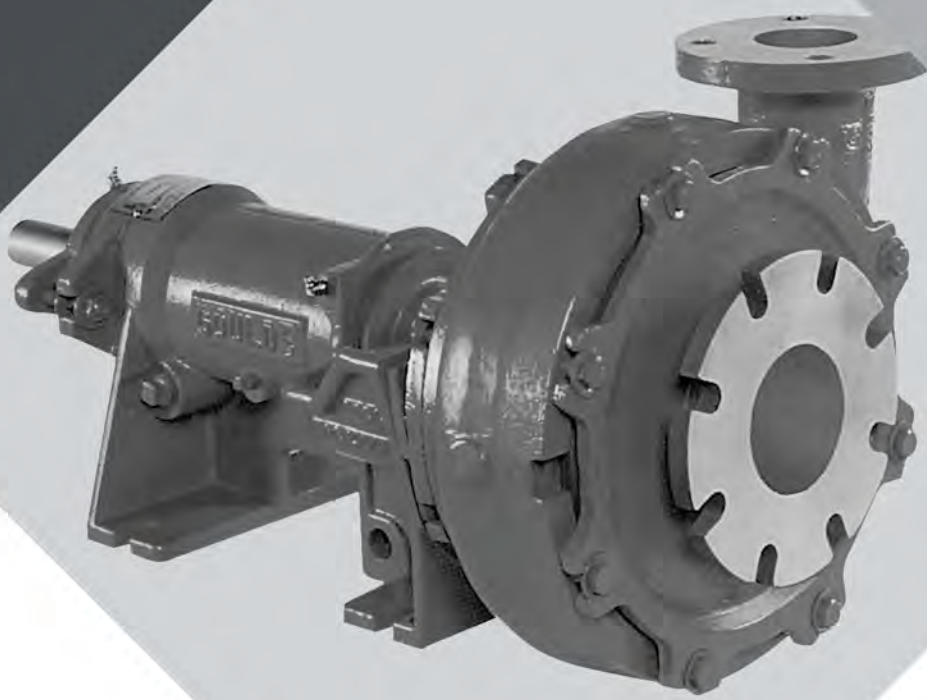
GOULDS PUMPS

# Installation, Operation and Maintenance Instructions

Model JC



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# General information

## Introduction

This instruction manual is intended to assist those involved with the installation, operation and maintenance of Goulds slurry pumps. It is recommended that this manual be thoroughly reviewed prior to installing or performing any work on the pump or motor.

## Importance of instructions

The design, material and workmanship incorporated in the construction of Goulds slurry pumps makes 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 manual was prepared to assist operators in understanding the construction and correct methods of installing, operating, and maintaining these pumps.

## Special warnings

Goulds 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 Goulds Pumps, Inc.

## 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.

# Installation

This section is a general installation and operating instruction for most Goulds pumps. Specific text and illustrations are included in this section. To insure pump performance and operating life, proper installation and reasonable maintenance are required. The following instructions are a guide for installation and maintenance personnel and the pump operator.

## Preparation for shipment

Goulds pumps are prepared at the factory for shipment under covered conditions. They are protected for transport and short term covered storage. Unless otherwise specified, it is assumed the pump will be installed upon delivery. Additional protection can be provided by request.

## Installation

Ⓔx Equipment that will operate in a potentially explosive environment must be installed in accordance with the following instructions.

Ⓔx All equipment being installed must be properly grounded to prevent unexpected static electric discharge. If not, a static electric discharge may occur when the pump is drained and disassembled for maintenance purposes.

### Location of unit

The pump should be located in a clean, dry area free from flooding. The area should provide adequate space for maintenance and repair, considering complete disassembly and handling of equipment. The unit should be positioned to provide the most efficient pipeline system.

## Piping

**WARNING:** Ⓔx Never draw piping into place by forcing at the flanged connections of the pump. This may impose dangerous strains on the unit and cause misalignment between pump and driver. Pipe strain will adversely effect the operation of the pump resulting in physical injury and damage to the equipment

**CAUTION:** Ⓔx Pump must never be throttled on suction side.

**WARNING:** Ⓔx NPSHa must always exceed NPSHr as shown on Goulds performance curves received with order. Reference Hydraulic Institute for NPSH and pipe friction values needed to evaluate suction piping.

Short, direct suction and discharge pipelines and a minimum of elbows and fittings result in the least amount of pipe friction.

### Suction piping

1. Excessive friction losses will cause cavitation.
2. Must be kept free of air leaks, particularly in long lines or conditions of high suction lift.
3. Flow regulating valves must not be located on suction side of the pump.

### Discharge piping

1. Excessive friction losses result in insufficient head.

2. A check valve should be located in the discharge line to protect the pump from reverse flow and excessive pressure.

## Piping support

The pumps are not designed to carry loads imposed by the weight of the pipeline. Suction and discharge piping must be supported near the pump, unless otherwise specified. Pumps and subbases can be designed to carry loads due to thermal expansion.

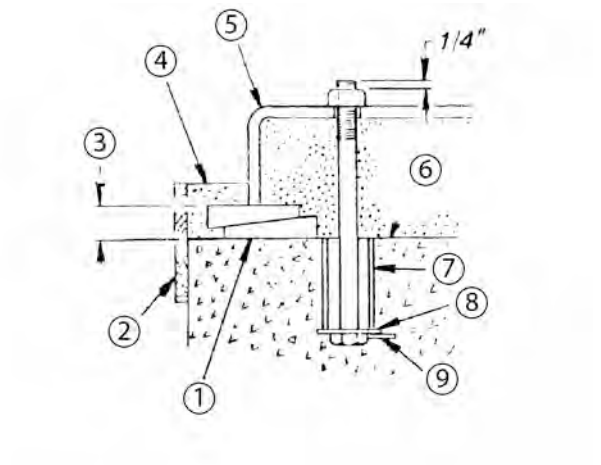
# Foundation

The foundation must be a permanent, rigid support for the subbase or floorplate. It should be an industrially accepted design capable of absorbing excessive vibration.

Foundations are typically concrete with anchor bolts cast in to secure the pump.

An anchor bolt assembly consists of a bolt and washer with a sleeve 2-½ times the diameter of the bolt. When the assembly is cast in concrete, the washer prevents the sleeve and bolt from being pulled. The sleeve I.D. provides an adjustment allowance around the bolt. A lug is generally welded on the bolt to prevent rotation when tightening.

Anchor bolts should be located in the concrete by a template dimensioned from the pump installation drawing. The top of the sleeve should be temporarily sealed with waste material to prevent concrete from entering during the concrete pouring operation. A typical anchor bolt arrangement is shown in *Foundation* (page 5).




1. Leveling wedges or shims left in place
2. Dam
3. 19mm - 38mm | ¾ - 1-1/2" allowance for grit
4. Finished grouting
5. Subbase
6. Top of foundation left rough - clean and wet down
7. Pipe sleeve
8. Washer
9. Lug

**Figure 1: Foundation**

## Installing pump on foundation

If subbases or floorplates were directly anchored to poured concrete foundations, surface irregularities would cause distortion. Rectangular metal blocks and shims, or metal wedges having a small taper, are placed beside each anchor bolt to level the subbase or floorplate (see Figures *Leveling with wedges* and *Leveling with blocks and shims*). The anchor bolts are then drawn tight enough to maintain position and level.

To secure the shims in place and provide a level surface for the base or plate, grout is poured over the concrete foundation. A 19mm to 38mm | ¾" to 1-½" grout allowance is recommended.

When subbases have cavities, grout holes are provided to fill all spaces. After the grout has hardened, permanently tighten the anchor bolts.

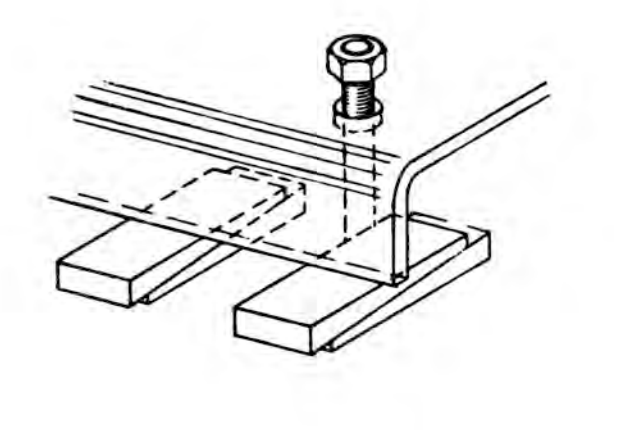


**Figure 2: Leveling with wedges**

When the grout has hardened and the anchor bolts are permanently secured, recheck level.

**NOTICE:** On large subbases/floorplates, shimming is recommended to be at 61cm | 24" spacing.

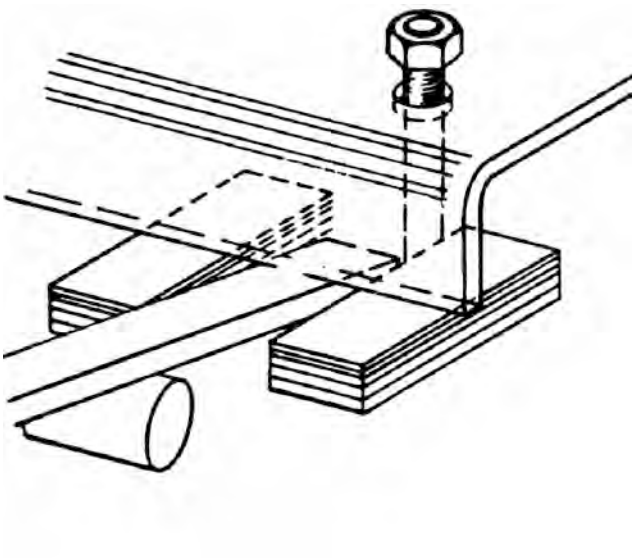


**Figure 3: Leveling with blocks and shims**

# Install pump, driver, and v-belt drive

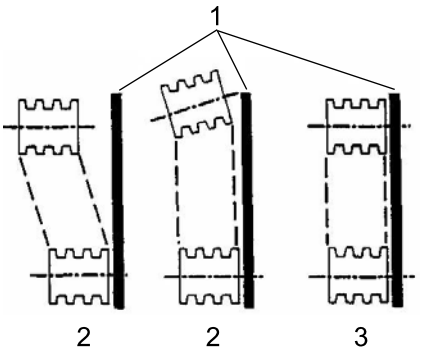
## Install and align the sheaves

Before installing the driver onto an overhead motor mount or side-by-side base, ensure that Foundation requirements and baseplate mounting procedures sections are complete.

**NOTICE:**
Ⓔx Alignment procedures must be followed to prevent unintended contact of rotating parts. Follow coupling manufacturer’s installation and operation procedures.

1. Mount and fasten the pump on the pedestal spacer, foundation, or baseplate as applicable. Use appropriate hardware.
2. For a motor that is mounted overhead, install the overhead motor mount.
3. For a motor that is mounted to the side of the pump, fasten the motor slide base on the baseplate or pump. Fasten the motor slide base on the baseplate or foundation, as applicable. Use appropriate hardware.
4. Mount the driver on the overhead motor mount or slide base, as applicable. Use appropriate hardware.
5. Install the v-belt drive bushings and sheaves. See the installation instructions from the v-belt drive manufacturer.

After the v-belt drive bushings and sheaves are installed, check the sheave alignment using a straight edge as shown in the following diagram.




1. Straight edge
2. Incorrect
3. Correct

**Figure 4: Sheave alignment**

**NOTICE:**
Make sure that the sheaves are properly aligned. Proper alignment is necessary to guarantee the correct power transmission and speed ratio, and ensures minimum vibration and long drive life.

## Install and tension the belt

1. After alignment of the sheaves, reduce the center distance between the pump and motor shafts so that the belts can be easily mounted into the sheave grooves.

| For... | Reduce the center distance by... |
|---|---|
| Overhead mounted motors | Adjusting the leveling nuts |
| Side mounted motors | Adjusting the motor slide base |

   Make sure that the center distance between the pump and motor shaft is reduced to the point where the belts can be put on the sheaves without the use of force. Never roll or pry the belts into place, as this could damage the belt cords.
2. After the belts are seated in the sheave grooves, increase the center distance between the pump and motor shafts to tension the belts.

Refer to pump general arrangement drawing for center distance ranges.

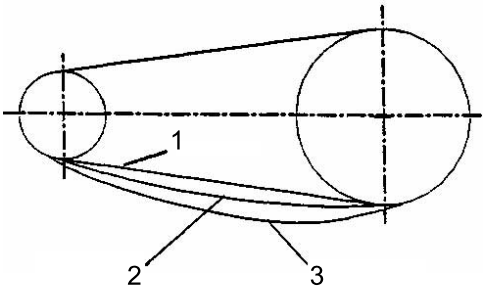



**Figure 5: V-belt tension**

Many v-belt drive manufacturers offer tension measurement tools that can aid in setting proper belt tension. Contact the v-belt drive manufacturer for more information.

3. Secure the overhead motor mount on slide base in place once the belts are properly tensioned.
4. Install the unit after installation to ensure that the belts and sheaves do not come into contact with the guard.

**CAUTION:**
The unit must not be operated without the proper drive guard in place. Operating the unit without the drive guard in place could result in personal injury to operating personnel.

# Pump-driver alignment

**WARNING:**
Ⓔx Alignment procedures must be followed to prevent unintended contact of rotating parts. Follow coupling manufacturer's installation and operation procedures.

## Shaft alignment of horizontal pump and driver

Pumps and drivers that are received from the factory with both machines mounted on a common subbase were accurately aligned before shipment. Because all subbases are, to some extent, flexible, factory alignment may be altered during shipment and handling. After the subbase has been leveled, grouted, and secured, check the alignment. Alignment should be rechecked after the pump is fully installed and before startup. Refer to the Alignment Procedure.

Disconnect coupling halves before proceeding with alignment. Check for angular and parallel alignment in the Alignment Procedure. The faces and outside diameters of the coupling halves must be square and concentric with the bores. If this condition does not exist, the Alternate Method of Alignment is recommended.

Subbase mounted horizontal pumps may be shipped with or without drivers and gears. Be sure pump and drivers are uncoupled before installation. Level by shimming beside each anchor bolt and grout as described in Installing Pump on Foundation.

## Alignment procedure

A check for angular alignment is made by inserting the taper gauge or feelers at four points between the coupling faces and comparing the distance between the faces at four points spaced around the coupling. The unit will be in angular alignment when the measurements show that the coupling faces are the same distance apart at all points *Checking angular alignment.*

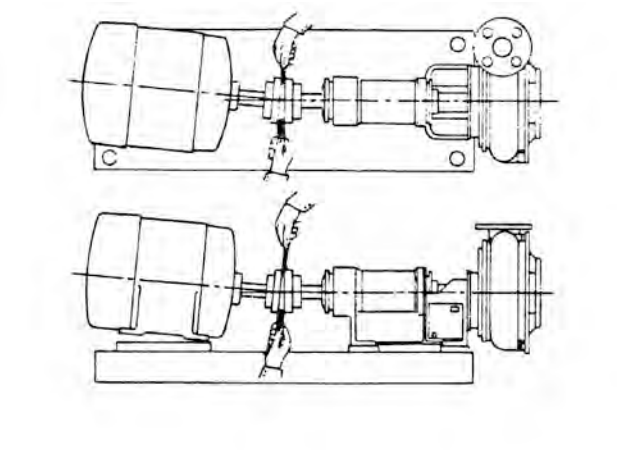


**Figure 6: Checking angular alignment**

A check for parallel alignment is made by placing a straight edge across both coupling rims at the top, bottom, and at both sides. The unit will be in parallel alignment when the straight edge rests evenly on the coupling rim at all positions. Allowance may be necessary for temperature changes and for coupling halves that are not of the same outside diameter.

**NOTICE:** Care must be taken to have the straight edge parallel to the axis of the shafts *Checking parallel alignment.*

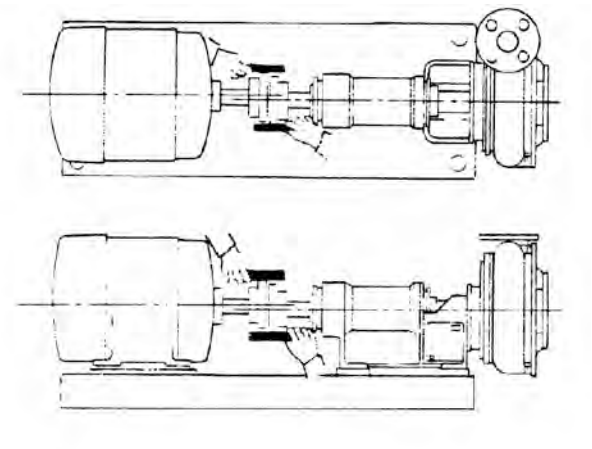


**Figure 7: Checking parallel alignment**

Angular and parallel misalignment are corrected by means of shims under the motor mounting feet. After each change, it is necessary to recheck the alignment of the coupling halves. Adjustment in one direction may disturb adjustments already made in another direction. It should not be necessary to adjust the shims under the pump.

The permissible amount of misalignment will vary with the type of pump and driver. The manufacturer’s recommendations should be obtained and followed.

When the driver is to be mounted on the subbase in the field, it is necessary to place the subbase with pump on the foundation to level the pump shaft, to check the coupling faces, the suction and discharge flanges for horizontal or vertical position, and to make any necessary corrective adjustments.

When the units are lined up cold, it may be necessary to make an allowance for the vertical rise of the driver and/or pump caused by heating. Goulds Pumps recommendations should be obtained and followed.

## Alternate method of alignment

An approved method for putting the coupling halves in final accurate alignment is by the use of a dial indicator. Check alignment by straight edge, taper gauge or feelers as accurately as possible by the procedure indicated above.

Bolt the indicator to the pump half of the coupling, with the indicator button resting on the other half coupling periphery, set the dial to zero, and chalk mark the coupling half at the point where the button rests. For any check, top, bottom, or sides, rotate both shafts by the same amount; i.e., all readings on the dial must be made with button on the chalk mark.

The readings will indicate whether the driver has to be raised or lowered or moved to either side. After each movement, check to see that coupling faces remain parallel to one another.

With this method, accurate alignment of shaft centers can be obtained even where faces or outside diameters of the coupling halves are not square or concentric with the bores, provided all measurements for angular alignment are made between the same two points on the faces, and all measurements for parallel alignment are made between the same two points on the outside diameters. Gross deviations in squareness or concentricity, however, may cause problems due to coupling unbalance or abnormal coupling wear and may need to be corrected for reasons other than accomplishment of shaft alignment.

## Alignment of gear type couplings

Gear type couplings are aligned in the same manner as outlined above. However, the coupling covers must be moved back out of the way and measurements made on the coupling hubs as shown *Gear coupling alignment*.

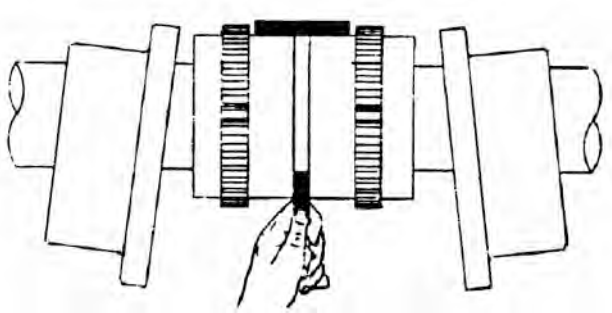


**Figure 8: Gear coupling alignment**

## Factors that may disturb alignment

The unit should be checked periodically for alignment. If the unit does not stay in line after being properly installed, the following are possible causes:

- Settling, seasoning or spring of the foundation.
- Wear of the bearings.
- Pipe strains distorting or shifting the machine.
- Springing of the baseplate by heat from an adjacent steam pipe or from a steam turbine.
- Shifting of the building structure due to variable loading or other causes.
- Loose nuts or bolts on the pump or driver assembly.

# Operation

## Preparation for start-up

### Stuffing boxes

In the conventional stuffing box, mechanical seals and packing seal between the stationary and rotating components of the pump. Generally, a clear liquid such as water is forced through the stuffing box to lubricate the sealing elements. The lubricating liquid pressure must exceed the pressure of the pumpage at the stuffing box. For end suction pumps, lubricating liquid pressure should be 10-15 PSIG higher than the discharge pressure. For side and double suction pumps, lubricating liquid pressure should be 10-15 PSIG higher than the suction pressure.

**NOTICE:** To determine suction or discharge pressure, use gauge pressure only.

The piping supplying the lubrication liquid should be fitted tightly to prevent air from entering. On suction lifts, a small quantity of air entering the pump at this point may result in loss of suction.

Lubrication liquid pressure is controlled by a valve on the outlet piping. Since the liquid leaking from the stuffing box should be clear, control of the packing lubricant will vary with the condition of the packing. Increase pressure within the stuffing box by closing outlet valve. Adjustments should be slow and consistent with the run-in procedure for new packing.

The lubricating liquid must be clean, free of grit and acid. Shaft sleeve scoring, packing destruction, and mechanical seal face damage will result from contaminated lubricant.

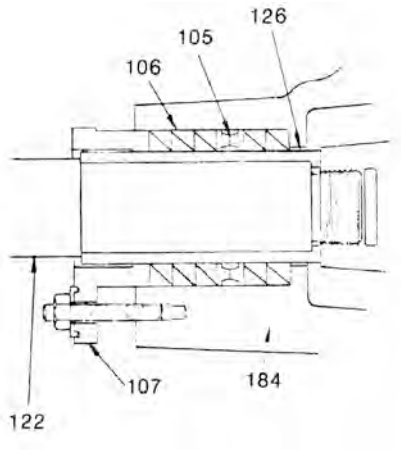
### Packing

**WARNING:**

Ⓔx Packed stuffing boxes are not allowed in an ATEX classified environment.

Original equipment packing is a suitable grade for the service intended. To replace original packing, contact your local Goulds representative.

Refer to Bill of Material and Assembly Drawing for specific packing size and configuration.




Packing (106)
Lantern ring (105)
Shaft sleeve (126)
Stuffing box cover (184)
Gland (107)
Shaft (122)
**Figure 9: Typical stuffing box**

# Packing procedure

1. Stuffing box and shaft sleeve must be clean and free of grit.
2. Form packing over shaft or mandrel of same diameter. Carefully cut to packing length. Discard rings cut too short.
3. Pre-form each ring by coiling 1-½ turns.
4. To install packing rings, do not pull straight. Expand the coil as a coil spring.

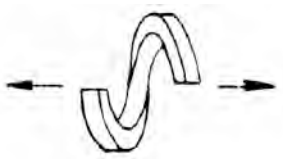


**Figure 10: Stuffing box packing - Correct**

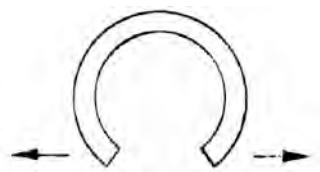


**Figure 11: Stuffing box packing - Incorrect**

5. Expand first coil as shown and insert into stuffing box. Tamp packing to stuffing box shoulder firmly with the gland. Note where the cut is positioned.
6. Install second and third coils as required by assembly drawing, staggering the cut 90º-120º.
7. Insert seal cage (lantern ring) into stuffing box, carefully noting its proper position on assembly drawing. Failure to properly locate seal cage will result in insufficient packing lubrication. Packing and shaft sleeve damage will occur.
8. After packing and seal cage are properly installed, insert gland into stuffing box. Tighten gland nuts finger-tight only. Shaft should turn freely.

**NOTICE:**
Do not over tighten gland nuts. Packing may set permanently and require removal. Over tightened packing causes excessive friction between packing and sleeve, and will result in damaged components. A noticeable temperature increase in stuffing box would indicate insufficient lubrication.

9. Follow pump start-up procedure. Turn on stuffing box lubricating liquid and start pump.
10. A significant amount of lubricating liquid should leak from gland side of stuffing box. Operate pump for at least 15 minutes before tightening gland nuts. Make small, even gland nut adjustments to reduce leakage. Allow adequate run-in time between adjustments. Acceptable leakage is 30-50 drops per minute.
11. Periodic maintenance is absolutely required for all packed pumps.
    Normal shaft run-out should be under 0.127mm | .005" to avoid pounding of stuffing box packing. With excessive shaft run-out, shaft straightening or replacement is necessary.

## Mechanical seals

**WARNING:**

- ⟨Ex⟩ The mechanical seal used in an ATEX classified environment must be properly certified.
- ⟨Ex⟩ The mechanical seal must have an appropriate seal flush system. Failure to do so will result in excess heat generation and seal failure.

Most mechanical seals are installed and adjusted at the factory. Due to size and design, some installed mechanical seals are supplied with shipping retainers. Shipping retainers hold the sealing faces apart to avoid damage during transport. Shipping retainers must be removed before shaft is to be rotated. Pumps with retained seal faces will be specially marked and instructions from the seal manufacturer for retainer removal will be provided.

Mechanical seals have a stationary and a rotating sealing face. Commonly, these sealing rings are of carbon and ceramic material, brittle in nature, and easily damaged. As the sealing rings seat with the operation of the pump, a compatible wear pattern develops between the mating surfaces. To disassemble the mechanical seal after the wear pattern is established would necessitate the replacement of the rotating and stationary sealing elements. Do not replace only one component.

To ensure the life and sealing characteristics of the mechanical seal, lubricating liquid must be circulated through the stuffing box. Clear, grit free liquid is necessary.

Special seal information and replacement seal elements should be provided by the seal manufacturer. Goulds strongly recommends the stocking of replacement sealing elements.

**CAUTION:** Do not make shaft adjustments on mechanical seal installations without consulting seal instructions and pump assembly drawing.

# Pump start-up

**WARNING:**

- Service temperature in an ATEX classified environment is limited to the area classification specified on the ATEX tag affixed to the pump (reference Table 1 in the ATEX identification section).
- The coupling used in an ATEX classified environment must be properly certified.
- The coupling guard used in an ATEX classified environment must be constructed from a non-sparking material.

# Start-up precautions

- All equipment and personal safety related devices and controls must be installed and operating properly.
- To prevent premature pump failure at initial start up due to dirt or debris in the pipe system, ensure the system has been adequately cleaned and flushed.
- Variable speed drivers should be brought to rated speed as quickly as possible
- Variable speed drivers should not be adjusted or checked for speed governor or over speed trip settings while coupled to the pump at initial start up. If settings have not been verified, uncouple the unit and refer to driver manufacturer's instructions for assistance. Pumpage temperatures in excess of 93°C | 200°F will require warmup of pump prior to operation. Circulate a small amount of pumpage through the pump until the casing temperature is within 38°C | 100°F of the pumpage temperature and evenly heated.

**CAUTION:** When starting the pump, immediately observe pressure gauges. If discharge pressure is not quickly attained, stop driver, reprime and attempt to restart.

## Bearing lubrication

Bearings must have adequate lubrication. Engage external lubrication system. Consult “Bearing section” of these instructions for specific information.

## Shaft rotation

The pump shaft must turn without any binding or rubbing. By manually turning the rotating element, only the uniform frictional drag of the bearings and the stuffing box should be sensed.

**CAUTION:** Serious damage may result if the pump is run in the wrong direction

## Correct rotation of the driver

The direction of rotation of the driver must be checked before it can be coupled with the pump. The direction of rotation of the pump is indicated in a prominent location. For pumps with impellers threaded on the shaft, reverse rotation would back the shaft from the impeller thread. Considerable damage may occur.

Lock out driver power to prevent electric shock, accidental start-up and physical injury.

**WARNING:**
Ⓔx When installing in a potentially explosive environment, ensure that the motor is properly certified.

## Lubricating lines to stuffing box

Lubricating liquid must be flowing to the stuffing box before the pump is started. Both mechanical seals and packing require lubrication for continuous service.

## Priming

The pump must be completely primed before operation.

**WARNING:**
Ⓔx Pumps must be fully primed at all times during operation.

## Water hammer

Water hammer is a high pressure surge within a closed pipe system, created by rapid change in the flow rate. Changes in the flow rate occur when there are sudden changes in pump speed. The most common cause is the sudden opening or closing of a valve or flow control device. Extensive damage to the pump and pipeline is a result of water hammer.

## Freezing

If the pump is exposed to below freezing temperatures, the liquid should be drained during idle periods.

# Locating problems

## Conditions leading to insufficient or no discharge

- Insufficient speed.
- Excessive discharge head
- Insufficient NPSH.
- Worn pump components
- Incorrect direction of rotation
- Incomplete pump priming
- Impeller or discharge pipe clogged
- Pumpage viscosity too high

## Conditions leading to excessive power consumption

- Excessive speed.
- Pump operating at high horsepower area of the pump curve (off design point)
- Mechanical binding or rubbing of rotating element.
- Pumpage specific gravity and/or viscosity too high

**CAUTION:** Always vary capacity with regulating valve in the discharge line. NEVER throttle flow from the suction side

**CAUTION:** Driver may overload if the pumpage specific gravity (density) is greater than originally assumed, or the rated flow rate is exceeded

**CAUTION:** Always operate the pump at or near the rated conditions to prevent damage resulting form cavitation or recirculation

**WARNING:** Do not operate pump below minimum rated flows or with suction and/or discharge valve closed. These conditions may create an explosive hazard due to vaporization of pumpage and can quickly lead to pump failure and physical injury.

**CAUTION:** Damage occurs from:

- Increased vibration levels – affects bearings, stuffing box or seal chamber and mechanical seal
- Increased radial loads – Stresses on shaft and bearings
- Heat build up–Vaporization causing rotating parts to score or seize
- Cavitation–Damage to internal surfaces of pump

**CAUTION:** Observe pump for vibration levels, bearing temperature and excessive noise. If normal levels are exceeded, shut down and resolve.

**WARNING:**

- ⟨Ex⟩ This unit must never be used without prior installation of the safety guards for rotating parts as prescribed by O.S.H.A.
- Operation of this pump with both suction and discharge valves closed for even brief periods of time is an unacceptable and dangerous practice. it can rapidly lead to a violent pump failure.

**WARNING:** ⟨Ex⟩ Inspection intervals should be shortened appropriately if the pumpage is abrasive and/or corrosive, or if the environment is classified as potentially explosive.

**WARNING:** ⟨Ex⟩ DO NOT apply heat to hub or nose of threaded impeller. There is a danger of explosion.

# Preventive Maintenance

## General comments

A routine maintenance program can extend the life of your pump. Well maintained equipment will last longer and require fewer repairs. It is recommended maintenance records be kept – this will help pinpoint potential causes of problems.

The Preventive Maintenance section must be adhered to in order to keep the applicable ATEX classification of the equipment. Failure to follow these procedures will void the ATEX classification for the equipment.

## Maintenance schedule

**Routine Maintenance**

- Bearing lubrication
- Seal Monitoring
- Vibration analysis
- Discharge pressure
- Temperature monitoring

**Routine Inspections**

- Check level and condition of oil through sight glass on bearing housing.
- Check for unusual noise, vibration and bearing temperatures.
- Inspect pump and piping for leaks.
- Check stuffing box leakage.
- Packing: Excessive leakage requires adjustment or possible packing replacement.
- Mechanical Seal: Should be no leakage.

**Quarterly Inspections**

- Check foundation and hold-down bolts for tightness.
- If pump has been left idle, check packing. Replace if required.
- Oil should be changed at least every 3 months or more often if there are any adverse atmospheric conditions or other conditions which might contaminate or break down the oil.

## Liquid end

## To disassemble the liquid end

1. Drain pumpage from pump and pipe line. Disconnect auxiliary lubrication lines, suction and discharge pipe line connections. Uncouple pump from driver.

**WARNING:** When handling hazardous and/or toxic fluids, proper personal protective equipment should be worn. If pump is being drained, precautions must be taken to prevent physical injury. Pumpage must be handled and disposed of in conformance with applicable environment regulations.

2. Remove cap screws or bolts which fasten suction disc (182)to casing (100).
3. Remove suction disc (182) and suction disc liner (100B) from casing fit.
4. Impeller (101) is threaded onto shaft (122). Remove impeller by restraining coupling end of shaft and turning impeller in the operating direction of rotation. Do not apply heat.

**NOTICE:**
If impeller is frozen on shaft, restrain the impeller, attach a spanner wrench to coupling end of shaft, and give the wrench a sharp blow.

**WARNING:** ⟨Ex⟩ Do not apply heat to hub or nose of threaded impeller. There is a danger of explosion.

5. Remove cap screws or bolts which fasten casing (100) to hub disc (184). Slide casing from hub disc fit.
6. Disassemble gland (107) from stuffing box.
7. Remove bolts which fasten hub disc (184) and bearing frame (228). Carefully pull hub disc from shaft sleeve (126). Packing (106) and seal cage (105) may be left in stuffing box during disassembly of hub disc.
8. Pull or drive shaft sleeve (126) from shaft (100) if replacement is necessary.

# To assemble the liquid end

1. Shaft (122) and shaft sleeve (126) must be clean and free of burrs. Install sleeve (126) on shaft.
2. Carefully guide hub disc (184) stuffing box over impeller end of shaft. Secure hub disc (184) to bearing frame (228) with bolts (370C).
3. Position casing (100) with gasket into hub disc (184) fit. Be sure discharge is in proper orientation. Fasten casing to hub disc with cap screws (370J).
4. Install impeller (101) with gasket onto shaft (100) Drawing impeller tight on shaft threads firmly secures shaft sleeve. Seal sleeve to impeller with RTV silicone.
5. Place suction disc liner (100B) into casing fit. With O-ring (412F) in position on liner O.D., install suction disc (182). Fasten suction disc to casing with cap screws (370E).
6. Set impeller clearance according to section Impeller Clearance in the bearing section of this manual.

**WARNING:**

⟨Ex⟩ Improper impeller adjustment could cause contact between the rotating and stationary parts, resulting in a spark and heat generation.

⟨Ex⟩ The impeller clearance setting procedure must be followed. Improperly setting the clearance or not following any of the proper procedures can result in sparks, unexpected heat generation and equipment damage.

7. Install packing (106), seal cage (105) and gland (107). Refer to assembly drawing for proper packing sequence and to section Stuffing Boxes in the General Instructions.
8. Install pump half of coupling or sheave. Realign pump and driver. Connect pump section and discharge to pipe line. Connect auxiliary lubrication lines.
9. Start-up instructions. Refer to General Instructions

# Power end

## “J ” type bearing

The “J” type bearing assembly uses medium-heavy ball bearings. On the small size “J” bearings, double row ball bearings are used for combined loading. The larger sizes utilize separate radial and thrust ball bearings. Adjustment of nose clearance can be easily accomplished without bearing disassembly.

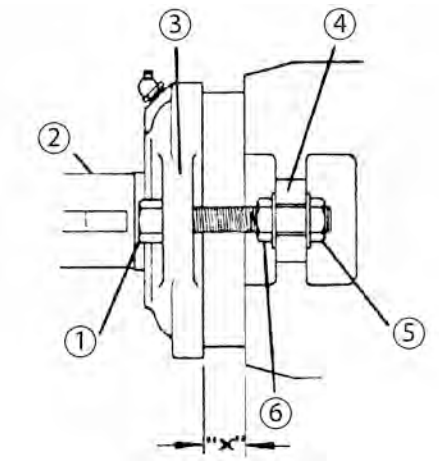
# Impeller clearances

**WARNING:**

Improper impeller adjustment could cause contact between the rotating and stationary parts, resulting in a spark and heat generation.

The impeller clearance setting procedure must be followed. Improperly setting the clearance or not following any of the proper procedures can result in sparks, unexpected heat generation and equipment damage.

To maintain maximum operating efficiency, a uniform 0.396mm - 0.792mm | 1/64" - 1/32" clearance between the parallel surfaces of suction disc liner (100B) and the nose of the impeller (101) is necessary. The clearance is adjusted by moving shaft (122) toward or away from suction disc liner (100B). There are adjusting lugs cast on bearing frame (228) and thrust bearing housing (134A). Studs (356A) threaded into thrust bearing housing lugs fit through the slots of bearing frame lugs. Jam nuts on studs, located on both sides of the frame lugs, are used to adjust and fasten the thrust bearing housing relative to the bearing frame.




1. Adjusting stud (356A)
2. Shaft (122)
3. Bearing housing lug
4. Bearing frame lug
5. Inboard jam nut (415)
6. Outboard jam nut (415)

**Figure 12: Impeller clearance**

## Methods to determine impeller nose clearance

### During Installation Or Repair

With a feeler gauge, measure the gap between the nose of the impeller and the casing liner on the suction side.

### During Normal Service

Move impeller toward suction side of casing liner until parallel surfaces slightly rub. Measure “X” dimension and add the recommended impeller nose clearance. Adjust dimension “X” per “Impeller Clearance Adjustment

Procedure.”

### Impeller Clearance Adjustment Procedure

1. Turn stud jam nuts at the bearing frame lugs to drive the shaft assembly in the desired direction. Moving shaft (122) toward suction side casing liner will decrease the clearance
2. To decrease impeller clearance, loosen outboard jam nut and drive the shaft assembly by turning the inboard jam nut.

3. When desired clearance is reached, tighten outboard jam nut securely. Check clearance after tightening.
4. To increase impeller clearance, loosen inboard jam nut and drive the shaft assembly by turning the outboard jam nut.

**CAUTION:** Jam nuts on both sides of bearing frame lugs must be secure. Normal impeller thrust will tend to decrease the impeller clearance. Impeller rubbing will result from insufficient jam nut tightening.

**Conditions Requiring Adjustments**

1. Overheated thrust bearings may develop from uneven adjustment of jam nuts. Check lubrication.
2. Noise, vibration and wear may result from the impeller rubbing on the suction or hub side casing liners. Adjust impeller clearance.
3. Poor performance and wear may result from excessive impeller clearance at the suction side casing liner.

**NOTICE:** Lubricate adjusting studs (356A) for easy maintenance.

# Maintenance of Bearings

## Bearing lubrication and care

Ⓔx Bearings must be lubricated properly in order to prevent excess heat generation, sparks, and premature failure.

Ⓔx The Preventive Maintenance section must be adhered to in order to keep the applicable ATEX classification of the equipment. Failure to follow these procedures will void the ATEX classification for the equipment.

Ⓔx Throughout this section on bearing lubrication, different pumpage temperatures are listed. If the equipment is ATEX certified and the listed temperature exceeds the applicable value shown in Table 1 under ATEX identification, then that temperature is not valid. Should this situation occur, please consult with your ITT/Goulds representative.

**CAUTION:** Ⓔx Operation of the unit without proper lubrication will cause bearing failure, and pump seizure.

## Oil lubrication

When the pump is furnished with oil lubrication, a good grade of oil should be used to ensure long bearing life.

**NOTICE:** Pumps furnished for oil lubrication are shipped without oil. Add oil until the level is up to the oil level line before the unit is started.

If too much oil is added, there will be excessive heat generated in the bearings and there may be leakage from the shaft seals. We recommend a commercial oil such as Mobil D.T.E. oil, B.B., Tellus 41 or equal. However, a good grade of #30 or #40 weight is satisfactory for normal temperatures.

For best results, the weight of the oil lubricant should be adjusted for the normal operating temperature as follows:

| | |
|---|---|
| To 60°C \| 150ºF | SAE 20 |
| To 71°C \| 160ºF | SAE 30 |

| | |
|---|---|
| To 79°C \| 175ºF | SAE 40 |
| To 93°C \| 200ºF | SAE 50 |

## Grease lubrication

When the pump is furnished for grease lubrication, the pump will be shipped with the bearings hand-packed with Mobilux #2 grease, unless otherwise specified by the customer. Other suitable greases are Humble Lidok #2, Texaco Regal Starfak #2, and Shell Alvania #2. If another brand is desired, it should be checked with the supplier to determine if it is equivalent to the above.

### Installing A Bearing

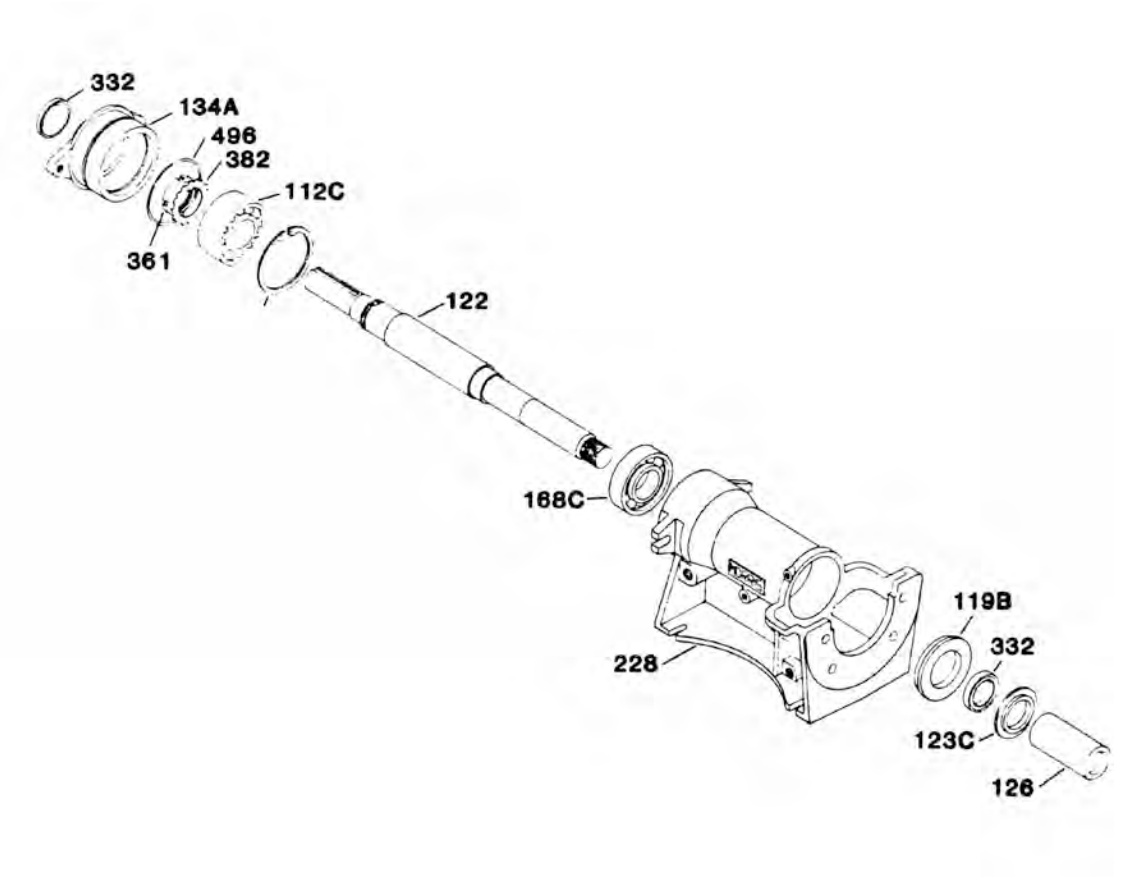
The bearings have sufficient grease for at least 24 hours of operation after start-up. The bearings will run hotter than normal for the first few hours until the grease is worked out of the ball path and the bearings have “run in”. Adding more grease during this period may increase the bearing temperature.

After the first regreasing, a small amount of grease should be added at each fitting every 500 hours of operation.

### Normal Bearing Temperature

Long bearing life is quite dependent on careful handling of a bearing when it is out of the housing and during the installation procedure. Dirt and rough handling are prime enemies of precision bearings. Bearings should be pressed, not “hammered” into place. If heat is used to facilitate the installation, a hot oil bath is the best method. Bearings for grease lubrication should be hand-packed with grease to ensure adequate lubrication at start-up.

**NOTICE:** The shaft seals above each bearing should be oiled with a few drops of #30 oil before the pump is started to ensure lubrication of the seal lip.




332 - Thrust bearing seal
134A - Thrust bearing housing
496 - Seal ring
382 - Thrust bearing lockwasher
112C - Thrust bearing
122 - Shaft
119B - Radial bearing retainer
332 - Radial bearing seal
126 - Shaft sleeve
123C - Radial bearing slinger
228 - Bearing frame
168C - Radial bearing
361 - Thrust bearing snap ring
136 - Thrust bearing locknut

**Figure 13: J bearing (1J - 4J)**

The running temperature for a bearing assembly depends on many factors such as speed, bearing loads, ambient air temperature, and condition of bearings. Temperatures higher than the human hand can tolerate are very satisfactory for good bearing operation and should not cause alarm.

For a given speed and loading, the bearing housing temperature will stabilize at some temperature, usually below 93°C | 200ºF, which will be the normal temperature for that installation. Higher temperatures than this normal temperature, without any change in speed or loading, can mean a lubrication difficulty or the approach of a bearing failure.

# To disassemble the “J” bearing

For the purpose of these instructions, assume the JC liquid end has been disassembled, including suction disc (182), suction disc liner (100B), impeller (101), casing (100), hub disc (184), stuffing box components, and shaft sleeve (126).

1. Pull pump coupling half or sheave from drive end of shaft.
2. Remove radial bearing slinger (123C) from shaft.
3. Remove jam nuts from adjusting studs (356A) which fasten bearing frame (228) and thrust bearing housing (134A). Carefully pull the shaft (122), bearings, and thrust bearing housing (134A) from the drive end of bearing frame (228). Support both ends of the shaft assembly to prevent seal and bearing damage.
4. Detach thrust bearing snap ring (361) from thrust bearing housing (134A). Slide housing over thrust bearing.

**NOTICE:**
See illustrations for specific thrust bearing configuration.

5. Remove thrust bearing locknut (136) and lockwasher (382).
6. Press or pull radial bearing (168C) from shaft (122). Apply pulling force to inside bearing race only.
7. Press or pull thrust bearing arrangement from shaft (122). For double row ball thrust bearing (112C), apply pulling force to inside race only. For two-bearing thrust arrangement, apply pulling force to inside race of thrust bearing (112D). The thrust bearing (112D), thrust bearing collar (237), and radial bearing (112C) will be removed.
8. Do not remove radial bearing retainer (119B) from bearing frame (228). A factory press fit insures a permanent installation.

# To assemble the “J” bearing

1. The shaft (122), thrust bearing housing (134A) and bearings must be clean and free of burrs.
2. To assemble thrust bearing arrangement:
   a) Double row ball thrust bearing: (1J-4J)
      1. Heat thrust bearing (112C) in 82°C | 180º F oil bath.
      2. Slide thrust bearing (112C) onto shaft (122) firmly against shaft shoulder.
      3. Install lockwasher (382) and locknut (136) before bearing cools. When bearing cools to room temperature, retighten locknut and secure lockwasher tang.
   b) Separate thrust (112C) and radial (112D) bearings on thrust end (5J):
      1. Heat thrust bearing (112D) in 82°C | 180º F oil bath and install on shaft (122) firmly against shaft shoulder.
      2. Heat thrust bearing collar (237) in oil bath and install shaft against inner thrust bearing inner race.
      3. Heat radial bearing (112C) in oil bath and install on shaft with inner race against thrust collar (237).
      4. Install lockwasher (382) and locknut (136) before bearings cool. When bearings cool to room temperature, retighten locknut and secure with lockwasher tang.
3. To install thrust bearing housing (134A):
   a) Double row ball thrust bearing:
      1. Lubricate seal (332) and O-ring (496) on thrust bearing housing (134A).
      2. Carefully slide housing (134A) onto shaft (122) over thrust bearing.
      3. Secure housing (134A) with thrust bearing snap ring (361).

b) Separate thrust (112D) and radial (112C) bearings on thrust end.
   1. Lubricate seal (332) and O-ring (496) on thrust bearing housing.
   2. Carefully slide housing (134A) onto shaft and bearings until housing shoulder bottoms on outer race of radial bearing (112C).
   3. Install thrust bearing snap ring (361) into ring groove of housing.
   4. With feeler gauge, measure clearance between snap ring (361) and outer race of thrust bearing (112D). The clearance should be 0.010mm - 0.026mm | .004" - .010 at **G** gap.
   5. From the feeler gauge measurement, subtract .007. The resulting dimension is the thickness of shims (331) at **S** gap.
   6. Remove snap ring. Pull housing (134A) and install calculated shim pack (331) against housing shoulder. Reinstall housing and snap ring.

4. Heat radial bearing (168C) in 82°C | 180º F oil bath. Slide radial bearing onto shaft (122) firmly against shaft shoulder. Allow bearing to cool to room temperature before further assembly.

---

**NOTICE:**
Radial retainer permanently pressed into bearing frame (228) at factory.

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5. Lubricate seal 332 in radial bearing retainer (119B). Carefully insert the shaft/bearing assembly into the bearing frame (228) from the drive end. Guide the threaded end of the shaft through seal (332) in retainer (119B). As the thrust bearing housing (134A) enters the bearing frame bore, align adjusting lugs on the frame and housing.
6. Loosely install adjusting studs (356A) in adjusting lugs. Do not tighten.
7. Install radial bearing slinger (123C).

# Spare Parts

## Ordering spare parts

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

Parts orders will be handled most promptly if the following directions are followed.

1. Include pump model and size and its serial number as shown on the nameplate.
2. For each part required, include the name and part number.
3. State the quantity required for each part.
4. Provide complete shipping instructions.

## Recommended spares

The following are recommended spare parts.

- 1 Suction Liner (100B)
- 1 Impeller (101)
- 1 Lantern Ring (105)
- 5 Packing Rings (106)
- 1 Thrust Bearing (112C)
- 1 Shaft Sleeve (126)
- 1 Radial Bearing (168C)
- 1 Parts Kit, see chart

| Parts Kit Chart | |
|---|---|
| Pump Size | Kit Number |
| 1×1.5-8, 1.5×2-8, 2×3-8 | 520101 |
| 1×1.5-11, 1.5×2-11, 2×3-11 | 520102 |
| 1.5×2-14, 2×3-14 | 520103 |
| 3×4-11 | 520104 |
| 3×4-14, 4×6-14 | 520105 |
| 6×6-14 HS | 520106 |
| 6×6-14 LS | 520107 |
| 8×10-18 | 520108 |
| 10×12-22 | 520109 |

Parts Kits include thrust bearing locknut, lockwasher and snap ring, grease seals, and required gaskets and/or O-rings.

## Parts list

| TYPICAL | | | |
|---|---|---|---|
| Item | QTY/Pump | Part Name | Alternate Part Name |
| 100 | 1 | Casing | |
| 100B | 1 | Suction Liner | Suction Disc Liner |
| 101 | 1(2) | Impeller | |
| 105 | 1 | Lantern Ring | Seal Cage |
| 106 | 5 | Packing Ring | |
| 107 | 1 | Gland | |
| 112C | 1 | Thrust Bearing | |
| 119B | 1 | End Cover | Bearing Retainer |
| 122 | 1 | Shaft | |
| 123C | | Deflector | Slinger |

| | | | |
|---|---|---|---|
| 126 | 1(2) | Shaft Sleeve | |
| 134A | 1 | Bearing Housing | |
| 136 | 1 | Locknut | |
| 168C | 1 | Radial Bearing | |
| 182 | 1 | Suction Cover | Suction Disc |
| 184 | 1 | Stuffing Box Cover | Hub Disc |
| 193B | 2 | Grease Fitting | |
| 222 | 1 | Set Screw | |
| 228 | 1 | Bearing Frame | |
| 332 | 3 | Grease Seal | |
| 351 | 1(1) | Gasket | |
| 353 | 2 | Stud, Gland | |
| 355 | 2 | Hex Nut | |
| 356A | 2 | Stud | |
| 361 | 1 | Snap Ring | |
| 370C | 4 | H Cap Screw | |
| 370E | 8 | H Cap Screw | |
| 370J | 8 | H Cap Screw | |
| 382 | 1 | Lockwasher | |
| 400 | 1 | Key | |
| 408 | 1 | Pipe Plug | |
| 412F | 1 | O-Ring | |
| 415 | 4 | Hex Jam Nut | |
| 496 | 1 | O-Ring | |
| 528J | 2 | Washer, 353 | |
| 528K | 8 | Washer, 370E | |
| 528L | 8 | Washer, 370j | |
| 528P | 4 | Washer, 356A | |

**NOTICE:**

1. Buna-N O-Ring 496A replaces gasket 351 on sizes 6x6-14 and 8x10-18.
2. Sleeve 126 is sealed to impeller 101 with RTV silicone. All Sizes Except 10x12-22 Grease Lube Bearings.

# JC sectional view

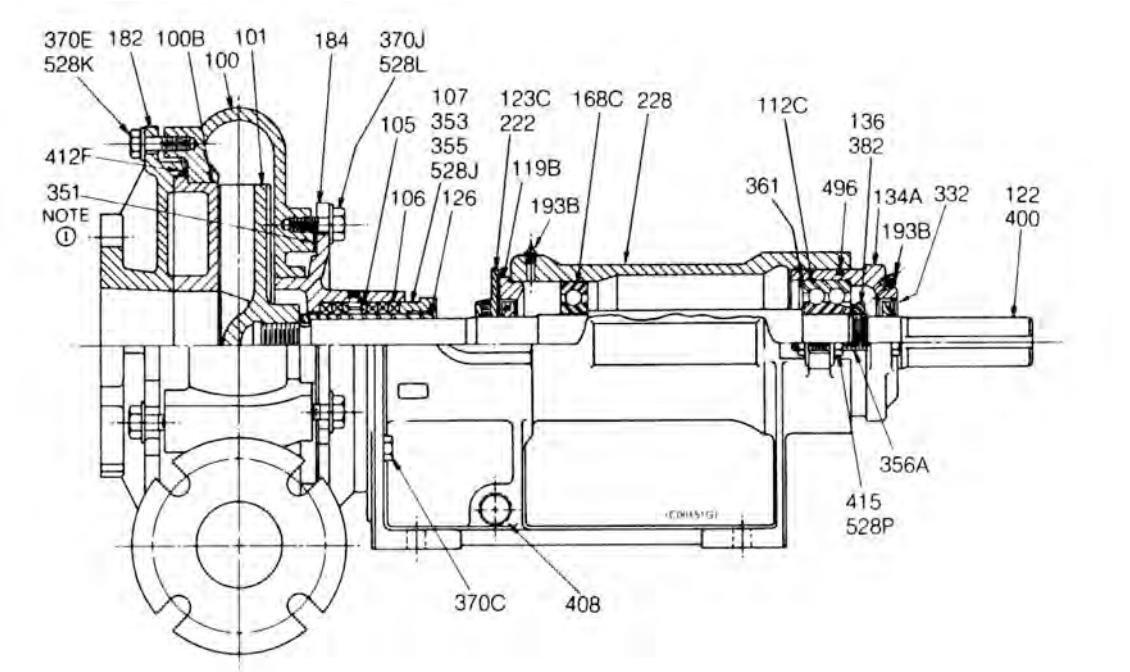


**Figure 14: Model JC Sectional Assembly - all sizes except 10x12-22, Grease Lube 1J, 2J, 3J, 4J Bearings**

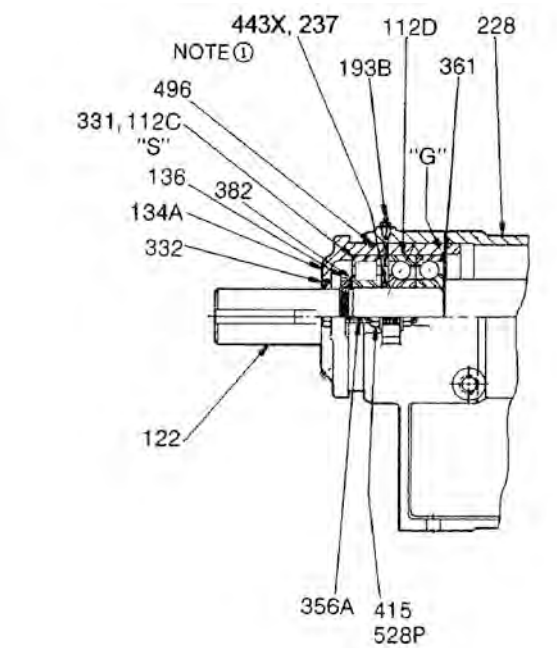


**Figure 15: Grease lubrication - Size 10x12-22, 5J**

# Appendix

## Special instructions

### Kaolin service - KJC pumps optimum impeller running clearance

The optimum impeller running clearance is the minimum clearance that will not significantly increase the input horsepower from the shear rate induced drag at the suction disc liner. For most liquids or slurries, the optimum performance of the JC pump is achieved with the impeller almost rubbing against the suction disc. Increasing this clearance causes more internal leakage around the impeller vanes, which results in decreased performance.

When pumping kaolin clay, the decrease in pump head from the internal leakage can be more than offset by the decrease in horsepower such that the overall performance is increased. The optimum clearance is set by adjusting the pump, when it is running, using a discharge pressure gauge and ammeter to monitor the results.

During an adjustment to reduce the clearance, the clearance has become too small when the percentage increase in motor amperes exceeds the percentage increase in discharge pressure. The opposite is true when increasing the clearance. The adjustment can be made without a pressure gauge, but it will be less accurate though perhaps satisfactory for the application.

If the slurry percentage solids varies frequently, it may be more practical to adjust the clearance for the most difficult to pump slurry and not change it for the other concentration.

## Expeller

#### General

Ⓔx Dynamic seals are not allowed in an ATEX classified environment.

To meet the high demand for waterless sealing of stuffing boxes in slurry pumps, Ashland Operations/Goulds has added an expeller to the JC line. Using its basic bearing and wetted end configuration, the JC now incorporates a hub disc that has been enlarged to allow for the expeller option.

When operating at normal design conditions, the expeller reduces the pressure usually present in conventional end suction pump stuffing boxes to zero (0). Theoretically, the only need for a packed stuffing box in expeller pumps is to seal the casing when the unit is shut-down or running at restricted flows.

**WARNING:** Important: Before performing any work, ensure electrical supply is locked out.

#### Clearance Adjustment

The impeller clearance in the JC pump with optional expeller should be maintained at .015² from the face of the impeller (101) to the suction cover liner (100B). Adjust this clearance as often as necessary in order to maintain efficient pump performance.

**NOTICE:** Ensure that the impeller is tightened on the shaft prior to clearance adjustment.

#### To Disassemble The Liquid End

1. Remove bolts (370E) that fasten the suction cover 182 to the casing (100). Remove the O-Ring (412F) and the suction cover liner (100B). A gentle tap about the circumference of the liner may facilitate removal of the liner.
2. Remove the impeller (101) by securing it with a wooden or soft metal block and turn the shaft in the counter-clockwise direction facing the pump drive end from the motor. The

reverse of this procedure is also possible. By securing the shaft, strike the impeller in the counter-clockwise direction using a lead or composite mallet.

**WARNING:** Do not apply heat to the impeller.

1. Remove the casing (100), expeller (262) and hub disc (expeller housing) (184) as one unit by only removing bolts (370C) that fasten this assembly to the bearing frame. Leave the packing and seal cage in the stuffing box to protect the sleeve and carefully slide the whole unit until it is clear of the shaft.
2. Remove bolts (370J) to expose the expeller for inspection.

**To Assemble The Wetted End**

1. Assemble the casing (100), expeller (262) and hub disc (184) using bolts (370J) prior to installation on the bearing frame.
2. Insert the shaft sleeve into the packed stuffing box so it engages with the recess in the expeller. This will act as a guide and center the expeller until the impeller can be installed.
3. Prior to sleeve installation on the shaft, apply a bead of silastic or silicon sealant on the expeller hub faces to seal the rotor assembly.
4. Carefully slide the whole assembly on to the shaft using the sleeve as a guide until the hub disc is aligned with the fit and bolt holes in the bearing frame.
5. Secure with bolts (370C).
6. Install the impeller by turning it in the clockwise direction taking care to tighten it against the expeller and shaft sleeve prior to clearance adjustment. Apply anti-seize or grease to threads of shaft to make future removal easier.
7. Replace the suction cover liner after applying a liberal amount of anti-seize compound or grease on the outer shoulder. This will also make removal easier in the future.
8. Install O-Ring (412F).0
9. Replace suction end cover (182) with bolts (370E). Only apply a moderate torque to tighten.
10. Check impeller clearance.

**Lubrication**

To lubricate the seals and purge the stuffing box, use a general purpose waterproof grease. Several shots of grease should be added to the stuffing box, as little as every three operating days or as much as every four operating hours, depending upon the severity of the pumpage abrasiveness. In addition, grease should be added prior to every tenth start-up.

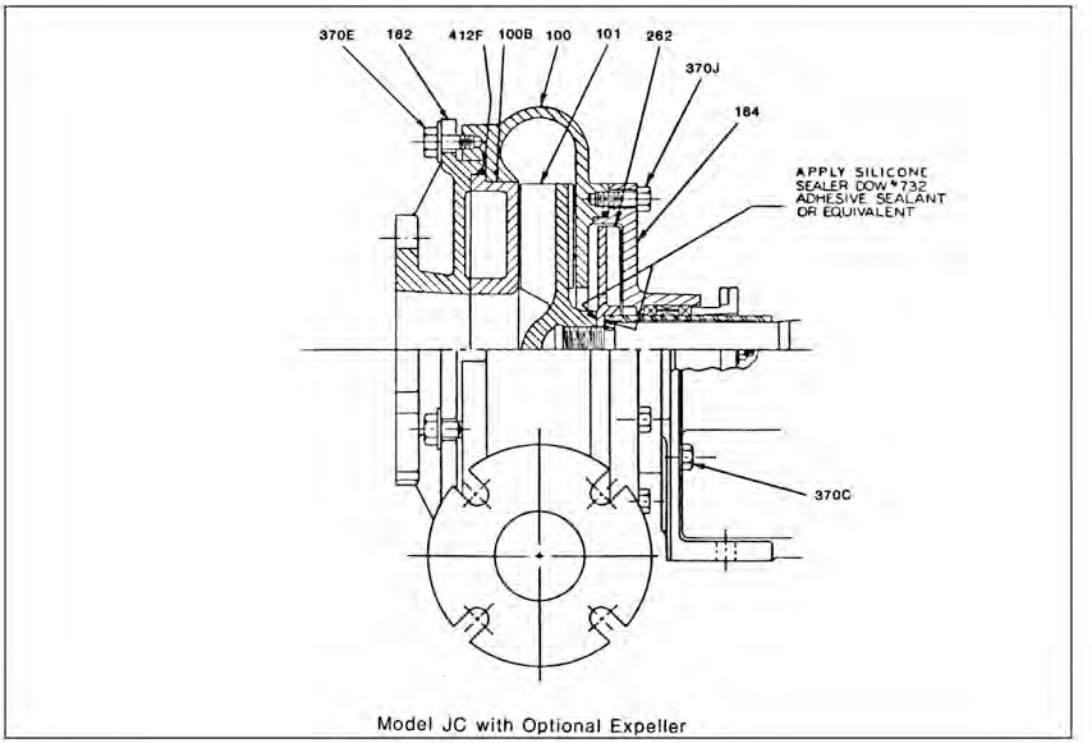


**Figure 16: Model JC with optional expeller**

## How to order

When ordering parts call 1-800-446-8537 or your local Goulds Representative

## Emergency service

Emergency parts service is available 24 hours/day, 365 days/year.
Call 1-800-446-8537
Visit our website at *http://www.gouldspumps.com*

Visit our website for the latest version of this document and more information:
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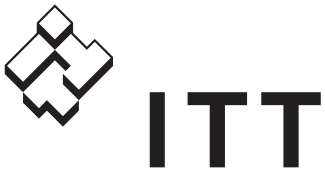

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