation and Storage	4
I-E	Handling Techniques	5
SECTION II	INSTALLATION	
II-A	Location	5
II-B, C	Foundations and Foundation Bolts	5
II-D	Mounting, Leveling and Grouting of Base Plate	6
II-E, F, G, H	Alignment	6
II-I	Grouting	9
II-J, K, L	Piping	10
II-M, N, O	Drivers	11
II-P, Q	Doweling	12
II-R, S, T	Falk, T. B. Wood 's, Rexnord Coupling Instructions	13
II-U	Stuffing Box	19
SECTION III	OPERATION	
III-A	Startup	19
III-B	Operation Checks	20
III-C	Shutdown Procedure	20
SECTION IV	PREVENTIVE AND CORRECTIVE MAINTENANCE	
IV-A	Lubrication	20
IV-B	Stuffing	21
IV-C	Vibration	21
IV-D	Alignment-	21
IV-E	Performance,	21
SECTION V	DISASSEMBLY AND REASSEMBLY	
V-A	Disassembly	21
V-B	Inspection and Parts Replacement Guidelines	22
V-C	Re-assembly procedures	23
V-D	Additional; Details	25
V-E	Parts List with Materials of Construction	26
V-F	Cross Sectional Drawing	27
SECTION VI	PUMP SIZE COMPARISON CHART	28
SECTION VII	TROUBLE SHOOTING	28
SECTION VIII	ORDERING SPARE PARTS	
VIII-A	Spare Parts ..,	29"
VIII-B	Instructions for Ordering Spare Parts, Notice	30
VIII-C	Pressure/Temperature Rating Limits	31

SECTION I-GENERAL

Read this entire Book

before attempting to install, operate or repair this pump. Properly installed, your Peerless Pump will give you satisfactory, dependable service. We urge that you carefully read these step-by-step instructions to simplify 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 Peerless Pump Company. 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; 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 if 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 per shipping terms INCOTERM 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.

• SECTION I-Continued

Introduction

This instruction manual: is intended to assist those involved with the installation, operation and maintenance of Peerless Pump, Company Series 8796 Self Priming 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 Peerless Pumps 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: Study thoroughly Sections I, II, III and carefully follow the instructions for installation. Sections IV, V, VI, VII, and VIII have answers to trouble and maintenance questions. Keep this instruction manual handy for reference. Further information can be obtained by contacting the local authorized Peerless Pump distributor or the Peerless Pump factory.

I-B. Special Warnings

Peerless Pump Company 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 Peerless Pump Company. For Pressure/Temperature limitations see page 29.

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

Peerless Pump Company'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 jobsite, and for a short period between installation and start-up. If the pump is to be idle and 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 Peerless Pump Company 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-pull-out assembly for maintenance and inspection. An assembled pump should be hoisted using a sling under suction flange and under rear of bearing frame. Bedplate mounted units should be hoisted using slings under base plate below both pump and driver,

SECTION II 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 on its operating curve. Ask your Peerless Pump Company 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 using 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 3/4 to 1-1/2 inches. Roughen top surface to provide a good bond of the grout. Ordinarily, the proportions used are 1 part cement to 3 parts sand and 4 parts medium aggregate.

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 3/4 inches to 1-1/2 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.

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.*

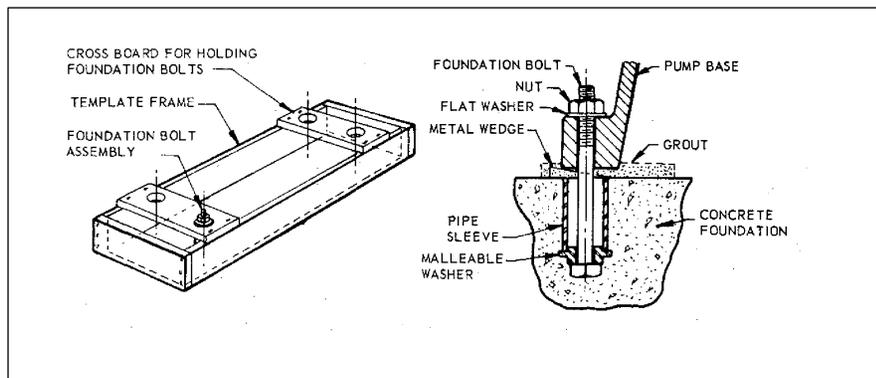


FIGURE 1. FOUNDATION BOLT LOCATION AND ANCHORAGE

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

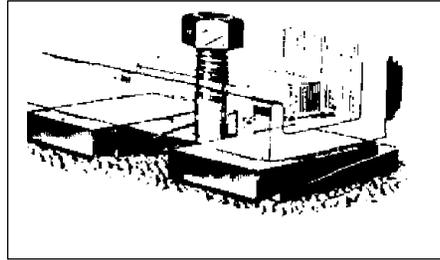


FIGURE 2. ADJUSTING WEDGES FOR MOUNTING

Factors that may change the alignment of the pumping unit are: (a)

- Setting 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 foundation

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 Table 1 for Falk (page 14), Table 3 for Wood's (page 15) or refer to "Allowable Shaft Engagements" for Rexnord (page 16).
- (c) Test for parallel and angular alignment with a straight edge and feeler gauge as shown in manufacturer's instructions in Section II-Q, R, S. 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.
- (d) An alternate 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

tum) does not exceed limits shown on either a tag or decal on the unit or on the unit outline drawing.

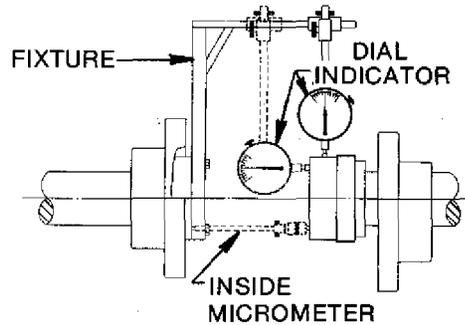


FIGURE 3. TESTING ALIGNMENT, DIAL INDICATOR

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-N while coupling halves are disconnected.

II-G Alignment Adjustment

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 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

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) A recommended mix of grout that is satisfactory for most applications is as follows:
 - (1) One part of normal Portland cement (94 lb.)
 - (2) One part of Embecco cement (100 lb.)
 - (3) One part coarse clean sand (100 lb.)
 - (4) Approximately 5 gallons of water
 - (5) If the thickness of the grout must be above approximately 2 inches, add 1-1/2 parts of 1/4-inch pea gravel (1-1/2 cubic feet) and an additional 1/2 gallon of water to the mixture.
- (d) Pour the grout through the holes provided in the base plate or through open ends of steel channel base plates. While pouring, tamp liberally to fill all cavities and prevent air pockets.

NOTE

In pouring and tamping, the grout will trap air in some places, temporarily place small diameter tubes (thick-walled rubber hose) to provide venting. Remove the tubes after grout has filled the cavity

before pouring the remainder.

(e) After the grout has thoroughly hardened, tighten the foundation bolts and connect the piping.

BE CERTAIN PIPING DOES NOT STRAIN PUMP.

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

(g) Connect the coupling halves.

(h) Approximately fourteen days after the grout has been poured or when the grout has thoroughly dried, apply an oil base paint to the exposed edges of the grout to prevent air and moisture from encountering the grout.

II-J, PIPING

The suction and discharge piping should be arranged for the simplest, most direct layout, be of sufficient size and be internally free of foreign material. The piping must never be pulled into position by the flange bolts. It must be independently supported and arranged so that expansion and contraction, due to temperature changes, will not cause misalignment. If the installation requires a low noise level of operation, the suction and discharge piping of the system should be connected to the pump suction and discharge flanges with rubber flexible connectors.

When it is necessary to locate the pump away from the source of supply rather than directly over it, extreme care must be exercised in the design and installation of the suction pipe. A horizontal suction line should have a gradual rise to the pump. Any high point in the suction line will become filled with air and thus prevent proper operation of the pump. A straight lateral reducer must not be used in a horizontal suction line. An eccentric reducer must be used instead. If an air pocket remains in the suction pipe when the pump has been primed and started, it is likely that the entrapped air will be drawn into the pump and may cause the pump to lose its prime. Priming time will be severely affected by long suction lines.

Note: It is very important to support and restrain both the suction and discharge pipes near the pump to avoid application of 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-K, Suction Piping

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

(a) Suction lines, when operating under suction lift, must be kept free from air leaks. (b) The suction pipe, should be the same diameter as the pump suction nozzle. Larger diameter pipe will prolong priming time. To prevent eddies and vortices, the end of the suction pipe must be at least two pipe diameters below the free liquid surface. If a foot valve is used to facilitate priming, the foot valve must have a minimum flow area 1-1/2 times the area of the suction pipe. The suction at all points should not contain loops or high spots in which air can be trapped.

(c) A strainer should be installed in the suction line. The screen must be checked and cleaned periodically. The openings in the screen must be smaller than the sphere size allowed for the impeller.

(d) A pump operating under suction lift should never use a gate or globe valve in the suction line.

- (e) The suction piping size may be equal to, but never less than the suction nozzle size. (f) Available NPSH must be greater than the NPSH requirement of the pump.
- (g) *Piping should be cleaned mechanically and chemically, and flushed prior to installing the pump. A large number of pump packing, mechanical seal and seizure troubles are due to improperly cleaned systems.*
- (h) The pump should also be inspected internally for foreign matter that may have entered the pump.

II - L. Discharge Piping

- (a) Siphoning - Do not terminate the discharge line at a level lower than that of the suction source, otherwise a siphoning could occur. This siphoning effect could cause damage to the pump. If it is necessary to terminate the discharge line at a lower level than the source of supply, then the discharge piping must include a siphon breaker.
- (b) Bypass Lines - When a self-priming pump is operating during its priming cycle, it must evacuate the air from the suction pipe and discharge it to the atmosphere. A pump installation with an open discharge facilitates this easily. However, discharge piping systems that incorporate check valves require an air bleed/bypass line. The air bleed/bypass line must be installed at the highest elevation between the pump discharge flange and the discharge check valve to allow the air in the suction line to vent to the atmosphere. The line should be the same diameter as the discharge line and the line should include a combination air release/vacuum valve. The valve will open during the priming cycle and close automatically when the pump reaches full prime to prevent continual bypass of flow. The outlet of the air bleed/bypass line should terminate in the wet well or sump and be open to atmosphere.

II-M. Driver

When the driver of the pumping unit is to be mounted in the field on a base plate furnished by Peerless Pump Company, the driver bolt holes for some models must be added as follows: Set the base plate with the pump on the foundation and level the unit as in Section II-D. Set the driver on the base plate, and align the coupling halves as described in Section II-F for parallel angular alignment. Mark the driver bolt holes. Remove the driver and drill and tap the base plate for the driver bolts. Set the driver on the base plate and align completely.

II-N. Engine Driven Units

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

- (a) Be well ventilated to keep the ambient temperature as low as possible. Taking 60⁰ F. as a datum point, every 10⁰ 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-O. 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 inter-changing 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-P. Doweling

To comply with Hydraulic Institute recommendations, all pumps should be doweled. Pump feet can be drilled for dowels at the factory or in the field. Bases or risers are not drilled at the factory. Doweling the pump accomplishes the following:

- (a) Prevents lateral movement.
- (b) Eases realignment if the pump is removed from the base.
- (c) Temporarily holds the pump should the hold down bolts loosen.

II-Q. Dowel Installation

We recommend installation of straight dowel pins as shown in Figure 5 as follows:

- (a) Check the coupling alignment after the unit has been in operation approximately one week. Correct if necessary (refer to Sections II-G and II-H).
- (b) Through opposite pump feet, drill through the riser (if used) and into the base (when necessary), holes of the same diameter (1/64 inch less than dowel pin) as in the feet to the proper depth for the pins (see Figure 5). Clean out the chips.
- (c) Ream the holes in the pump feet and base to the proper diameter for the pins (light push fit). Clean out the chips.
- (d) Install a spare nut (or cap) on the pins to prevent damaging the threads. Insert pins to a depth which leaves sufficient thread to attach nut.
- (e) Attach nuts and tighten - do not pull dowel.
- (t) If the pump was not drilled at the factory for dowels, use the following to determine dowel pin diameter. Measure the mounting bolt hole diameter in the pump foot. Dowel Diameter = Pump foot bolt hole diameter minus 3/8 ".

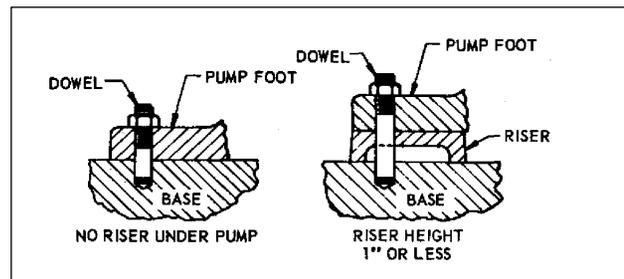
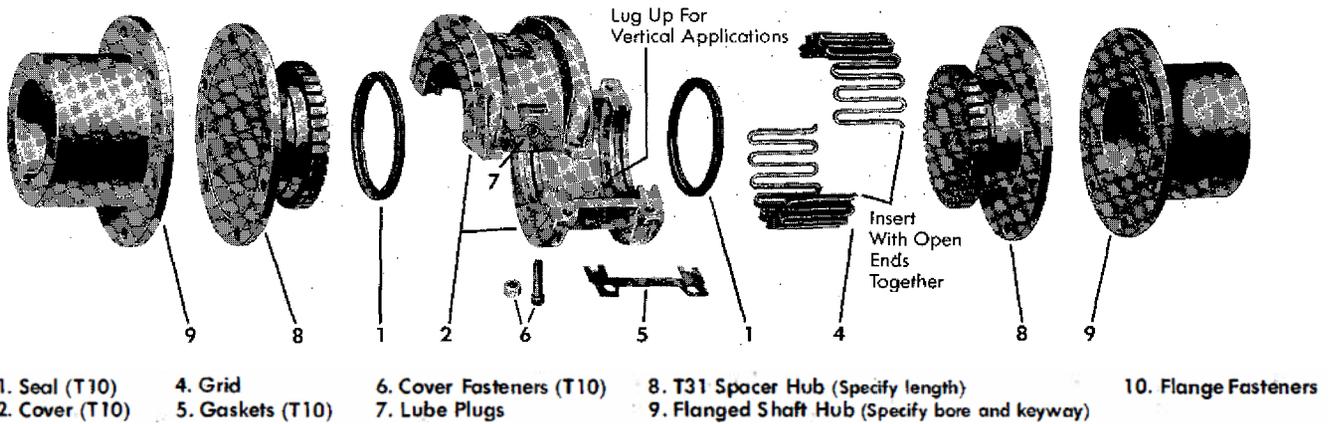


FIGURE 4. DOWELING METHODS

II-R, Installation Falk SteelFlex® Spacer Couplings 4.

6.



INTRODUCTION -This manual applies to Sizes 20 thru 140T31 and 1020 thru 1140T31 Folk Steelflex Tapered Grid Spacer Couplings. Unless otherwise stated, information for Sizes 1 020 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 140TIO 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 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.

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.

LUBRICANT 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 Point - 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 possible 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 Folk 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 on 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

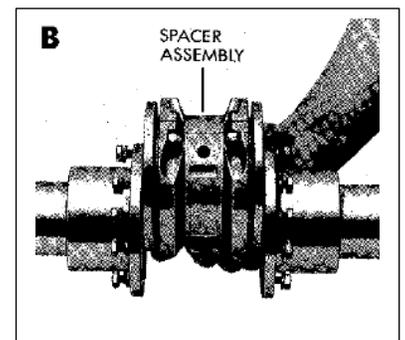
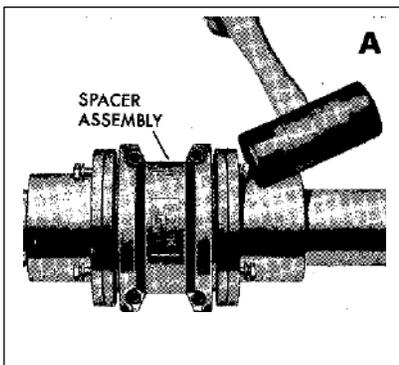
(See Limited End Float "Caution")

A REMOVE SPACER ASSEMBLY

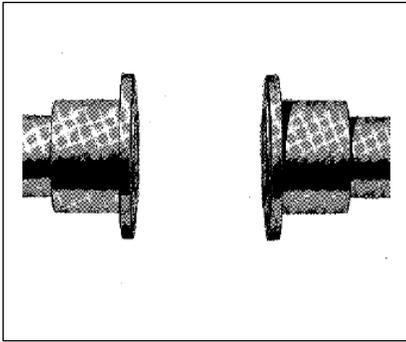
Remove pipe plugs and all but two fasteners opposite each other in each hub. Loosen these about one-quarter inch and tap them with a mallet to disengage Steelflex Spacer from the shaft hubs. Remove fasteners and Spacer.

B INSERT SPACER ASSEMBLY

Insert fasteners as shown - 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.

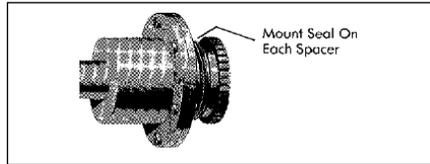


INSTALLATION OF DISASSEMBLED TYPE T31 STEELFLEX SPACER COUPLINGS



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.

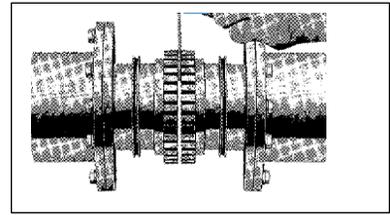


FLANGE FASTENER TIGHTENING TORQUES

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

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.

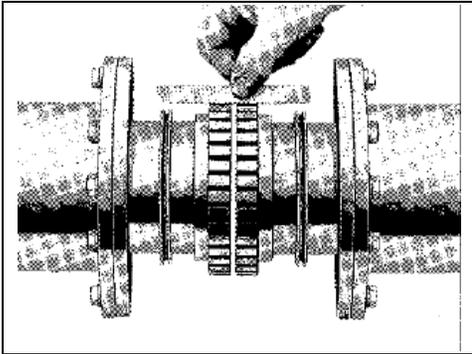


REQUIRED GAP

SIZE	GAP
1020- 1090188 "
1100-1110250"
1120-1140375"

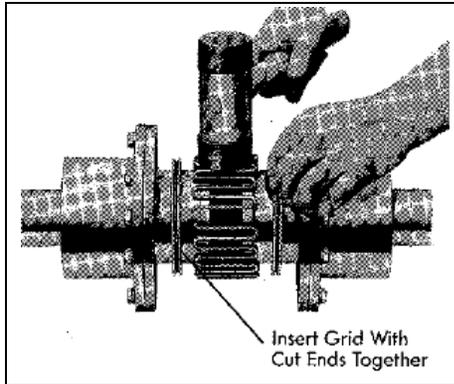
3 GAP AND ANGULAR ALIGNMENT

Use a spacer bar equal in thickness to the gap as specified. Insert bar, as shown above, 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

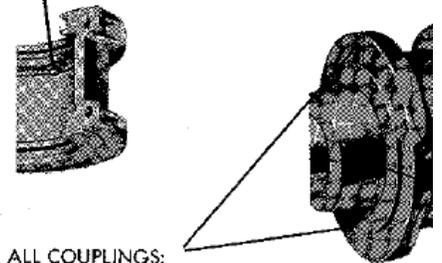
Align so that a straight edge rests squarely (or within the limits specified in Table 1) on both hubs as shown above and at 90° intervals. Check with feelers. The clearance must not exceed the; OFFSET limit specified in Table 1. Tighten all foundation fasteners and repeat Steps 3 and 4. Realign coupling 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.

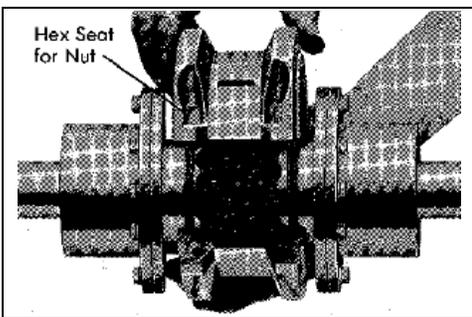
VERTICAL COUPLINGS:
Match marks and lugs up.



ALL COUPLINGS:
Match marks on same side.

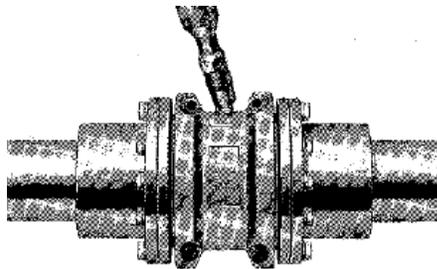
6 COVER MATCH MARKS

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 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 hell 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 lubricate 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 Alignment Limits—Inches		Lube Wt (lb)	Cover Fastener 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

Align couplings within "Operating Alignment Limits" specified above. Exceeding these limits reduces coupling life.

II-S. Installation Wood's Sure-Flex® Spacer Couplings

Sure-Flex flanges (outer metallic parts) and sleeves (inner elastomeric 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.)



- 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	TYPES	TYPE SC	
	2 Set Screws at 90 °	2 setscrews at 90 °	4 Hex Head Cap Screws Flange to Hub	1 Set Screw over Keyway In Hub
3	3			
4	3		5.5"	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	155
14		100	150	165
16	...	100	150	165

Coupling size is marked on flanges.

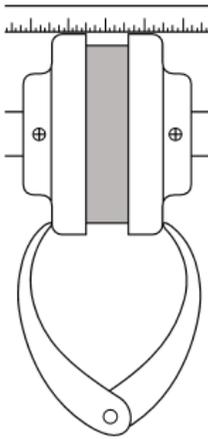
- Inspect all coupling components and remove any protective coatings or lubricants from bores, mating surfaces and fasteners. Remove any existing burrs, etc. from the shaft.
- Slide one coupling flange onto each shaft, using snug fitting keys.
- Position the flanges on the shafts so that each shaft extends 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.

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

(Continued next page)

SURE-FLEX COUPLINGS, continued

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

- Using a torque wrench, tighten set screws to values in Table 2.

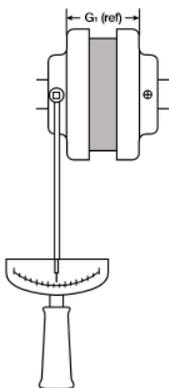


TABLE 3 - MAXIMUM ALLOWABLE MISALIGNMENT
(Dimensions in inches)

SLEEVE SIZE	G DIMENSION	TYPES JES, JNS, E & N		TYPEH&HS	
		PARALLEL	ANGULAR	PARALLEL	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	-	-

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.

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

Caution: Coupling sleeves may be thrown from the assembly when subjected to a severe shock load.

Table 2 - Fastener Torque Values

Size	Type J		Type S		Type SC*				Type B		Type C			
	Set Screws		Set Screws		Cap Screws Flg-Hub		Set Screws		Cap Screws		Clamping Screws		Set Screws	
	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm	ft-lbs	Nm
3	3	4	-	-	-	-	-	-	-	-	-	-	-	-
4	3	4	-	-	5.5**	8**	7	10	-	-	-	-	-	-
5	7	10	7	10	4	6	13	18	-	-	-	-	-	-
6	13	18	13	18	9	12	13	18	5	7	15	21	13	18
7	-	-	13	18	9	12	13	18	5	7	30	41	13	18
8	-	-	23	31	18	24	23	31	9	12	55	75	13	18
9	-	-	23	31	31	42	23	31	9	12	55	75	13	18
10	-	-	23	31	50	68	50	68	15	20	100	136	13	18
11	-	-	23	31	75	102	50	68	30	41	100	136	13	18
12	-	-	50	68	150	203	100	136	60	81	200	271	13	18
13	-	-	100	136	150	203	165	226	75	102	-	-	-	-
14	-	-	100	136	150	203	165	226	75	102	-	-	-	-
16	-	-	100	136	-	-	-	-	135	183	-	-	-	-

* Torque values apply to hub size when different than flange size
** Values for socket head clamping screw

Reprinted with permission of T. B. Wood's Sons Co.

II- T 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 in compliance with OSHA standards for the speeds and applications in which they are used. It is the responsibility of the user to provide proper guarding.

Failure to secure caps crews 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

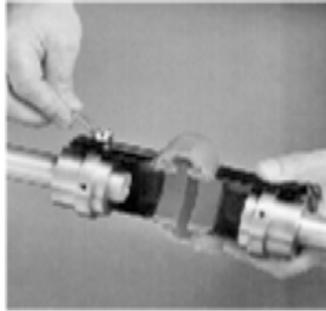
It is the responsibility of the user to consider the coupling's stiffness (available from Rexnord) as it relates to the drive system frequency.

STEP 1



Inspect both driving and driven shafts and hub bores making sure they are free from dirt and burrs. Be sure they 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 cap screws. The elastomer element will space the other hub. It is important to have cap screw properly tightened. See Table 1 below for recommended cap screw torques and instructions. Now secure the other hub to the shaft.

HELPFUL HINT:

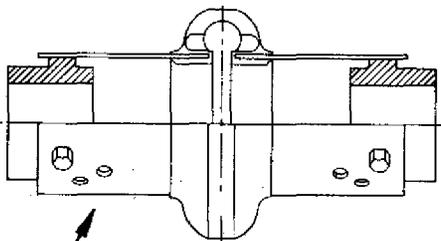
If the cap screw holes in the element do not line up properly with the hubs due to equipment misalignment, rotate the shafts (if possible) slightly as you install each cap screw. On larger coupling sizes, first install the cap screws that are in the center of the half element.

STEP 3

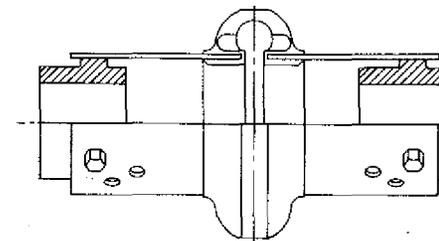


Mount other half of the elastomer element to hubs. Be sure to secure rings to the spacer element if provided. Tighten all cap screws to the recommended cap screw torques in Table 1 and you're done!

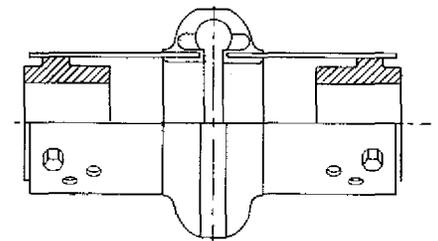
Spacer coupling installation is shown; the same procedure applies for the standard design coupling.



Standard Method
Both hubs mounted outward.



Optional Method
One hub mounted inward; one hub mounted outward.

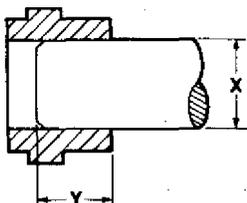


Optional Method
Both hubs mounted inward.

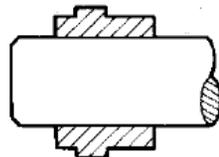
Additional mounting positions are possible with the optional assembly holes on the spacer element. Select the combination which most closely matches the dimension desired between shaft ends.

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

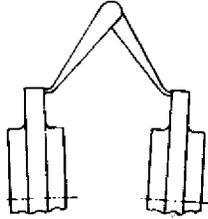
RECOMMENDED CAPSCREW TORQUES FOR PROPER INSTALLATION	CPLG SIZE	TORQUE-DRY		
		IN. LBS.	FT. LBS.	Nm
- IMPORTANT - Cap screws have self-locking patches which should <i>not</i> be reused	2	204	17	23
	3			
	4			
	5			
	10			
more than twice.	20	360	30	40
	30			
Caps crews can be further used with application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

EQUIPMENT ALIGNMENT

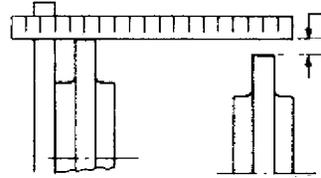
Coupling alignment is directly related to equipment and coupling life.

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 cap screws to the values shown in Table 1 as described on the reverse side.
5. If practical, recheck and tighten cap screws after several hours of operation.



ADJUST FOR ANGULAR MISALIGNMENT



ADJUST FOR PARALLEL OFFSET

PARALLEL OFFSET

DIMENSIONS AND PART NUMBERS

Coupling Part Numbers

FLEXIBLE ELEMENT			CAPS CREWS'						
Size	Spacer	Standard	Carbon Stainless		Size-In	Metric Part Number	Size-MM	Quantity	
			Steel	Steel					
2	00075	00005	00910	00938	1/4-20 x 3/8	01410	M6-1x10	8+8**	
3	00080	00010	00912	00940	1/4-20 x 112	01420	M6-1 x 12	8+8**	
4	00085	00015	00918	00946		01450		M10-1.5 x 16	8+8**
5	00090	00020							8+8**
10	00095	00025							12+8**
20	00100	00030	00920	00948	3/8-16 x 5/8	01460	12		
30	00105	00035	00924	00952		01480	12		
40	00110	00040					16		
50	00115	00045					16		
60	00120	00050					00928	00956	01500
70	00125	00055	1/2-13 x 7/8				16		
80	00130	00080					16		
100		00065					00934	00965	01530
120		00070	00938	00967	3/4-10 x 1-1/2	01540		24	
140		00071	85753	85702	1.0-8 x 1-1/2	01545	M24-3.0 x 40	32	

Hubs*

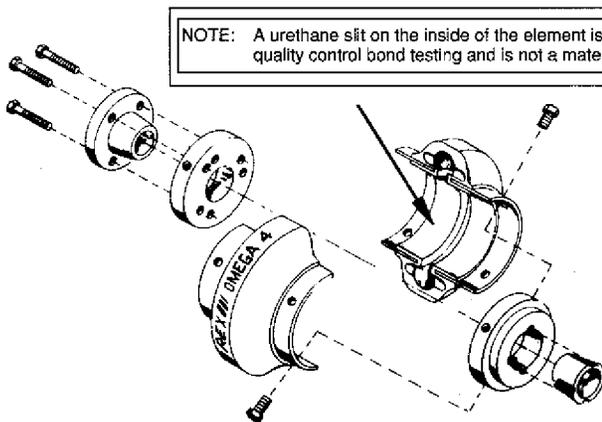
Size	Rough Bore		Stock Bore (Part & Ranges)		Taper-Lock Hubs		Taper-Lock Bushing +	O.D. Hubs	O.D.	Standard Sleeve E
	STD ++	Steel	STD ++	Steel	Iron	Steel				
2	00215	69822	00220-00235							
3	00240	69823	00245-00265							
4	00270	69824	00275 (0300)			00800	00730	1008	00860	JA
5	00305	69825	00310-00335			00805	00745	1108	00865	SH
10	00340	69826	00345-00370			00810	00750	1310	00870	SDS
20	00650	00375	00651-00659	00380-00400		00815	00755	1610	00875	SK
30	00660	00405	00661-00668	00408-00425		00820	00760	2012	00880	SF
40	00670	00430	00669-00679	00431-00455		00625	00765	2517	00865	E
50	00680	00460	00681-00686	00461-00470		00830	00770	2517	00890	E
60	00690	00475	00692-00698	00480-00495		00835	00775	3020	00895	F
70	00700	00500				00840	00780	3535	00900	J
80	00710	00525				00845	00785	4040	00905	M
100	00720	00550				00850		4545		M
120	00725	00575				00855		5050		N
140	00727	00580				00857		7060	00908"	P

Cap screws have self-locking patches which should not be lubricated or reused more than twice.
Extra cap screws provided for spacer couplings with rings.

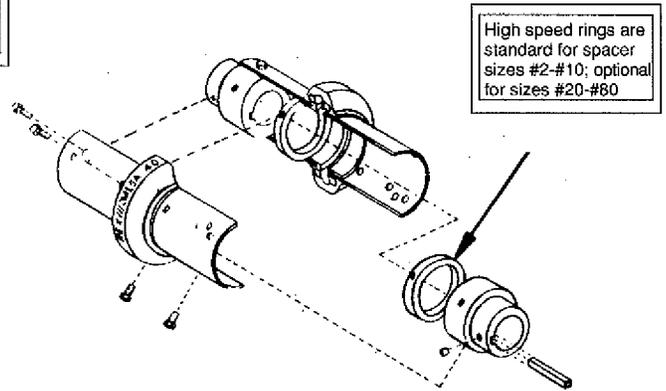
- * Hubs are interchangeable for both the spacer and the standard coupling.
- ** Consult Factory
- *** Iron
- + Not supplied by Rexnord.
- ++ Standard hub material specifications: High strength sintered steel (Sizes #2 - #10), and Cast iron (Sizes #20 and above).

REX OMEGA STANDARD COUPLING

REX OMEGA SPACER COUPLING



NOTE: A urethane slit on the inside of the element is the result of our quality control bond testing and is not a material defect.



High speed rings are standard for spacer sizes #2-#10; optional for sizes #20-#80

NOTE: Omega hubs are interchangeable with either standard or spacer flex elements: i.e., taper bushed hubs can be used with spacer elements and finished straight bore hubs can be used with standard elements.

ELEMENT REPLACEMENT: If element replacement is required, it is important to change both half elements, never replace just one half element. This is important because the element stiffness properties may change over time, and elements are packaged in weight matched pairs for better balance on high speed applications.

II-U, 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 be piped into the lantern ring connection, also (refer to packing recommendations).

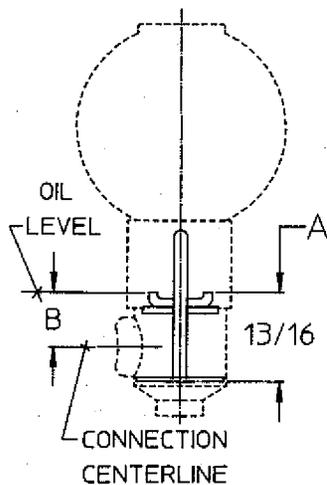
2. Mechanical Seals: When mechanical seals are supplied, they are installed and adjusted at the factory. They must not run dry or in abrasives. Connect recirculation, flush and/or cooling lines as required, following instructions on the seal print supplied for the unit.

SECTION III-OPERATION

III-A. Startup

1. Check List

a. Lubrication- Pump bearings are normally oil lubricated. **(THE BEARINGS ARE NOT LUBRICATED AT THE FACTORY.)** These pumps are supplied with an oiler which maintains a constant oil level in the bearing frame. Locate oiler as shown on the outline drawings supplied for the unit. For correct adjustment of oiler see Fig. 6



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
ST, MT, LT	# 3 (4 Ounce)	13/16"	1/2"
XLT	# 5 (8 Ounce)	13/16"	1/2"

FIGURE 6. OIL LUBRICATED BEARINGS

b. Oil- A high quality turbine type oil with rust and oxidation inhibitors should be used. Under normal operating conditions, an oil of 300 SSU viscosity at 100⁰ F. (approximately SAE 20) should be used. Fill oiler bottle and replace in oiler housing. Repeat until oil remains visible in bottle. Do not add oil through the vent or breather. Optional grease lubricated bearings are lubricated at the factory and need lubrication only after 2,000 hours of operation, or every 3 months, whichever occurs first. On pumps supplied with greased-for-life bearings, no additional lubrication is required for the life of the bearing.

c. Free Rotation- Rotate shaft by hand to make sure it is free. Drag from packing or seal is normal, but if pump cannot be rotated by hand or binding or rubbing is noticed, correct before starting pump.

2. Priming

When the pump is first put in operation, it should be primed with the pumped liquid through the 1-1/2 inch (1 inch on STP) priming connection. Fill until liquid is level with the inside of the suction pipe. On subsequent starts, enough liquid is retained in the casing to allow repriming. During the priming cycle, a self-priming pump does not develop full pressure. **When priming against pressure, such as in a system with a check valve, it will be necessary to vent air with an air vent valve or continuous bleed line connected to the top of the discharge piping between discharge flange and check valve.**

During the priming cycle, the stuffing box will normally be below atmospheric pressure. On pumps supplied with conventional stuffing box packing, air may be drawn into casing and interfere with priming. Sealing by use of liquid from an outside source, or by use of a grease lubricator is recommended.

3. Startup

a. Valves - be sure suction valve is fully open. Normally, discharge valve should be at least partially closed for flow control.

b. Rotation Check - if not already done, uncouple the unit and jog the motor to check for proper rotation (refer to Section II-N).

III-B. Operation Checks - Inspect pump carefully and frequently during the first few hours of operation. If packing runs hot, shut pump down, allow box to cool, loosen gland if necessary. (Do not loosen gland until packing has cooled.) Mechanical seal may weep slightly, but should be "run-in" in a few hours. Be sure all auxiliary lines (cooling, flushing, sealing, etc.) are functioning properly. Check pump bearings for excessive heating. Check complete unit for excessive vibration and unusual noises. Do not run pump at greatly reduced flow because damage can result.

III-C. Shutdown Procedure - Back flow through the pump will cause reverse rotation. If back flow is excessive, and there is a possibility of the pump being turned on during this period of reverse rotation, then Precautions should be taken to prevent the back flow. This can be done by installing a check valve in the discharge line, or by closing a discharge valve immediately prior to shutting down the pump. **NOTE: IT IS NOT RECOMMENDED THAT THE PUMP RUN LONGER THAN ABSOLUTELY NECESSARY AGAINST A CLOSED DISCHARGE VALVE.**

SECTION IV - PREVENTIVE AND CORRECTIVE MAINTENANCE

IV-A. Lubrication

Oil lubricated units require only that oil be visible in reservoir or the oiler. Grease lubricated units should be regreased at startup and every 2,000 hours or 3 month intervals, whichever occurs first. Use a sodium or lithium grease and fill until grease comes out grease relief fittings. Follow motor and coupling manufacturers' lubrication instructions.

IV-B. Stuffing Box

1. Packing Type Stuffing Box: Periodically inspect stuffing box to see that there is sufficient leakage to lubricate the packing and maintain a cool box. Never restrict the leakage from the packing as this will cause damage to both packing and shaft sleeve. Draw up gland nuts slowly and evenly and only while pump is running. After pump has been in operation for some time and the packing has been completely "run-in", a leakage of 40 to 60 drops per minute of the liquid should be allowed to flow from the stuffing box at all times for cooling and lubricating the packing and shaft sleeve.

2. Mechanical Seal Type Stuffing Boxes: This type of box requires no attention other than to make sure that the circulating lines do not become clogged.

IV-C. Vibration

It is a good practice to periodically monitor vibration of the pump. Normally, the vibration level will be well within accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Trouble Shooting, Section VII.

IV-D. Alignment-Final. Alignment should be checked after unit has reached operating temperature, following startup. Repeat alignment procedures outlined in Section II-F. Check alignment again after one week of operation.

IV-E. Performance

If performance or priming capability deteriorates, refer to Trouble Shooting, Section VII.

SECTION V-DISASSEMBLY AND RE-ASSEMBLY

V-A. Disassembly

1. Prepare pump for disassembly as follows:

- a. Lock out power supply to motor.
- b. Shut off valves controlling flow to and from pump.
- c. Flush pump of all corrosive or toxic liquid, if required.
Remove all auxiliary tubing and piping.
- d. Disconnect coupling and remove coupling spacer.
- e. Drain oil.
- g. On units with packed stuffing box, unbolt and remove split gland (107).

2. Disassemble pump as follows:

- a. place sling from hoist through eyebolt (132). On ST units, place sling through frame (228A) above shaft (122).
- b. Remove frame foot hold down bolts.
- c. Remove bolts (370) holding frame (228A) or frame adapter (108) to casing (100).
- d. Slide back pull-out assembly from casing, using jacking bolts (418) provided.
- e. Remove casing gasket (351)
- f. Unscrew impeller (101) from shaft (122). The threads are right hand. Remove O-ring (412A). which seals between the impeller and shaft or sleeve.
- g. (1) On units with outside mechanical seal, remove gland stud nuts (355) and carefully slide gland

toward bearing frame (228A)

(2) On units with inside mechanical seal, loosen set screws holding rotary portion of seal to shaft and slide seal toward bearing frame (228A). remove gland stud nuts and carefully slide off studs.

- h. Remove stud nuts (370H) which hold stuffing box cover (184) to frame adapter. Pull stuffing box cover from frame or adapter. Slide sleeve (if any) off shaft.
- i. On units with mechanical seal, loosen set screws holding rotary portion of seal to shaft, and carefully slide seal and gland assembly off shaft. On units having a shaft sleeve, it is not necessary to remove rotary portion of seal from sleeve unless replacement of seal is required.
- j. Slide deflector (if any) (123) off shaft
- k. Scribe shaft at coupling hub for proper positioning of hub during re-assembly and remove hub.
- l. Remove bearing housing bolts (370C). Using impeller adjustment bolts (370D) for jacking, remove shaft and bearing assembly from frame. This will include the shaft, both bearings (112A) and (168A), and bearing housing (134A). Do not lose or damage O-ring (496).
- m. Remove inboard bearing (168A) using a bearing puller. **Never use a hammer to drive shaft through bearing!** Protect bearing from contamination.
- n. Remove bearing housing retaining ring (361A) and slide bearing housing off ball bearing. Do not damage oil seal (332A).
- o. Straighten tang in lock washer and remove bearing locknut (136) and lock washer. Remove ball bearing (112A) using a bearing puller. Protect bearing from contamination.
- p. On units with stuffing boxes, remove Lantern ring (105) and packing rings (106) from stuffing box cover (184).

V-B. Inspection and Parts Replacement Guidelines

1. **Caseing**-Check for sediment in priming chamber.

2. **Impeller**-Replace if it shows excessive erosion, corrosion, extreme wear, or vane breakage. Replace impeller O-ring. O-ring groove and impeller hub must be in good condition. Check impeller balance if possible. Reduction in hydraulic performance and reduced mechanical seal, packing or thrust bearing life may be caused by excessive impeller wear. If a larger diameter impeller than originally furnished is required, this may be done by re machining the inner volute to remove the part of the cutwater necessary to accommodate the larger diameter impeller. There should be a .015" clearance between impeller vane tips and the volute cutwater. ***Note: If a smaller diameter impeller is to be used than what was originally furnished, a new inner volute must also be installed, otherwise the self-priming characteristics will be adversely affected.***

3. **Shaft-Check** for runout (.005" max.) to see that shaft has not been bent. On pumps without shaft sleeves, shaft surface in stuffing box area must be smooth and free of grooves. Bearing seats and oil seal area must be smooth and free of scratches or grooves. Shaft threads must be in good condition. Metalize or replace shaft if necessary.

4. **Shaft Sleeve**-Sleeve surface in stuffing box must be smooth. If grooved, replace.

5. **Mechanical Seal**-Seal faces, gaskets, and shaft sealing members must be in perfect condition or leakage may result. Replace worn or damaged parts.

6. **Ball Bearings**-Replace if worn, loose or rough and noisy when rotated.

7. **Oil Seals**-Replace if worn or otherwise damaged.

8. **General**-All parts should be clean before assembly. All burrs should be removed.

V-C. RE-ASSEMBLY Procedures- This procedure covers re-assembly of pump after complete disassembly. Make sure all directions outlined in Section V-B have been followed.

1. Oil shaft at thrust bearing fit on coupling end of shaft (122). Slide thrust (coupling end) bearing (112A) on shaft as far as possible by hand. Place pipe or driving sleeve over shaft, making sure it rests against inner face only. Make sure bearing is "square" on shaft. Tap or press evenly until bearing is seated firmly against shaft shoulder. Do not mar the shaft.
2. Place lock washer and bearing locknut (136) on shaft and tighten firmly. Bend "tang" of lock washer into slot in locknut.
3. Slide bearing housing (134A), with O-ring (496) in place, on shaft and over bearing (112A) as far as possible. Do not damage oil seal (332A).
4. Insert retaining ring (361A) into groove in bearing housing (134A). Flat side of retaining ring must be against bearing (112A).
5. Oil inboard bearing seat on shaft. Slide inboard ball bearing (168A) on shaft (122) as far as possible by hand. Continue as in Step 1 above.
6. Place a small amount of O-ring lubricant on inside of bearing frame (228A) at bearing housing (134A), at inboard bearing seats (168A), on O-ring (496), and on inboard oil seal (333A) Carefully slide shaft assembly into bearing frame. Do not damage inboard oil seal (333A). Screw bearing housing bolts (370C) about 1/2" into bearing frame (228A).
7. Slide deflector if any, (123) on shaft (122).
8. If unit has packed stuffing box, place stuffing box cover (184) against adapter (108), making sure that studs (370H) are aligned with proper holes in adapter. Replace nuts and firmly tighten. Slide sleeve (if any) on shaft. Make sure grooves in end of sleeve engage drive pin on shaft. Continue assembly at Step 10, (page 22).

9. If unit has mechanical seal:

The following instructions refer to pumps equipped with mechanical seals, either with or without sleeves. If the unit has a single inside or double seal, a preliminary impeller adjustment must be performed to assure proper positioning of mechanical seal.

- (A) Position sleeve (126), if any, on shaft (122) and engage groove in sleeve with drive pin (469) on shaft. Place stuffing box cover (184) against frame (228). Make sure studs (370H) align with proper holes in frame. Firmly tighten nuts or bolts.
- (B) Screw impeller (101) with O-ring (412A) in place on shaft. Make sure that shaft assembly extends through stuffing box cover (184) so that the impeller will NOT contact face of stuffing box cover.
- (C) Using impeller adjusting bolts (370C and 370D), adjust the impeller clearance until a .020¹¹ (0.5mm) feeler gauge can be inserted between the back of the impeller and the face of the stuffing box cover.

The following instructions are for three basic seal types: Single Inside, Single Outside, and Double Seals. Refer to seal manufacturer's drawing seal type and positioning dimension. Follow pertinent procedures.

a. Single Inside Seal

- (1) Scribe the shaft (122) or shaft sleeve (126) lightly at the face of the stuffing box. (2) Remove the impeller and stuffing box.

- (3) Assemble the gland (250) with gaskets and stationary seat and slide the assembly over the shaft (122) or shaft sleeve (126).
- (4) Slide the rotary portion of the seal on the shaft (122) (or shaft sleeve) (126) establishing its location from the scribe line to the dimension as shown on the seal manufacturer's drawing. Tighten set screws.
- (5) Reinstall the stuffing box cover and tighten. Do not damage the seal parts.
- (6) Reinstall the impeller with O-ring.
- (?) Slide the gland assembly against the stuffing box and tighten the nuts evenly. Do not damage the seal parts.
- (8) Refer to step 12 for further assembly details.

b. Double Seals

- (1) Scribe the shaft (122) or shaft sleeve (126) lightly at the face of the stuffing box.
- (2) Remove the impeller and stuffing box.
- (3) Assemble the gland (250) with gaskets and stationary seat and slide the assembly over the shaft (122) or shaft sleeve (126).
- (4) Slide the rotary portion of the seal on the shaft (122) or shaft sleeve (126) establishing its location from the scribe line to the dimension as shown on the seal manufacturer's drawings. Tighten set screws.
- (5) Place inboard stationary seat and gaskets into bottom of stuffing box.
- (6) Re-install the stuffing box cover and tighten. Do not damage seal parts.
- (7) Re-install the impeller with O-ring.
- (8) Slide the gland assembly against the stuffing box and tighten the nuts evenly. Do not damage seal parts.
- (9) Refer to step 12 for further assembly details.

c. Single Outside Seals

Preliminary impeller adjustment is not necessary with this type of mechanical seal.

- (1) If unit has shaft sleeve (126), slide on shaft (122) and engage groove in sleeve with drive pin (469) on shaft.
- (2) Lubricate rotary portion of seal and slide on shaft sleeve. Do not tighten set screws.
- (3) Assemble gland (250), gaskets, and stationary seat and slide assembly on shaft or sleeve.
- (4) Place stuffing box cover (184) against frame making sure that the studs (370H) align with the proper holes in frame. Firmly tighten nuts.
- (5) Screw impeller with O-ring on shaft make sure impeller does not make contact with stuffing box cover. If the impeller does hit, use impeller adjusting cap screws to correct.
- (6) Place gland assembly against face of stuffing box and firmly tighten stud nuts.
- (7) Slide rotary portion toward gland until it contacts stationary seat. Compress the rotary. Tighten screws.

(V-C RE-ASSEMBLY- *Continued*)

10. Screw impeller (101) with O-Ring (412A) in place, on the shaft (122).

11. On units with stuffing box packing (106), repack stuffing box as outlined in Section I.1-F. Assemble gland stud nuts finger tight.

12. Install and position coupling hub at scribe mark on shaft.

13. Place casing gasket (351) against shoulder in casing.
14. Slide the pullout assembly into the casing (100). Install frame-to-casing bolts (370) and tighten evenly while rotating shaft (122) by hand. If impeller ceases to turn freely stop tightening operation and adjust the impeller setting with the adjusting bolts (370C and 370D) before resuming tightening of frame-to-casing bolts (370).
15. Reset impeller clearances.
 - (a) Loosen bolts (370C and 370D).
 - (b) Tighten bolts (370C) while turning shaft until impeller starts to rub against casing.
- (c) Loosen bolts (370C) until a 0.015 (0.375 mm) feeler can be placed between the bolt head and the bearing housing. If desired, a dial indicator can be used instead of a feeler gauge to check that the bearing housing has been moved the correct 0.015 (0.375 mm) distance.
- (d) Tighten bolts (370D) evenly. Bearing housing shaft and impeller will be jacked to proper clearance from casing. Tighten bolts (370C) and jam nuts on bolts (370D)-

V-D. Additional Details

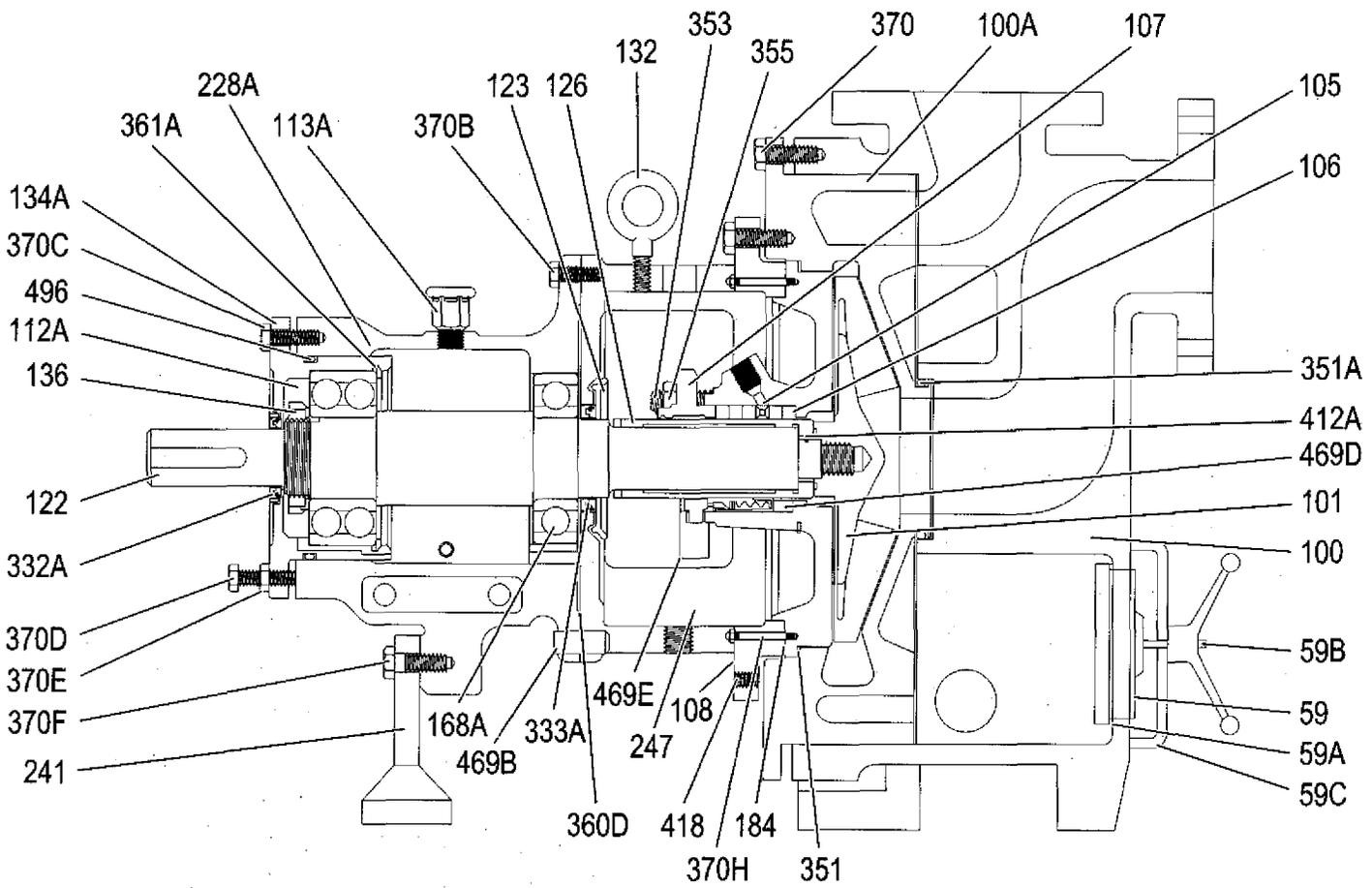
An alternate method for setting inside mechanical seals is the "Modified Vise grip Method" .

1. Follow assembly up to step 7.
2. Assemble the gland with stationary seat and gaskets.
3. Install the shaft sleeve, if used on the shaft, and engage groove in sleeve with drive pin (469) on shaft.
4. Slide gland assembly over the shaft or shaft sleeve.
5. Install the stuffing box cover and impeller. Establish a preliminary rotor adjustment (refer to Section V -C Step 9).
6. Slide gland assembly against stuffing box. Do not bolt the gland to the stuffing box.
7. Clamp the modified vise grip on the shaft or sleeve directly behind and against the gland.
8. Leave the vise grip in place and remove the impeller and stuffing box cover.
9. Lubricate the rotary portion of seal and slide it on the shaft until it meets the stationary seat in the gland.
10. Compress rotary portion of seal to correct dimension as shown on seal manufacturer's drawing. Tighten set screws.
11. Remove vise grip and reinstall stuffing box cover and tighten.
12. Reinstall impeller with O-ring.
13. Slide the gland assembly against the stuffing box and tighten nuts evenly.
14. Refer to Section V-C Step 12, etc.

SECTION V-E-PARTS LIST WITH MATERIALS OF CONSTRUCTION

Parts List and Materials of Construction -Peerless Pump Series 8796 Self Priming Process Pumps							
Item No.	Qty per pump	Part Description	All Ductile Iron	All 316 Stn Stl	AllCD4M	Alloy 20 Stain Steel	Hastelloy B Or C
59	1	Cover Oval Clean out	Ductile Iron	316 Stn Stl	CD4M	Alloy 20	Hastelloy ECH-Sponge
59A	1	Gasket	ECH-Sponge	ECH-Sponge	ECH-Sponge	ECH-Sponge	ECH-Sponge
59B	1	Wing Nut	Steel	Steel	Steel	Steel	Steel
59C	1	Hand Hole Brace	Steel	Steel	Steel	Steel	Steel
100	1	Casing	Ductile Iron	316 Stn Stl	CD4M	Alloy 20 Stn Stl	Hastelloy
100A	1	Inner Volute	Ductile Iron	316 Stn Stl	CD4M	Alloy 20 Stn Stl	Hastelloy
101	1	Impeller	Ductile Iron	316 Stn Stl	CD4M	Alloy 20 Stn Stl	Hastelloy
105	1	Lantern Rina	TFE	TFE	TFE	TFE	TFE
106	1 Set	Stuffing Box Packing	PTFE-aramid	PTFE-aramid	PTFE-aramid	PTFE-aramid	PTFE-aramid
107	1	Packing Gland	316 Stn Stl	316 Stn Stl	Alloy 20 Stn Stl	Alloy 20 Stn Stl	Hastelloy
108	1	Frame Adapter	Ductile Iron	Ductile Iron	Ductile Iron	Ductile Iron	Ductile Iron
112A	1	Ball Bearing-Outboard	Steel	Steel	Steel	Steel	Steel
113A	1	Bearing Frame Breather	Steel	Steel	Steel	Steel	Steel
122	1	Pump Shaft for Sleeve	SAE4140	SAE4140	SAE 4140	SAE 4140	316 Stn Stl
123	1	Deflector Used with Up Seal Construction	Nylon -Glass Ref.	Nylon -Glass Ref.	Nylon -Glass Ref.	Nylon -Glass Ref.	Nylon -Glass Ref.
126	1	Shaft Sleeve	316 Stn Stl	316 Stn Stl	CD4M	Alloy 20 Stn Stl	Hastelloy
132	1	Eve Bolt	Steel	Steel	Steel	Steel	Steel
134A	1	Bearing Housing	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
136	1	Bearing Locknut	Steel	Steel	Steel	Steel	Steel
168A	1	Ball Bearing Inboard	Steel	Steel	Steel	Steel	Steel
184	1	Stuffing Box Cover-Std.	Ductile Iron	316 Stn Stl	CD4M	Alloy 20 Stn Stl	Hastelloy
228A	1	Bearing Frame	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
241	1	Bearing Frame Foot	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron
247	1	Drip Basin		316 Stn Stl	316 Stn Stl	316 Stn Stl	316 Stn Stl
251	1	Constant Level Oiler (not shown)	Glass/White Metal	Glass/White Metal	Glass/White Metal	Glass/White Metal	Glass/White Metal
332A	1	Oil Seal- Coupling End Labyrinth Isolator	Brz/Buna Rubber	Brz/Buna Rubber	Brz/Buna Rubber	Brz/Buna Rubber	Brz/Buna Rubber
333A	1	Oil Seal- Inboard End Labyrinth Isolator	Brz/Buna Rubber	Brz/Buna Rubber	Brz/8una Rubber	Brz/Buna Rubber	Brz/Buna Rubber
351	1	Gasket-Adapt to Stuff Box	Veg Fiber	Veg Fiber	Veg Fiber	Veg Fiber	Veg Fiber
351A	1	O-Ring, Volte to Casing	Viton	Viton	Viton	Viton	Viton
353	2	Gland Stud	316 Stn Stl	316Stn Stl	316 Stn Stl	316Stn Stl	Monel
355	2	Nut, Gland Stud	316 Stn Stl	316 Stn Stl	316 Stn Stl	316 Stn Stl	316Stn Stl
360D	1	Gasket-Brg. Frm. to Adapter	Veg Fiber	Veg Fiber	Veg Fiber	Veg Fiber	Veg Fiber
361A	1	Ret Ring-Bearing Housing	Steel	Steel	Steel	Steel	Steel
370	4to 24	Cap Screw-Frame/Adapt to Casing	Steel	304 Stn Stl	304 Stn Stl	304 Stn Stl	304 Stn Stl
370H	2	Stud & Nut, Cover to Adapter	304 Stn Stl	304 Stn Stl	304 Stn Stl	304 Stn Stl	304 Stn Stl
370B	4	Cap Scr Adpt/Adpt. Rg. Frm.	Steel	Steel	Steel	Steel	Steel
370C	3-to 4	Tao Bolt Bra Housing	Steel	Steel	Steel	Steel	Steel
3700	3to 4	Tap Bolt w/Jam Nut Impeller Adjusting	Steel	Steel	Steel	Steel	Steel
370F	1 to 2	Cap Screw-Frame Foot	Steel	Steel	Steel	Steel	Steel
370H	2	Stud & Nut Cover to Adapter	304 Stn Stl	304 Stn Stl	304 Stn Stl	304 Stn Stl	304 Stn Stl
412A	1	"0" Ring - Impeller	TFE	TFE	TFE	TFE	TFE
418	2-3	Tap Bolt - Jacking'	Steel	Steel	Steel	Steel	Steel
469B	2	Dowel Pin-Frame to Adapter	Steel	Steel	Steel	Steel	Steel
4690	1	Drive Pin -Shaft Sleeve	420 Stn Stl	420 Stn Stl	420 Stn Stl	420 Stn Stl	420 Stn Stl
469E	1	Seal Gland	316 Stn Stl	316 Stn Stl	CD4M	Alloy 20 Stn Stl	Hastelloy
496	1	"0" Ring- Bearing Housing	Buna Rubr	Buna Rubr	Buna Rubr	Buna Rubr	Buna Rubr
503	1	Adapter Ring (not shown) Model 1 .5x 1.5 8ST only	Ductile Iron	Ductile Iron	Ductile Iron	Ductile Iron	Ductile Iron

SECTION V-F-CROSS SECTIONAL DRAWING



SECTION VI-PUMP SIZE COMPARISON CHART

MODEL 8796		MODEL 8196	
1-1/2x1-1-1/2x8	ST	1x1-1/2x8	ST
2x2x10	MT	1x2x10	MT
3x3x10	MT	2x3x10	MT
4x4x10	MT	3x4x10	MT
3x3x13	MT	2x3x13	MT
4x4x13	MT	3x4x13	MT

SECTION VII-TROUBLE SHOOTING

Problems		Possible Causes & Corrections
A	No liquid delivered not enough liquid delivered, or not enough pressure	10, 11, 12, 13, 14, 18, 19, 20
B	Pump works a while and then emits	4, 5, 7, 8, 9, 11, 12, 20
C	Pump takes too much power	6, 13, 14, 15, 16, 21, 22, 23, 24, 31
D	Pump is noisy or vibrates	15, 16, 17, 28, 31
E	Pump leaks excessively at stuffing: box	8, 24, 25, 26, 27
F	High bearing" temperature	15, 16, 17, 29, 30 31
G	Stuffing: box overheating:	8, 24, 25, 26, 27
H	Pump does not prime	7, 8, 32, 33, 34

Causes & Corrective Measures

1. Pump not primed or properly vented-check and see if casing and suction pipe are completely filled with liquid
2. Speed too low-check whether motor wiring is correct and receives full voltage or turbine receives full steam pressure.
3. System discharge head too high-check system head (particularly friction losses).
4. Suction lift too high-check NPSH available (suction piping too small or long may cause excessive friction losses). Check with vacuum or compound gauge.
5. Impeller or piping obstructed-check for obstructions.
6. Wrong direction of rotation-check rotation.
7. Air pocket or leak in suction line-check suction piping for air pockets and/or air leaks.
8. Stuffing box packing or seal worn allowing leakage of air into pump casing-check packing or seal and replace as required. Check for proper lubrication.
9. Not enough suction head for hot or volatile liquids-increase suction head, consult factory.
10. Foot valve too small-install correct size foot valve.
11. Foot valve or suction pipe not immersed deep enough-consult factory for proper depth. Use baffle to eliminate vortices.
12. Entrained air or gases in liquid-consult factory.

(Causes & Corrective Measures· Continued)

13. Impeller clearance' too great - check for proper clearance.
14. Impeller damaged-inspect and replace as required,
15. Rotating parts bind-check internal wearing parts for proper clearances.
16. Shaft bent-straighten or replace as required.
17. Coupling or pump and driver misaligned-check alignment and realign if required.
18. Impeller diameter too small-consult factory for proper impeller diameter.
19. Improper pressure gauge location-check correct position and discharge nozzle or pipe.
20. Casing gasket damaged-check gaskets and replace as required.
21. Speed too high-check motor winding voltage or steam pressure received by turbine.
22. Head lower than rating; pumps too much liquid-consult factory. Install throttle valve, trim impeller' diameter;
23. Liquid heavier than anticipated-check specific gravity and viscosity.
24. Stuffing box not properly packed (insufficient packing, not properly inserted or run in, packing too tight)-check packing and repack stuffing box.
25. Incorrect packing or mechanical seal-consult factory.
26. Damaged mechanical seal-inspect and replace as required. Consult factory.
27. Shaft sleeve scored-re-machine or replace as required.
28. Cavitation-increase NPSH available Consult factory.
29. Pump capacity too low-consult factory for minimum continuous flow.
30. Excessive vibration.
31. Improper bearing lubrication or bearings worn out-inspect and replace as required.
32. Check valve in discharge line-install vent line from pump discharge to check valve.
33. Back pressure in discharge line-eliminate any receiver tank "down legs" and "U" shaped loops in discharge piping.
34. No initial casing fill.

SECTION VIII-A-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 this unit is equipped with stuffing box packing, the following parts should be on hand: (1)
 - Stuffing box packing (item 106)-one set.
 - (2) Stuffing box gland packing (item 107)-one set.
 2. An alternative, though not as desirable as that stated above, can be used on non-critical services. This involves having on hand parts that are most likely to wear and can be used as needed. See Section VI-A, Parts List, for these recommended spares.

VIII-B. Instructions for Ordering Spare Parts

Repair orders will be handled with the minimum of delay if the following directions are followed:

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 in Section VI.
3. Give the number (quantity) of parts required.
4. Give complete shipping instructions.

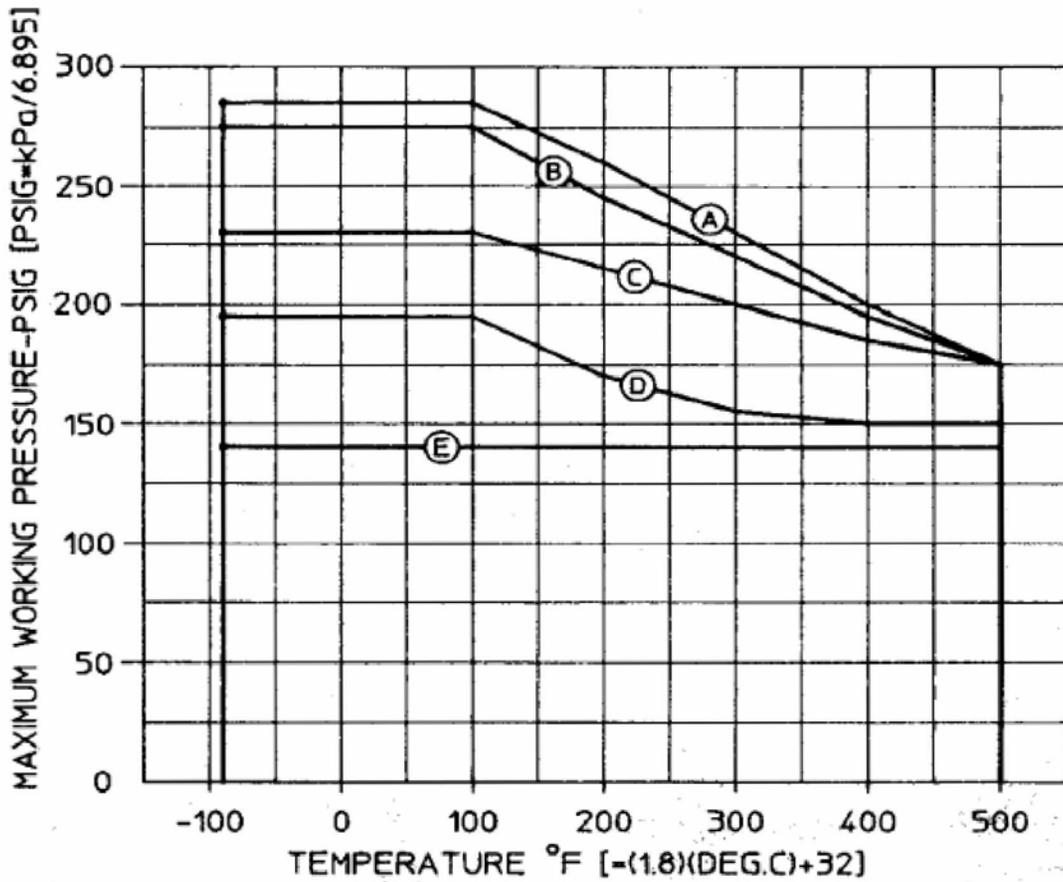
Notice:

Materials of construction, specifications, dimensions, design features and application information, where shown in this bulletin, are subject to change without notice by Peerless Pump Company at their option.

SECTION VIII-C-PRESSURE/TEMPERATURE RATING LIMITS

**HORIZONTAL PROCESS PUMPS SINGLE STAGE END SUCTION SELF-PRIMING
Type 8796 (Frame Mounted)**

**150 Lb ANSI Flanges
Pressure/Temperature Ratings**



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

CONTACT FACTORY FOR SUCTION PRESSURES OVER 160 PSIG.