

 **GOULDS PUMPS**

Installation, Operation, and Maintenance Manual

Model 5500



ITT

ENGINEERED FOR LIFE

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Introduction and Safety

Introduction

Purpose of this manual

The purpose of this manual is to provide necessary information for:

- Installation
- Operation
- Maintenance



CAUTION:

Failure to observe the instructions contained in this manual could result in personal injury and property damage, and may void the warranty. Read this manual carefully before installing and using the product.

NOTICE:

Save this manual for future reference and keep it readily available.

Requesting other information

Special versions can be supplied with supplementary instruction leaflets. See the sales contract for any modifications or special version characteristics. For instructions, situations, or events that are not considered in this manual or in the sales documents, please contact the nearest ITT representative.

Always specify the exact product type and identification code when requesting technical information or spare parts.

Safety



WARNING:

- The operator must be aware of the pumpage and take appropriate safety precautions to prevent physical injury.
 - Risk of serious injury or death. If any pressure-containing device is over-pressurized, it can explode, rupture, or discharge its contents. It is critical to take all necessary measures to avoid over-pressurization.
 - Risk of death, serious personal injury, and property damage. Installing, operating, or maintaining the unit using any method not prescribed in this manual is prohibited. Prohibited methods include any modification to the equipment or use of parts not provided by ITT. If there is any uncertainty regarding the appropriate use of the equipment, please contact an ITT representative before proceeding.
 - Risk of serious personal injury. Applying heat to impellers, propellers, or their retaining devices can cause trapped liquid to rapidly expand and result in a violent explosion. This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Never apply heat to aid in their removal unless explicitly stated in this manual.
 - Risk of serious personal injury or property damage. Dry running may cause rotating parts within the pump to seize to non-moving parts. Do not run dry.
 - Running a pump without safety devices exposes operators to risk of serious personal injury or death. Never operate a unit unless appropriate safety devices (guards, etc.) are properly installed. See specific information about safety devices in other sections of this manual.
 - Risk of death, serious personal injury, and property damage. Heat and pressure buildup can cause explosion, rupture, and discharge of pumpage. Never operate the pump with suction and/or discharge valves closed.
 - Never operate the pump with the suction valve closed.
 - Precautions must be taken to prevent physical injury. The pump may handle hazardous and/or toxic fluids. Proper personal protective equipment should be worn. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.
 - If the pump or motor is damaged or leaking, electric shock, fire, explosion, liberation of toxic fumes, physical harm, or environmental damage may result. Do not operate the unit until the problem has been corrected or repaired.
-



CAUTION:

Failure to observe the instructions contained in this manual could result in personal injury and property damage, and may void the warranty. Read this manual carefully before installing and using the product.

Risk of injury and/or property damage. Operating a pump in an inappropriate application can cause over pressurization, overheating, and/or unstable operation. Do not change the service application without the approval of an authorized ITT representative.

NOTICE:

Save this manual for future reference and keep it readily available.




Safety terminology and symbols

About safety messages

It is extremely important that you read, understand, and follow the safety messages and regulations carefully before handling the product. They are published to help prevent these hazards:

- Personal accidents and health problems
- Damage to the product
- Product malfunction

Hazard levels

Hazard level	Indication
 DANGER:	A hazardous situation which, if not avoided, will result in death or serious injury
 WARNING:	A hazardous situation which, if not avoided, could result in death or serious injury
 CAUTION:	A hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE:	<ul style="list-style-type: none"> • A potential situation which, if not avoided, could result in undesirable conditions • A practice not related to personal injury

Hazard categories

Hazard categories can either fall under hazard levels or let specific symbols replace the ordinary hazard level symbols.

Electrical hazards are indicated by the following specific symbol:



Electrical Hazard:

These are examples of other categories that can occur. They fall under the ordinary hazard levels and may use complementing symbols:

- Crush hazard
- Cutting hazard
- Arc flash hazard

Environmental safety

The work area

Always keep the station clean to avoid and/or discover emissions.

Waste and emissions regulations

Observe these safety regulations regarding waste and emissions:

- Appropriately dispose of all waste.
- Handle and dispose of the processed liquid in compliance with applicable environmental regulations.
- Clean up all spills in accordance with safety and environmental procedures.
- Report all environmental emissions to the appropriate authorities.



WARNING:

If the product has been contaminated in any way, such as from toxic chemicals or nuclear radiation, do NOT send the product to ITT unless it has been properly decontaminated.

Electrical installation

For electrical installation recycling requirements, consult your local electric utility.

Recycling guidelines

Always follow local laws and regulations regarding recycling.

User safety

General safety rules

These safety rules apply:

- Always keep the work area clean.
- Pay attention to the risks presented by gas and vapors in the work area.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.

Safety equipment

Use safety equipment according to the company regulations. Use this safety equipment within the work area:

- Helmet
- Safety goggles, preferably with side shields
- Protective shoes
- Protective gloves
- Gas mask
- Hearing protection
- First-aid kit
- Safety devices

Electrical connections

Electrical connections must be made by certified electricians in compliance with all international, national, state, and local regulations. For more information about requirements, see sections dealing specifically with electrical connections.

Precautions before work

Observe these safety precautions before you work with the product or are in connection with the product:

- Provide a suitable barrier around the work area, for example, a guard rail.
- Make sure that all safety guards are in place and secure.
- Allow all system and pump components to cool before you handle them.
- Make sure that you have a clear path of retreat.
- Make sure that the product cannot roll or fall over and injure people or damage property.
- Make sure that the lifting equipment is in good condition.
- Use a lifting harness, a safety line, and a breathing device as required.
- Make sure that the product is thoroughly clean.
- Make sure that there are no poisonous gases within the work area.
- Make sure that you have quick access to a first-aid kit.
- Disconnect and lock out power before servicing.
- Check the explosion risk before you weld or use electric hand tools.

Precautions during work

Observe these safety precautions when you work with the product or are in connection with the product:

**CAUTION:**

Failure to observe the instructions contained in this manual could result in personal injury and property damage, and may void the warranty. Read this manual carefully before installing and using the product.

- Never work alone.
- Always wear protective clothing and hand protection.
- Stay clear of suspended loads.
- Always lift the product by its lifting device.
- Beware of the risk of a sudden start if the product is used with an automatic level control.
- Beware of the starting jerk, which can be powerful.
- Rinse the components in water after you disassemble the pump.
- Do not exceed the maximum working pressure of the pump.
- Do not open any vent or drain valve or remove any plugs while the system is pressurized. Make sure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.
- Never operate a pump without a properly installed coupling guard.
- Always bear in mind the risk of drowning, electrical accidents, and burn injuries.
- Always wear protective gloves. The pump and condition monitor can be hot.

Hazardous liquids

The product is designed for use in liquids that can be hazardous to your health. Observe these rules when you work with the product:

- Make sure that all personnel who work with biologically hazardous liquids are vaccinated against diseases to which they may be exposed.
- Observe strict personal cleanliness.
- A small amount of liquid will be present in certain areas like the seal chamber.

Wash the skin and eyes

1. Follow these procedures for chemicals or hazardous fluids that have come into contact with your eyes or your skin:

Condition	Action
Chemicals or hazardous fluids in eyes	<ol style="list-style-type: none"> 1. Hold your eyelids apart forcibly with your fingers. 2. Rinse the eyes with eyewash or running water for at least 15 minutes. 3. Seek medical attention.
Chemicals or hazardous fluids on skin	<ol style="list-style-type: none"> 1. Remove contaminated clothing. 2. Wash the skin with soap and water for at least 1 minute. 3. Seek medical attention, if necessary.

Safety regulations for Ex-approved products in potentially explosive atmospheres**Description of ATEX**

The ATEX directives are a specification enforced in Europe for electrical and non-electrical equipment. ATEX deals with the control of potentially explosive atmospheres and the standards of equipment and protective systems used within these atmospheres. The relevance of the ATEX requirements is not limited to Europe. You can apply these guidelines to equipment installed in any potentially explosive atmosphere.

Guidelines for compliance

Compliance is only fulfilled when the pump is operated within its intended use, for example within its intended hydraulic range. The conditions of the service must not be changed without approval of an authorized ITT representative. When installing or maintaining explosion-proof pumps, follow these guidelines:

- Always install ATEX-approved equipment in compliance with the directive and applicable standards (IEC/EN 60079–14).
- Do not install explosion proof products in locations that are classified as hazardous in the national electric code, ANSI/NFPA 70–2005.






WARNING:

Risk of serious personal injury. Applying heat to impellers, propellers, or their retaining devices can cause trapped liquid to rapidly expand and result in a violent explosion. This manual clearly identifies accepted methods for disassembling units. These methods must be adhered to. Never apply heat to aid in their removal unless explicitly stated in this manual.

If there are any questions regarding these requirements, the intended use, or if the equipment requires modification, contact an ITT representative before you proceed.

Personnel requirements

ITT disclaims all responsibility for work done by untrained and unauthorized personnel. These are the personnel requirements for Ex-approved products in potentially explosive atmospheres:

-  All work on the product must be carried out by certified electricians and ITT-authorized mechanics. Special rules apply to installations in explosive atmospheres.
-  All users must know about the risks of electric current and the chemical and physical characteristics of the gas and/or vapor present in hazardous areas.
-  Any maintenance for Ex-approved products must conform to international and national standards (for example IEC/EN 60079-17).

Product and product handling requirements

These are the product and product handling requirements for Ex-approved products in potentially explosive atmospheres:

- Only use the product in accordance with the approved motor data stated on the nameplates.
- The Ex-approved product must never run dry during normal operation. Dry running during service and inspection is only permitted outside the classified area.
- Never start a pump without the proper priming.
- Before you start working with the product, make sure that the product and the control panel are isolated from the power supply and the control circuit, so they cannot be energized.
- Do not open the product while it is energized or in an explosive gas atmosphere.
- Make sure that thermal contacts are connected to a protection circuit according to the approval classification of the product.
- Intrinsically safe circuits are normally required for the automatic level-control system by the level regulator if mounted in zone 0.
- The yield stress of fasteners must be in accordance with the approval drawing and the product specification.
- Make sure that the equipment is properly maintained:
 - Monitor the pump components and the end temperature of the liquid.
 - Maintain proper bearing lubrication.
- Do not modify the equipment without approval from an authorized ITT representative.
- Only use parts that have been provided by an authorized ITT representative.

Equipment for monitoring

For additional safety, use condition-monitoring devices. Condition-monitoring devices include but are not limited to these devices:

- Pressure gauges

- Flow meters
- Level indicators
- Motor load readings
- Temperature detectors
- Bearing monitors
- Leak detectors
- PumpSmart control system

Product approval standards

Regular standards



WARNING:

Use of equipment unsuitable for the environment can pose risks of ignition and/or explosion. Ensure that the code classifications on the pump are compatible with the specific environment in which the equipment is to be installed. If they are not compatible, do not operate the equipment and contact an ITT representative before proceeding.

All standard products are approved according to CSA standards in Canada and UL standards in USA. The drive unit degree of protection follows IP68. See the nameplate for maximum submersion, according to standard IEC 60529.

All electrical ratings and performance of the motors comply with IEC 600341.

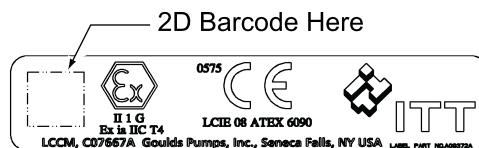
Explosion-proofing standards

All explosion-proof products for use in explosive atmospheres are designed in compliance with one or more of the following approvals:

- EN, ATEX Directive 94/9/EC
- FM According to NEC
 - Class 1 Div 1 Groups “C”, and “D”
 - Class 2 Div 1 Groups “E”, “F”, and “G”
 - Class 3 Div 1 Hazardous Locations

ATEX/IECEx:

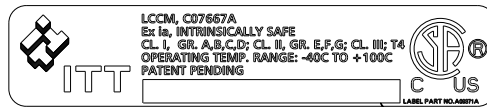
- Group: IIC
- Category: Ex ia
- Temperature Class: T4 (for ambients up to 100°C)
- ATEX Marking: Ex II 1 G



CSA certification

Intrinsically safe for:

- Class I, Div. 1, Groups A, B, C, D
- Class II, Div. 1, Groups E, F, G
- Class III
- Certified to Canadian and US requirements



SERIAL NO& YEAR OF
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Product warranty

Coverage

ITTT undertakes to remedy faults in products from ITTT under these conditions:

- The faults are due to defects in design, materials, or workmanship.
- The faults are reported to an ITTT representative within the warranty period.
- The product is used only under the conditions described in this manual.
- The monitoring equipment incorporated in the product is correctly connected and in use.
- All service and repair work is done by ITTT-authorized personnel.
- Genuine ITTT parts are used.
- Only Ex-approved spare parts and accessories authorized by ITTT are used in Ex-approved products.

Limitations

The warranty does not cover faults caused by these situations:

- Deficient maintenance
- Improper installation
- Modifications or changes to the product and installation made without consulting ITTT
- Incorrectly executed repair work
- Normal wear and tear

ITTT assumes no liability for these situations:

- Bodily injuries
- Material damages
- Economic losses

Warranty claim

ITTT products are high-quality products with expected reliable operation and long life. However, should the need arise for a warranty claim, then contact your ITTT representative.

Transportation and Storage

Inspect the delivery

Inspect the package

1. Inspect the package for damaged or missing items upon delivery.
2. Note any damaged or missing items on the receipt and freight bill.
3. File a claim with the shipping company if anything is out of order.
If the product has been picked up at a distributor, make a claim directly to the distributor.

Inspect the unit

1. Remove packing materials from the product.
Dispose of all packing materials in accordance with local regulations.
2. Inspect the product to determine if any parts have been damaged or are missing.
3. If applicable, unfasten the product by removing any screws, bolts, or straps.
For your personal safety, be careful when you handle nails and straps.
4. Contact your sales representative if anything is out of order.

Transportation guidelines

Precautions



WARNING:

- Stay clear of suspended loads.
 - Observe accident prevention regulations in force.
-

Pump handling



WARNING:

Dropping, rolling or tipping units, or applying other shock loads, can cause property damage and personal injury. Ensure that the unit is properly supported and secure during lifting and handling.



CAUTION:

Risk of injury or equipment damage from use of inadequate lifting devices. Ensure lifting devices (such as chains, straps, forklifts, cranes, etc.) are rated to sufficient capacity.

Lifting methods



WARNING:

- Risk of serious personal injury or equipment damage. Proper lifting practices are critical to safe transport of heavy equipment. Ensure that practices used are in compliance with all applicable regulations and standards.
 - Safe lifting points are specifically identified in this manual. It is critical to lift the equipment only at these points. Integral lifting eyes or eye bolts on pump and motor components are intended for use in lifting the individual components only.
 - Lifting and handling heavy equipment poses a crush hazard. Use caution during lifting and handling and wear appropriate Personal Protective Equipment (PPE, such as steel-toed shoes, gloves, etc.) at all times. Seek assistance if necessary.
-

Table 1: Methods

Pump type	Lifting method
A bare pump without lifting handles	Use a suitable sling attached properly to solid points like the casing, the flanges, or the frames.
A bare pump with lifting lugs	Use a suitable sling attached to the lifting lugs in the casing and bearing cartridge.
A base-mounted pump	Use slings under the pump casing and the drive unit, under the base rails, or through lifting lugs, when provided.

Storage guidelines

Storage location

The product must be stored in a covered and dry location free from heat, dirt, and vibrations.

NOTICE:

- Protect the product against humidity, heat sources, and mechanical damage.
- Do not place heavy weights on the packed product.

Pump storage requirements

Storage requirements depend on the amount of time that you store the unit. The normal packaging is designed only to protect the unit during shipping.

Length of time in storage	Storage requirements
Upon receipt/short-term (less than six months)	<ul style="list-style-type: none"> • Store in a covered and dry location. • Store the unit free from dirt and vibrations.
Long-term (more than six months)	<ul style="list-style-type: none"> • Store in a covered and dry location. • Store the unit free from heat, dirt, and vibrations. • Rotate the shaft by hand several times at least every three months.

Frostproofing

This table shows to what degree the pump is frostproof:

When the pump is...	Then...
Operating	The pump is frostproof.
Immersed in a liquid	The pump is frostproof.
Lifted out of a liquid into a temperature below freezing	The impeller might freeze.
Sitting idle	The pump might freeze.

Product Description

General description

The Workhorse for the toughest services

The Model 5500 severe duty slurry pumps are engineered and manufactured for dependable performance and long life. Tested under punishing conditions, these heavy duty pumps stay the course and keep working efficiently.

Designed for minimal maintenance, Model 5500 pumps are extremely easy to service when necessary. They are backed by Goulds parts and Goulds service, so long life in continuous use is assured. Minimize downtime, increase productivity with the Workhorse – the Goulds Model 5500.

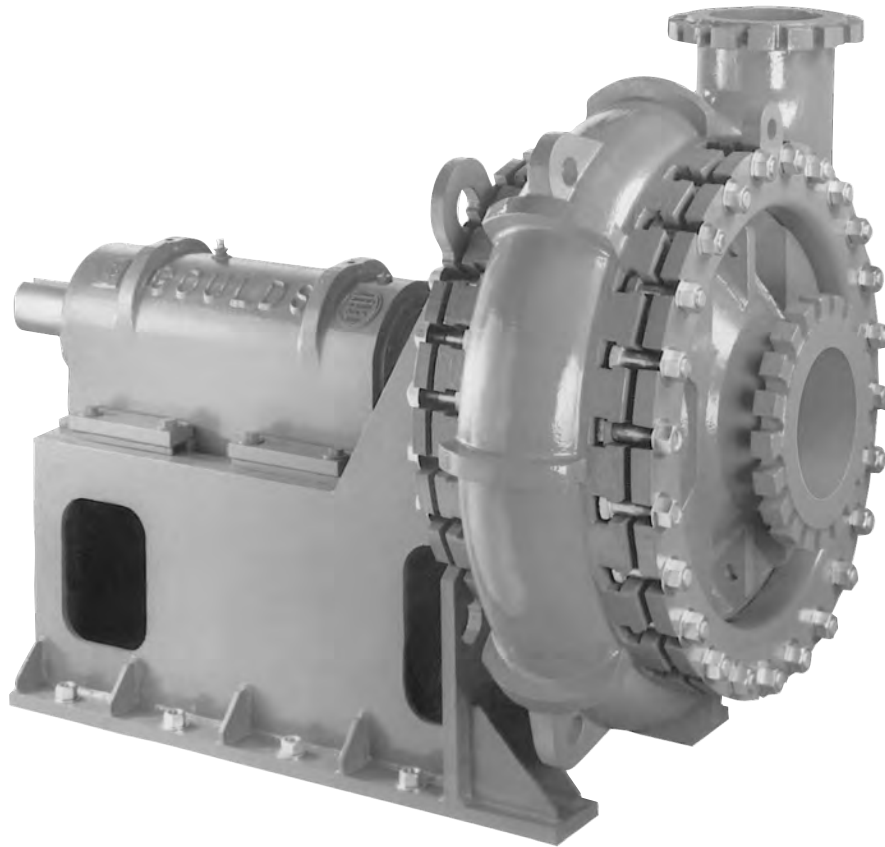


Figure 1: Model 5500

Nameplate information

Important information for ordering

Every pump has nameplates that provide information about the pump. The nameplates are located on the casing and the bearing housing.

When you order spare parts, identify this pump information:

- Model
- Size
- Serial number
- Item numbers of the required parts

Item numbers can be found in the spare parts list.

Refer to the nameplate on the bearing housing for most of the information. See [Assembly drawings \(exploded views\)](#) (page 36) for item numbers.

Nameplate on the pump casing using English units

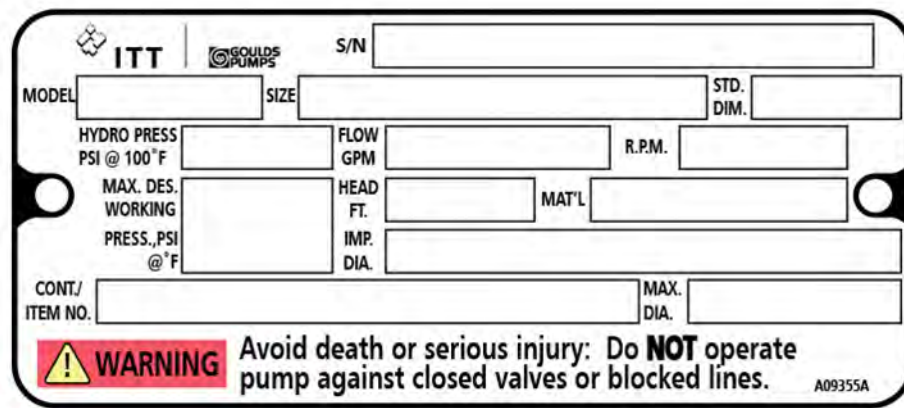


Figure 2: Nameplate on the pump casing using English units

Table 2: Explanation of nameplate on the pump casing

Nameplate field	Explanation
S/N	Serial number of the pump
MODEL	Pump model
SIZE	Size of the pump
STD. DIM.	Standard ANSI dimensional code
HYDRO PRESS PSI	Hydrostatic pressure at 100°F, in PSI
FLOW	Rated pump flow in GPM
R.P.M.	Rated pump speed, revolutions per minute
MAX. DES. WORKING PRESS., PSI	Maximum working pressure at temperature °F, in PSI
HEAD	Rated pump head, in feet
MAT'L.	Material of which the pump is constructed
IMP. DIA.	Impeller diameter, in inches
CONT./ITEM NO.	Customer contract or item number
MAX. DIA.	Maximum impeller diameter, in inches

Nameplate on the pump casing using metric units

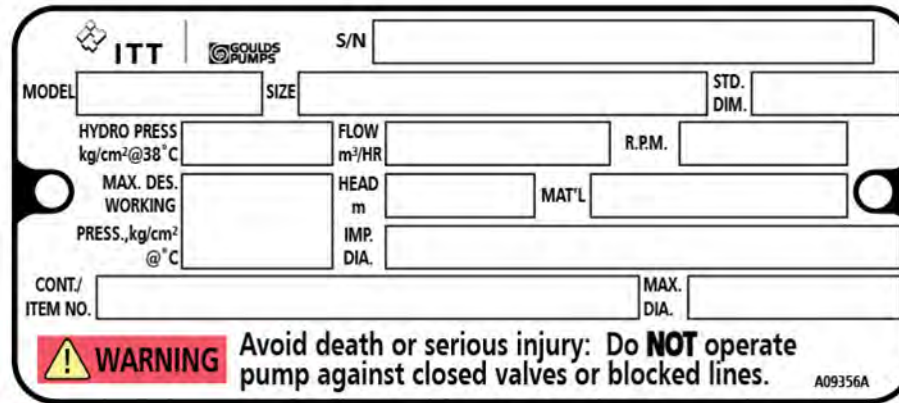


Figure 3: Nameplate on pump casing using metric units

Table 3: Explanation of nameplate on the pump casing

Nameplate field	Explanation
S/N	Serial number of the pump
MODEL	Pump model
SIZE	Size of the pump
STD. DIM.	Standard ANSI dimensional code
HYDRO PRESS	Hydrostatic pressure at 2038° C, in kg/cm2
FLOW	Rated pump flow in m3/hr
R.P.M.	Rated pump speed, revolutions per minute
MAX. DES. WORKING PRESS. @°C	Maximum working pressure at temperature °C, in kg/cm2
HEAD	Rated pump head, in m
MAT'L.	Material of which the pump is constructed
IMP. DIA.	Impeller diameter, in inches
CONT./ITEM NO.	Customer contract or item number
MAX. DIA.	Maximum impeller diameter, in inches



Installation

Pre-installation

Precautions



WARNING:

-  When installing in a potentially explosive environment, ensure that the motor is properly certified.
-  All equipment being installed must be properly grounded to prevent unexpected discharge. Discharge can cause equipment damage, electric shock, and result in serious injury. Test the ground lead to verify it is connected correctly.

NOTICE:

- Electrical connections must be made by certified electricians in compliance with all international, national, state and local regulations.
- Supervision by an authorized ITT representative is recommended to ensure proper installation. Improper installation may result in equipment damage or decreased performance.

Pump location guidelines

Guideline	Explanation/comment
Keep the pump as close to the liquid source as practically possible.	This minimizes the friction loss and keeps the suction piping as short as possible.
Make sure that the space around the pump is sufficient.	This facilitates ventilation, inspection, maintenance, and service.
If you require lifting equipment such as a hoist or tackle, make sure that there is enough space above the pump.	This makes it easier to properly use the lifting equipment and safely remove and relocate the components to a safe location.
Protect the unit from weather and water damage due to rain, flooding, and freezing temperatures.	This is applicable if nothing else is specified.
Do not install and operate the equipment in closed systems unless the system is constructed with properly-sized safety devices and control devices.	Acceptable devices: <ul style="list-style-type: none"> • Pressure relief valves • Compression tanks • Pressure controls • Temperature controls • Flow controls If the system does not include these devices, consult the engineer or architect in charge before you operate the pump.
Take into consideration the occurrence of unwanted noise and vibration.	The best pump location for noise and vibration absorption is on a concrete floor with subsoil underneath.

Foundation requirements

Requirements

- Provide a flat, substantial concrete foundation in order to prevent strain and distortion when you tighten the foundation bolts.
- Foundation bolts should be 3.175 - 6.350mm | 0.125 - 0.250 in. smaller in diameter than the pump frame hole size. The hole size is shown on the certified dimension drawing.

Suction and Discharge Pipe

Provision must be made to support suction and discharge piping independently from the pump to prevent excessive nozzle loads. Short, direct suction and discharge pipelines and a minimum of elbows and fittings result in the least amount of frictional losses and ideal operating conditions. Excessive friction losses in suction piping could cause cavitation. The suction must be kept free of air leaks, particularly in long lines or on conditions of suction lift. Flow regulating valves should not be located on the suction side of the pump. It is recommended that a check valve be used in the discharge line to protect the pump from reverse flow and excessive pressure during shutdown.

V-Belt Drive Installation Checks

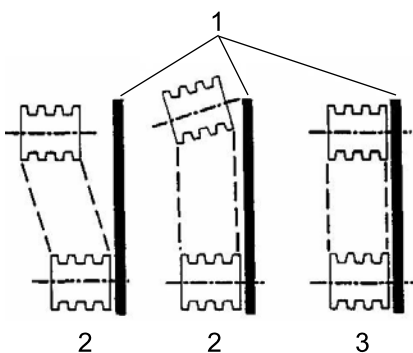
Use the following steps and guidelines to make sure that the v-belt drive is properly installed and that the belts are properly tensioned.



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.

1. Alignment must be maintained for full power transmission, minimum vibration, and long drive life. A dial indicator can be used to check runout on the periphery and face of each sheave. A straight edge can be used to check the alignment of pump and drive sheaves.



1. Straight edge
2. Incorrect
3. Correct

Figure 4: V-belt alignment

2. When installing new belts, shorten center distance between sheaves so that belts can be put on without the use of force. NEVER "roll" or "pry" the belts into place, as this could damage the belt cords.
3. Regardless of the belt section used, the belt should never be allowed to bottom in the groove. This will cause the belts to lose their wedging action and slippage can occur. Sheaves or belts that permit such a condition to occur should be changed.
4. Proper belt tension is the primary reason for long belt life. Improper tension could cause belt fatigue and/or hot bearings.
The general method for tensioning belts is given below, and should satisfy most drive requirements.

- a) Reduce the center distance so that the belts may be placed over the sheaves and in the grooves without forcing them over the sides of the grooves. Arrange the belts so that both the top and bottom spans have about the same sag. Apply tension to the belts by increasing the center distance until the belts are snug.

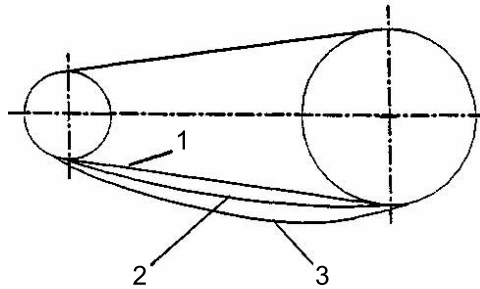


Figure 5: V-belt tension

- b) Operate the drive a few minutes to seat the belts in the sheave grooves. Observe the operation of the drive under its highest load condition (usually starting). A slight bowing of the slack side of the drive indicates proper tension. If the slack side remains taut during the peak load, the drive is too tight. Excessive bowing or slippage indicates insufficient tension. If the belts squeal as the motor comes on or at some subsequent peak load, they are not tight enough to deliver the torque demanded by the drive motor. The drive should be stopped and the belts tightened.
 - c) Check the tension on a new drive frequently during the first day by observing the slack side span. After a few days' operation the belts will seat themselves in the sheave grooves and it may become necessary to readjust the drive to show a slight bow in the slack side.
Other methods of determining proper belt tension can be obtained from the drive manufacturer.
5. Belt guards protect personnel from danger and the drive from contamination. Inspect periodically to assure that belts do not rub against guard.
 6. Dirt and grease reduce belt life. Belt dressing affects performance only temporarily and is NEVER recommended. Maintaining a clean drive is better practice.
If any questions arise pertaining to the drive limitations, consult the drive manufacturer.

Pump-to-drive alignment

Precautions



WARNING:

- Misalignment can cause decreased performance, equipment damage, and even catastrophic failure of frame-mounted units leading to serious injury. Proper alignment is the responsibility of the installer and the user of the unit. Check the alignment of all drive components prior to operating the unit.
 - Follow the coupling installation and operation procedures from the coupling manufacturer.
- Failure to disconnect and lock out driver power may result in serious physical injury or death. Always disconnect and lock out power to the driver before performing any installation or maintenance tasks.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturer's installation and operation manuals (IOM) for specific instructions and recommendations.

NOTICE:

Before beginning any alignment procedure, make sure driver power is locked out. Failure to lock out driver power will result in serious physical injury.

Proper alignment is the responsibility of the installer and the user of the unit. Check the pump-to-driver alignment before you operate the unit. Failure to do so can result in equipment damage or decreased performance.

When to perform alignment checks

You must perform alignment checks under these circumstances:

- The process temperature changes.
- The piping changes.
- The pump has been serviced.

Types of alignment checks**Initial alignment (cold alignment)**

Type of check	When it is used
Before Grouting Baseplate	To ensure alignment can be obtained.
After Grouting Baseplate	To ensure no changes have occurred during grouting process.
After Connecting Piping	To ensure pipe strains haven't altered alignment. If changes have occurred, alter piping to remove pipe strains on pump flanges.

Final alignment (hot alignment)

Type of check	When it is used
After First Run	To obtain correct alignment when both pump and driver are at operating temperature.
Thereafter	alignment should be checked periodically in accordance with plant operating procedures.

NOTICE:

Alignment check must be made if process temperature changes, piping changes and or pump service is performed.

Permitted indicator values for alignment checks

Good alignment is achieved when the dial indicator readings as specified In the alignment procedure are 0.10 mm | 0.004 in. Total Indicated Reading (T.I.R.) or less when the pump and driver are at operating temperature (Final Alignment). Misalignment over 0.10 mm | 0.004 in. may be allowed depending on the coupling type.

Attach the dial indicators for alignment

1. Mount two dial indicators on one of the coupling halves (X) so they contact the other coupling half (Y).
2. Check setting of indicators by rotating coupling half X to ensure indicators stay in contact with coupling half Y but do not bottom out. Adjust indicators accordingly.

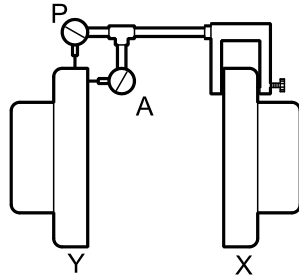


Figure 6: Dial indicators

Alignment measurement guidelines

NOTICE: Take care not to damage indicators when moving driver during alignment corrections.

1. To ensure accuracy of indicator readings, always rotate both coupling halves together so indicators contact the same point on coupling half Y. This will eliminate any measurement problems due to runout on coupling half Y.
2. Take indicator measurements with driver feet hold-down bolts tightened. Loosen hold down bolts prior to making alignment corrections.

Cold settings for parallel vertical alignment

This topic gives the recommended cold settings of parallel vertical alignment.

Introduction

This section shows the recommended preliminary (cold) settings for electric motor-driven pumps based on different temperatures of pumped fluid. Consult driver manufacturers for recommended cold settings for other types of drivers such as steam turbines and engines.

Table 4: Cold Setting of Parallel Vertical Alignment

Pumpage Temperature	Set Driver Shaft
10°C 50°F	0.05mm 0.02 in. LOW
65°C 150°F	0.03mm 0.001 in. HIGH
120°C 250°F	0.12mm 0.005 in. HIGH

Pump-to-driver alignment instructions

Perform angular alignment for a vertical correction

A unit is in angular alignment when indicator A does not vary by more than 0.10 mm | 0.004 in. as measured at four points 90° apart.

1. Set the angular alignment indicator to zero at the top-center position (12 o'clock) of the driver coupling half (Y).
2. Rotate the indicator to the bottom-center position (6 o'clock).
3. Record the indicator reading.

When the reading value is...	Then...
Negative	The coupling halves are farther apart at the bottom than at the top. Perform one of these steps: <ul style="list-style-type: none"> • Add shims in order to raise the feet of the driver at the shaft end. • Remove shims in order to lower the feet of the driver at the other end.

When the reading value is...	Then...
Positive	The coupling halves are closer at the bottom than at the top. Perform one of these steps: <ul style="list-style-type: none"> Remove shims in order to lower the feet of the driver at the shaft end. Add shims in order to raise the feet of the driver at the other end.

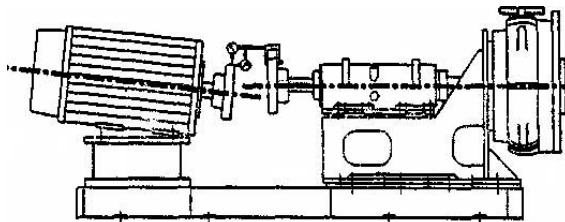


Figure 7: Vertical correction of the motor

- Repeat these steps until indicator A reads 0.05 mm | 0.002 in. or less.

Perform angular alignment for a horizontal correction

- Set the angular alignment indicator (A) to zero on left side of the driver coupling half (Y), 90° from the top-center position (9 o'clock).
- Rotate the indicator through the top-center position to the right side, 180° from the start position (3 o'clock).
- Record the indicator reading.

When the reading value is...	Then...
Negative	The coupling halves are farther apart on the right side than the left. Perform one of these steps: <ul style="list-style-type: none"> Slide the shaft end of the driver to the left. Slide the opposite end to the right.
Positive	The coupling halves are closer together on the right side than the left. Perform one of these steps: <ul style="list-style-type: none"> Slide the shaft end of the driver to the right. Slide the opposite end to the left.

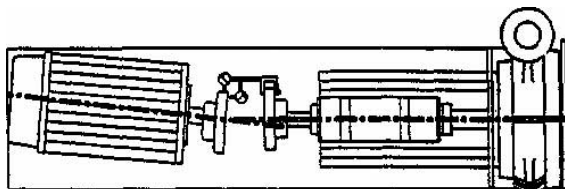


Figure 8: Horizontal correction of the motor

- Repeat these steps until indicator A reads 0.10 mm | 0.004 in. or less.

Perform parallel alignment for a vertical correction

Refer to the alignment table [Permitted indicator values for alignment checks](#) (page 19)

Before you start this procedure, make sure that the dial indicators are correctly set up.

A unit is in parallel alignment when the parallel indicator (P) does not vary by more than 0.10 mm | 0.004 in. as measured at four points 90° apart at the operating temperature.

- Set the parallel alignment indicator (P) to zero at the top-center position (12 o'clock) of the driver coupling half (Y).
- Rotate the indicator to the bottom-center position (6 o'clock).
- Record the indicator reading.

When the reading value is...	Then...
Negative	The pump coupling half (X) is lower than the driver coupling half (Y). Remove shims of a thickness equal to half of the indicator reading value under each driver foot.

When the reading value is...	Then...
Positive	The pump coupling half (X) is higher than the driver coupling half (Y). Add shims of a thickness equal to half of the indicator reading value to each driver foot.

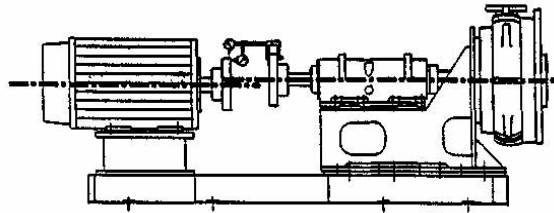


Figure 9: Vertical correction of the motor

- Repeat the previous steps until the permitted reading value is achieved.

NOTICE:

The specified permitted reading values are valid only at operating temperature. For cold settings, other values are permitted. The correct tolerances must be used. Failure to do so can result in misalignment.

The permitted value is 0.10 mm | 0.004 in. or less.

Perform parallel alignment for a horizontal correction

A unit is in parallel alignment when the parallel indicator (P) does not vary by more than 0.10 mm | 0.004 in. as measured at four points 90° apart at the operating temperature.

- Set the parallel alignment indicator (P) to zero on the left side of the driver coupling half (Y), 90° from the top-center position (9 o'clock).
- Rotate the indicator through the top-center position to the right side, 180° from the start position (3 o'clock).
- Record the indicator reading.

When the reading value is...	Then...
Negative	The driver coupling half (Y) is to the left of the pump coupling half (X).
Positive	The driver coupling half (Y) is to the right of the pump coupling half (X).

- Slide the driver carefully in the appropriate direction.

NOTICE:

Make sure to slide the driver evenly. Failure to do so can negatively affect horizontal angular correction.

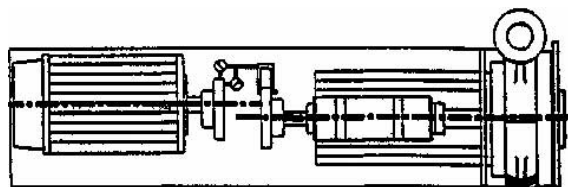


Figure 10: Horizontal correction of the motor

- Repeat the previous steps until the permitted reading value is achieved. The permitted value is 0.10 mm | 0.004 in. or less.

Seal the shaft with a packed stuffing box

Goulds Model 5500 pumps are properly packed at the factory. The packing gland is set finger-tight and may require adjustment during start-up. Refer to [Adjust the stuffing box](#) (page 24) for stuffing box adjustment.

Connect pump with a supply of clean water for lubrication of the packing. See *Conditions for flush water connections* table (page 28) for the gland water supply requirements.

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

Original equipment packing is a suitable grade for the service intended.

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 - 1/2 turns.
4. To install packing rings, do not pull straight. Expand the coil as a coil spring, for the correct and incorrect method of installing packing. Note the location of the lantern ring prior to packing installation. The lantern ring and packing locations are different for the weep and flush arrangements. See section [Prepare the stuffing box connection](#) (page 27).

Packing Rings

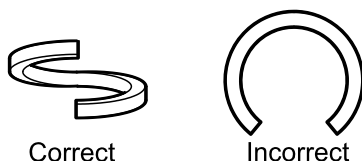


Figure 11: Packing rings

5. Expand the first coil as shown and insert into stuffing box. Tamp packing to stuffing box shoulder firmly with the gland.
NOTE THE POSITION OF THE CUT.
6. Install the second and third coil as required by assembly drawing, staggering the cut 90° to 120°.
7. Insert lantern ring into stuffing box, carefully noting its proper position on the assembly drawing. Failure to properly locate the seal cage will result in insufficient packing lubrication. Packing and shaft sleeve damage may result.
8. After packing and lantern ring are properly installed, insert gland into stuffing box. Tighten gland nuts finger tight only. The shaft should turn freely.
9. Turn lubricant supply on, start pump, and adjust the gland as described in the pump start-up procedure.
10. Periodic maintenance is absolutely required for all packed pumps. Normal shaft run-out should be under 0.127mm | .005in to avoid pounding of stuffing box packing. With excessive shaft run-out, shaft straightening or replacement is necessary.

Commissioning, Startup, Operation, and Shutdown

Lubricate the bearings with oil

1. Remove the bearing housing oil drain plug.
2. Drain the oil which may be used in assembly.
3. Replace the oil drain plug and fill the bearing housing until the oil starts to come out the static oil level tap located on the side of the bearing housing.
This indicates the proper oil fill level when pump is shut down. An oil sight gauge is also provided which indicates the appropriate oil level during operation. See [Oil Volumes](#) (page 26) and [Acceptable oil for lubricating bearings](#) (page 26) for recommended oil.

Check the 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 should be felt. If the pump does not turn freely, it should be checked to determine the cause of binding.

Check the motor rotation



WARNING:

Check motor rotation before driver is coupled to the pump. Reverse rotation could unscrew impeller from shaft and cause considerable damage.

1. Check the motor rotation to assure that it will drive the pump in the correct direction.
The direction of rotation of the driver should be checked before driver is coupled to the pump. Reverse rotation could unscrew the impeller, causing considerable damage. An arrow on the pump indicates the proper rotation, which is normally clockwise when viewed from the drive end.
The pump must be completely primed before operation.



WARNING:

Do not operate pump for prolonged periods of time with a closed discharge valve. The resulting heat build-up could lead to pump failure and possible personal injury to operating personnel.

Impeller-clearance check

The impeller-clearance check ensures the following:

- The pump turns freely.
- The pump operates at optimal efficiency for long equipment life and low energy consumption.

Adjust the stuffing box

1. If packing is used, then adjust the stuffing box during the first few hours of operation. When the pump is first started, there should be considerable leakage by the gland to cool the packing.
2. Gradually tighten the gland nuts one flat at a time while observing the leakage and the stuffing box temperature.

The normal leakage for a properly adjusted stuffing box, depending on shaft size and speed, varies from a few drops a second to a small trickle out of the gland.

NOTICE:

Do not over tighten gland nuts. Overtightened packing causes excessive friction between packing and sleeve and will result in damaged components.

NOTICE:

Packing requires time to "run in" and extra coolant (leakage) while it is being "run in". If the leakage is reduced too quickly, the packing will overheat and may be destroyed. The shaft sleeve may also be damaged.

Shaft-sealing options

In most cases, the manufacturer seals the shaft before shipping the pump. If your pump does not have a sealed shaft, see the Shaft-seal maintenance section in the Maintenance chapter.

This model uses these types of shaft seals:

- Cartridge mechanical seal

Maintenance

Lubricate the bearing



CAUTION:

Operation of the unit without proper lubrication can result in overheating of bearings, bearing failures, pump seizures, and actual breakup of equipment, exposing operating personnel to possible injury.

1. Before starting the pump, add oil to the housing until it is visible in the center of the indicator.
This bearing uses an oil bath lubrication. Oil lubricated bearing assemblies are shipped without oil. For the best results, the minimum oil viscosity should be maintained as shown in [Acceptable oil for lubricating bearings](#) (page 26) table.



CAUTION: Do not use the amount of oil from [Oil Volumes](#) (page 26) table.

2. Spin pumps to fill splash reservoirs in the bearing housing.
3. Check oil level indicator and add oil accordingly. Monitor oil level indicator for the first 24 hours of operation and maintain fill level.
4. If the unit has an external oil lube system, fill the bearing housing and the reservoir to satisfy the system requirements.
5. Periodically check the oil level using the sight glass when the pump is operating, or the oil fill plug when the pump is stopped.
6. Change the oil every 1000 hours. If the bearing assembly is exposed to dirty or moist conditions, the oil should be changed more often.

Oil Volumes

This table shows the recommended amount of oil to order based on the bearing housing size.

Table 5: Oil volumes

Frame size	Liters	Quantity (Qts.)
B1	1.89	2
B2	4.73	5
B3	5.68	6
B4	10.41	11
B5	21.77	23

Acceptable oil for lubricating bearings

Industrial type petroleum based rust and oxidation inhibited oil or synthetic lubricants are recommended. Use of oil with extreme pressure additive is optional. The viscosity of the oil should be 150 SSU at the operating temperature to prevent accelerated bearing wear.

Table 6: Acceptable oil

Operating Temperature	Gear Oil
Below 71°C 160°F	SAE40
Below 82°C 180°F	SAE 50 or 90
Below 99°C 210°F	SAE140

Prepare the stuffing box connection

NOTICE: Periodic maintenance is required for all packed pumps.

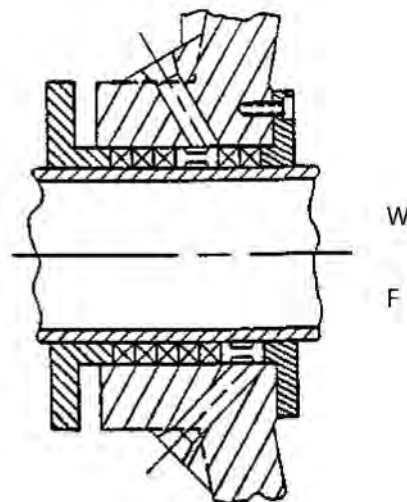
NOTICE: If a mechanical seal is to be installed in the pump there is some clearance available to center the stuffing box around the shaft by moving it in the frame to meet the instructions supplied with the seal. Use a dial indicator to properly locate the seal to the stuffing box and shaft.

1. Make sure that the stuffing box and shaft sleeve are clean before packing a pump.
2. Verify that the lantern ring is properly positioned to accept the flush water. The gland water source should be capable of supplying water at a pressure approximately equal to the pump discharge pressure. Depending on the conditions of service, the required box pressure may be somewhat less.

The stuffing box is supplied with water connections for both the weep type and full flush configurations. The stuffing box cover is marked with an "F" and a "W" to show the proper locations for full flush or weep style connections. This graphic shows the proper number of rings of packing required to yield the correct locations for the lantern ring and gland.

Table 7: Flush water requirements

Frame	Sleeve O.D.	(W) Weep GPM	(F) Full GPM
B1	2.50	.25	19
B2	3.75	.4	28
B3	5.00	.8	42
B4	6.25	1.5	55
B5	8.00	2.5	70



W - weep type

F - full flush

Figure 12: Stuffing box cover cross section

3. Install a valve in the gland water line to limit pressure to the optimum for the actual conditions of service.

NOTICE:

Excessive pressure will increase water consumption, gland water leakage and shaft sleeve wear.

- Turn on the flush water before pump is started and leave on for a short period of time after pump is stopped.

Table 8: Conditions for flush water connections

Condition	Action
Abrasive applications	A full flush box will give the best protection
Units with an expeller and a grease packed stuffing box	A weep style arrangement is normally used in conjunction with a grease cup or weight loaded greaser

Set the impeller adjustment

The pump flow and discharge head will decrease as wear occurs between the impeller front shroud and the suction cover. To maintain optimum pump performance and minimize the effects of wear, the impeller clearance should be adjusted periodically. Use the following procedure to set impeller adjustment:

- Stop pump. Do not attempt adjustment on a running pump.
- Loosen the eight bearing housing locking screws (370C).
- Use impeller adjustment screw (370D) to move impeller forward until it makes contact with the suction cover. Then back impeller away from suction cover approximately 0.79mm | 0.030in (1/32nd) (1/4 turn on impeller adjusting nut) or until impeller turns freely.
- Lock adjustment screw (370D) in place and secure bearing housing using the bearing housing clamps (402) and bearing housing locking screws (370C).
- Rotate shaft to insure all parts turn freely.

Lubricate the end cover seals

End cover seals (332, 332A, 333, 333A) must be lubricated to purge contaminants away from the bearing housing.

- Remove the pipe plugs from the bottom of both end covers and apply grease to the fittings on top until grease flows from the tapped holes.
- Install the pipe plugs.
- Lubricate the seals every 500 hours or as required to maintain grease between the seals.

Disassembly

Disassemble the pump

- Before disassembly, be sure pump frame (228) is secured to foundation.
- Lock out power supply to motor.
- Clean pump exterior to prevent contamination of parts being disassembled.
- Shut off valves controlling flow to and from the pump. Remove all gland water and auxiliary piping and tubing.
- Loosen V-belts and remove or disconnect coupling from shaft. Follow drive, or coupling manufacturer's instructions.
- Drain oil from bearing housing (134) by removing pipe plug.
- Support suction cover liner (100B). This may be done through the use of the safety clips which are provided.



WARNING:

Suction cover liner must be supported before removing suction cover. Failure to do so could result in personal injury and property damage.

- Unbolt and remove suction cover (182). See [Remove the suction cover](#) (page 30).
- Remove gasket (351).

10. Unbolt split gland (107) and remove from stuffing box cover (184).
11. Slightly loosen bearing housing locking screws (370C), but do not remove. The shaft assembly should be moved toward the suction of the pump as far as possible.
12. Unlock impeller adjusting screw (370D).
13. Slide bearing housing and shaft assembly using impeller adjusting screw (370D) to extend impeller toward the suction side of the casing (100), resulting in better access to the impeller.

The largest amount of adjustment can be obtained by removing the gland (107). On pumps equipped with expellers (262), the amount of adjustment will be limited by the clearance between the expeller and the back wall of the casing (100).

14. Remove knock-off deflector (123A). To do this, remove bolts that hold together the two halves of the split ring. Then remove set screws from knockoff deflector and use jacking screws to force knockoff deflector from shaft. Support the impeller (101) with a hook in the eye or a chain through a vane passage. With the impeller as far out of the casing as possible, a bar, cable, or chain should be put into the impeller (101) to prevent it from rotating. Tighten the bearing housing locking screws to secure the shaft assembly. Turn the shaft from the drive end counterclockwise to loosen the impeller from the shaft. A special tool is available from Goulds Pumps, Inc. to turn the shaft. The impeller must be supported before the impeller is completely unscrewed. A special tool to hold the impeller is also available from Goulds Pumps Inc.

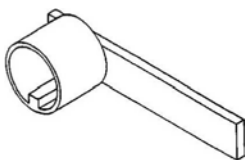


Figure 13: Shaft rotator to install and remove the impeller from the casing

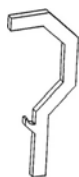


Figure 14: Impeller hook to install and remove the impeller from the casing



CAUTION:

At no time should heat be applied to the impeller hub or nose. The cavity at the impeller nose may contain moisture which when converted to steam could cause a violent explosion.

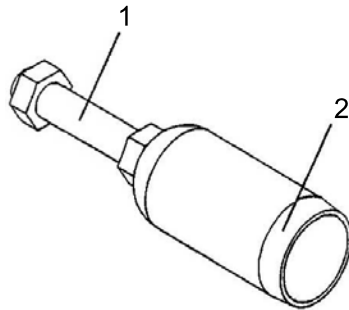


WARNING:

Do not apply heat to hub or nose of threaded impeller. Danger of explosion.

15. Remove fiber gasket (211) from between impeller (101) and sleeve (126).
16. Unbolt and remove casing (100) and gasket (360).

17. Remove optional expeller (262) if pump is so equipped.
18. Unbolt and remove stuffing box cover (184).
19. From stuffing box cover (184) remove stuffing box bushing (125), packing (106) and lantern ring (105).
20. Slide shaft sleeve (126) from shaft (122). Sleeve has a female threaded end to engage with a standard pipe thread. A sleeve puller tool is available from Goulds Pumps, Inc. A pipe nipple of the correct size can also be screwed in to the sleeve end to provide an easy way to attach and pull the sleeve from the shaft.



1. Threaded
2. Tapered threads

Figure 15: Sleeve puller to remove the shaft sleeve

21. Remove bearing housing locking screws (370C) and bearing housing clamps (402).
22. Loosen impeller adjusting screw (370D) and lift bearing housing and shaft assembly from the frame (228).

Remove the suction cover

1. Support the suction cover (182) to disassemble the water end of the pump.
2. Remove the bolts (except for the 370A bolts with safety clips) by loosening slightly and sliding them out of the tee slots.
3. Remove the two bolts with the safety clips after they are fully unscrewed and the suction cover clamp (452) is removed.
Two of the bolts (370A) holding the suction cover clamp (452) also hold the suction cover (182) from loosening unexpectedly via the attached safety clips.
4. Support the suction cover with a chain or cable and take apart the safety clip assembly to release the suction cover (182) fully. The suction cover (182) has a tapered fit into the casing to ease disassembly.
5. Loosen the suction cover by using a pry bar between the tee slot flange and the outside diameter of the suction cover (182). Prying around the entire circumference will provide the best results.

Disassemble the bearing housing and shaft assembly

1. Remove inboard end cover (119).
2. Remove bearing locking screw (136A), if pump is so equipped (B5 frame only). The bearing locking screw protrudes into the inboard bearing. It is located on top of the bearing housing at the inboard bearing position.
3. Remove outboard end cover (109).
4. Carefully remove shaft (122) with both bearings from the outboard side of the bearing housing (134).
5. Inspect bearings completely. If bearings and shaft are in good condition, do not disassemble. Protect bearings from dirt and other contaminants.

NOTICE:

Have replacement bearings available whenever bearings are to be removed from the shaft.

6. To remove inboard bearing (168) from shaft, loosen setscrews on inboard bearing locknut (140) and unscrew (B5 frame only).
7. Remove inboard bearing (168) with an acceptable bearing puller. Loosen setscrews on oil thrower (114), if pump is so equipped, and slide out of the way of the bearing puller if necessary.
8. To remove outboard bearing (112), straighten tang in lockwasher (382A) and remove outboard bearing locknut (136) and keyed washer (140B). A keyed washer is not required on the B3 frame.
9. Remove outboard bearing (112) with an acceptable bearing puller. Loosen setscrews on oil thrower (114), if pump is so equipped, and slide out of the way of the bearing puller if necessary.
10. Remove oil seals (332, 332A, 333, 333A) from the bearing housing end covers. (Note the seal lip positions).

Guidelines for parts inspection and replacement

Table 9: Guidelines for parts inspection and replacement

Part	Replacement guideline
Impeller	Replace if impeller shows excessive erosion, corrosion, wear or vane breakage. Impeller hub must be in good condition. Reduction in hydraulic performance may be caused by excessive impeller wear, especially along the mating surface with the suction cover.
Suction cover	Replace when impeller mating surface is overly worn and hydraulic performance has been significantly reduced. Consideration should be given to rotating the suction cover to equalize wear.
Shaft sleeve	Sleeve surface in stuffing box must be smooth. Replace if badly grooved or cut.
Stuffing box bushing	Replace if bore is oversize or out-of-round.
Expeller	Replace if expeller shows excessive wear, erosion, corrosion, or vane breakage.
Casing	Replace if worn.
Shaft	Check for runout (.006" max.) to see that shaft has not been bent. Bearing seats and oil seal area must be smooth and free of scratches or grooves. Shaft threads must be in good condition. Replace if necessary.
Bearings	Replace if worn, loose, or rough and noisy when rotated.
Oil seals	Oil Seals - Replace if worn, damaged, or leaking.

NOTICE:

If bearing replacement is necessary, the new bearings installed should be the same brand and construction as the bearings installed at the factory. Despite manufacturers' claims, there is a difference in load-carrying capacity and life between apparently interchangeable bearings from various manufacturers.

Reassembly

Reassemble the bearing housing and shaft assembly

1. All parts should be cleaned thoroughly before assembly.
2. Check shaft for nicks or worn areas.
3. Press oil seals (332, 332A, 333, 333A) into both end covers (109, 119). Fill the cavity between the seals with grease. Inspect O-Ring (496) on outboard end cover (109) and replace if necessary.
4. Position oil thrower (114) on shaft and secure between bearing fits. B5 Frame only.

5. Press inboard bearing (168) onto shaft (122). For B5 frame, install inboard bearing locknut (140) and secure with setscrews.
6. Press outboard bearing (112) onto shaft (122).

NOTICE:

When bearings are heated for installation on the shaft, the temperature should not exceed 121°C | 250°F. Do not use a torch or open flame on the bearings.

7. Position keyed washer (1408) (not on B3 frame) and bearing lockwasher (382A) against the bearing shoulder. Tighten outboard bearing locknut (136). Bend tang of lockwasher to engage slot in locknut.
8. From the outboard side of the bearing housing (134), install shaft (122) with both bearings into the bearing housing (134). For inboard spherical roller bearings (B1, B2, B3, and B4 frames) care must be taken to keep the outside race from misaligning. A tool to help maintain alignment is available from Goulds Pumps, Inc. For the B5 frame, position hole in inboard bearing outer race so that it will engage properly with the inboard bearing locking screw (136A). The spherical design of the inboard bearing requires that it must be supported to maintain alignment with the shaft centerline. Proper alignment is essential for easy installation of the bearing into the housing. The bearing holder tool provides such support. A 1/16" gasket washer must be used under the head of the locking screw (136A) before it is tightened. Make certain that locking screw (136A) does not bottom in the bearing.

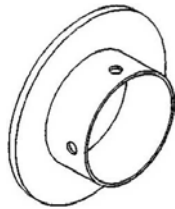


Figure 16: Bearing holder to install the shaft and bearing assembly into the housing for B3 and B4 frames only

9. Attach inboard end cover (119) and gasket (360N). Avoid damaging the seals.
10. Attach outboard end cover (109). Avoid damaging the O-Ring and seals. Note that there should be a nominal .063" gap between the end cover (109) and the bearing housing (134). Do not overtighten capscrews (370N).
11. Install knock-off deflector (123A) onto shaft against shoulder.
12. Rotate shaft to assure all parts are free.

Reassemble the pump

1. Check that frame (228) is securely bolted to the foundation. Clean frame (228). The top of the frame must be clean and burr free where it meets the bearing housing (134).
2. Coat the bearing housing to frame fit with an anti-seizing compound such as "Never Seez" or equal.
3. Position impeller adjusting nuts (370D) apart and place reassembled bearing housing assembly into frame (228).
4. Attach bearing housing clamps (402) with bearing housing locking screws (370C).
5. Apply a small bead of silicone sealant around the shaft 0.25" from the knock off deflector (123A). Coat inside of sleeve with an anti-seizing compound such as "Never Seez" or equal. Slide shaft sleeve (126) onto shaft (122).
6. Install lantern ring (105) on shaft (122) back toward the inboard end cover (119).
7. Insert stuffing box cover (184) into frame (228) and secure studs (370H).
8. Install stuffing box bushing (125) into stuffing box cover (184) and secure hex socket cap screws (459).

9. Place fiber gasket (211) against end of shaft sleeve (126).
10. Install optional expeller (262), if so equipped, over the shaft sleeve.
11. Attach gasket (360) to stuffing box cover (184) with a gasket adhesive.
12. Bolt casing (100) to frame (228) using studs (370B) and hex nuts. Tighten to the values shown in the casing Bolt-Torque chart, Table 6.
13. Slightly loosen bearing housing locking screws (370C)—DO NOT REMOVE and slide bearing housing shaft assembly so that the impeller end of the shaft extends as far as possible toward the suction cover (182). Use the impeller adjusting screw (370D) to position the shaft.
14. Place fiber gasket (563) on the end of expeller, if so equipped. Apply a light coating of grease on the gasket to eliminate tears during tightening.
15. Apply an anti-seizing compound to the shaft threads. Support threaded impeller (101) at the beginning of the shaft (122) and prevent impeller (101) from turning. Rotate shaft (122) to tighten impeller (101) onto shaft (122). Impeller threads are right hand threads.
16. Move impeller (101) toward back wall of casing (100) as far as possible by turning the impeller adjusting nuts (370D).
17. Attach gasket (351) to suction cover (182) using gasket adhesive.
18. Position suction cover (182) into casing (100) and support. A flat bar can be positioned through the tee slots to give support, or the safety clips which are supplied with the pump should be used at this time.
19. Position suction cover clamp (452) over suction cover (182) and bolt in place with bolts (370A). Hand tighten all bolts first. Tighten all bolts evenly using a criss-cross method.

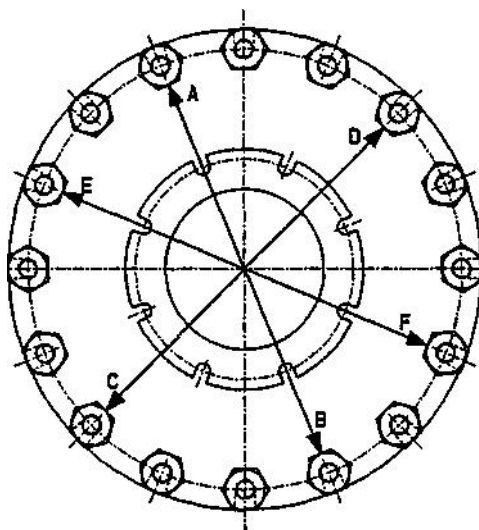


Figure 17: Tighten bolts

20. Wrench tighten bolts repeatedly using the criss-cross pattern until the torque value listed in following table is reached.

Table 10: 5500 Casing bolt torque values

Pump size	Lubricate threads before tightening	
	Torque (ft lbs) suction side (lubricated)	Torque (ft lbs) stuffing box side (lubricated)
3x4-12	24-29	31-36
3x4-17	160-175	63-69
3x4-18	160-175	63-69
3x4-1 8HP	273-300	105-115
4x6-15	41-45	63-69
4x6-21	113-125	82-90
4x6-29	167-182	108-120
4x6-29HP	334-365	216-235

Lubricate threads before tightening		
Pump size	Torque (ft lbs) suction side (lubricated)	Torque (ft lbs) stuffing box side (lubricated)
6x6-18	69-77	123-135
6x8-19	76-85	123-135
6x6-22	113-125	82-90
6x8-26	207-225	125-140
6x8-26HP	356-400	216-235
8x10-21	113-125	82-90
8x10-29	190-210	116-125
10x12-25	77-85	172-190
10x12-34	200-220	116-125
12x14-29	102-115	172-190
12x14-38	207-228	160-175
14x16-42	174-200	106-120

21. Adjust impeller (101) using the impeller adjusting screw (370D) so that the impeller (101) slightly rubs the suction cover. Back off the impeller approximately 0.79mm | 0.030in. (1/32nd) (1/4 turn of the impeller adjusting nut) or until it turns freely. Lock adjusting screws (370D).
22. Tighten bearing housing clamps (402) with bearing housing locking screws (370D).
23. Rotate shaft to assure all parts are free.
24. Pack pump with square packing (106). With the weep (W) arrangement, install two rows into the stuffing box cover (184) before the lantern ring (105) and five rows after the lantern ring (105). For full flush (F) water inlets, install the lantern ring (105) before seven rows of packing. Make certain that lantern ring is properly positioned to receive the flush water.

Table 11: Packing chart

Frame	Sleeve O.D.	Packing size
B1	2.50	7/16"
B2	3.75	1/2"
B3	5.00	5/8"
B4	6.25	3/4"
B5	8.00	3/4"

25. Position both halves of the gland (107) around the shaft sleeve (126) and bolt together. Push packing into box by tightening gland studs (353) against gland (107) evenly. See section on Operating and Maintenance Instructions for information regarding stuffing box water requirements.
26. Attach suction, discharge, and auxiliary piping.
27. Check drive or coupling alignment as noted in Section II.
28. Follow procedures listed under "Pump Start-Up" for proper lubrication requirements. Be sure to add oil to the bearing housing prior to running the pump.

Troubleshooting

Operation Troubleshooting

Table 12: Operation troubleshooting

Symptom	Cause	Remedy
Insufficient capacity		
Pump not primed; check for air leaks in suction line.	Speed too low.	
	Total piping system head higher than pump rating.	
	Suction lift too great or insufficient NPSH of system.	
	Impeller passages partially blocked.	
	Suction line partially blocked.	
	Wrong direction of rotation.	
	Mechanical defects: impeller worn or damaged; defective gasket causing leakage.	
	Pumpage viscosity too high.	
Excessive power consumption		
Speed too high.	Total piping system head lower than pump rating (pump will attempt to pump too much water).	
	Slurry being pumped has higher specific gravity than that for which pump is rated.	
	Mechanical defects: packing too tight; shaft bent, impeller rub, worn bearings, worn impeller or other water end parts.	
Pump vibration		
Foundation not sufficiently rigid.	Impeller partially blocked causing unbalance.	
	Misalignment.	
	Mechanical defects: shaft bent; worn bearings; impeller worn.	
	Insufficient net positive suction available (NPSHa)	

Alignment troubleshooting

Symptom	Cause	Remedy
Horizontal (side-to-side) alignment cannot be obtained (angular or parallel).	The driver feet are bolt-bound.	Loosen the pump's hold-down bolts, and slide the pump and driver until you achieve horizontal alignment.
	The baseplate is not leveled properly and is probably twisted.	<ol style="list-style-type: none"> Determine which corners of the baseplate are high or low. Remove or add shims at the appropriate corners. Realign the pump and driver.
Vertical (top-to-bottom) alignment cannot be obtained (angular or parallel).	The baseplate is not leveled properly and is probably bowed.	<ol style="list-style-type: none"> Determine if the center of the baseplate should be raised or lowered. Level screws equally at the center of the baseplate. Realign the pump and driver.

Parts Listings and Cross-Sectionals

Assembly drawings (exploded views)

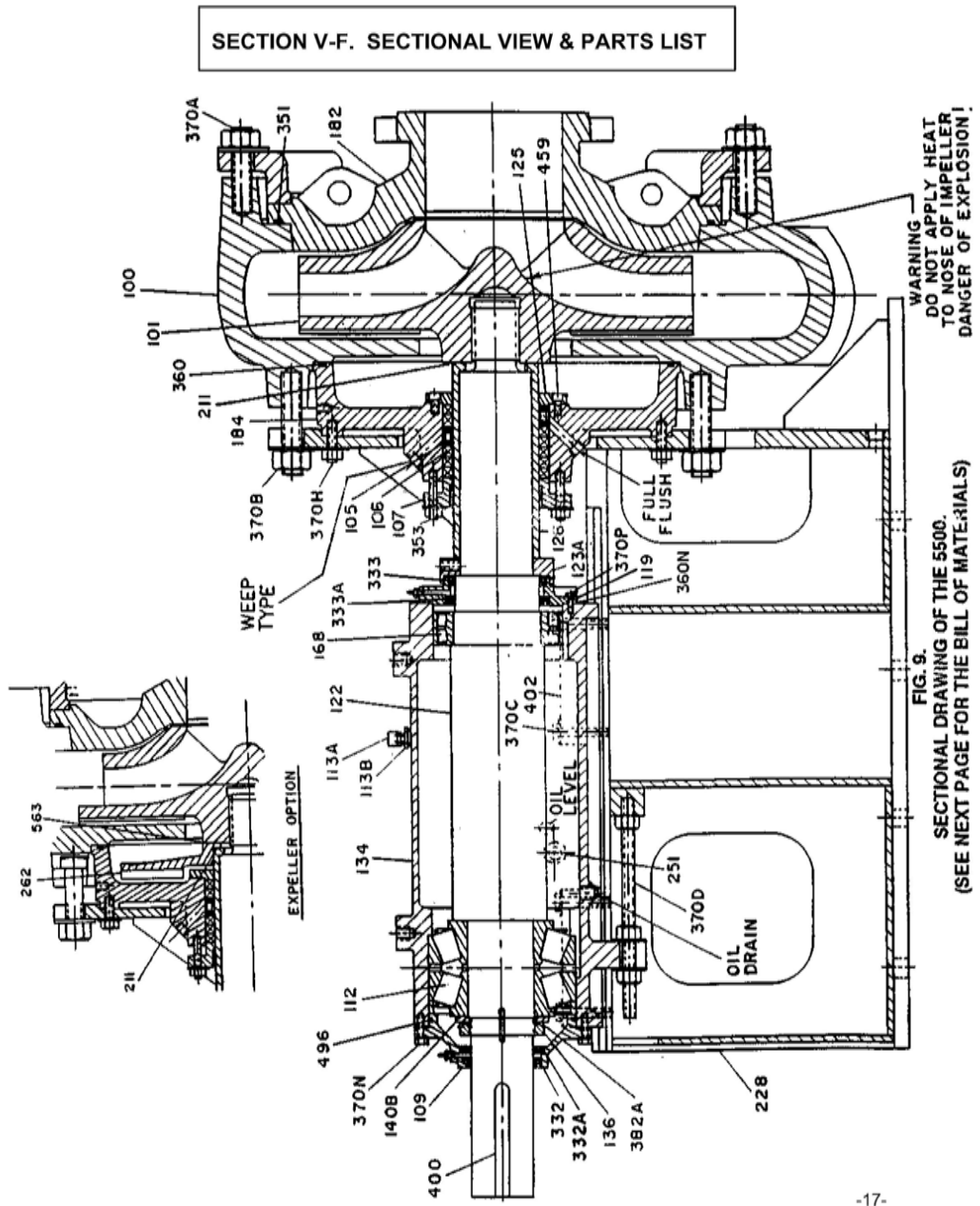


Table 13: Parts List

Item	Qty	Description
100	1	Casing
101	1	Impeller
105	1	LANTERN RING

Item	Qty	Description
106	1	PACKING
107	1	GLAND
109	1	OUTBOARD END COVER
112	1	OUTBOARD BEARING
113A	1	BREATHER
113B	1	OIL FILL BUSHING
114	1	OIL THROWER (NOT SHOWN)
119	1	INBOARD END COVER
122	1	SHAFT
123A	1	KNOCK OFF DEFLECTOR
125	1	STUFFING BOX BUSHING
126	1	SHAFT SLEEVE
134	1	BEARING HOUSING
136	1	OUTBOARD BEARING LOCKNUT
136A	1	INBOARD BEARING LOCKING SCREW (B5 ONLY, NOT SHOWN)
140	1	INBOARD BEARING LOCKNUT (NOT SHOWN)
140B	1	KEYED WASHER
168	1	INBOARD BEARING
182	1	SUCTION COVER
184	1	STUFFING BOX COVER
211	1	GASKET (101/262-126)
228	1	FRAME
251	1	OIL LEVEL SIGHT
262	1	EXPELLER (OPTIONAL)
332	1	OUTBOARD SEAL, OUTSIDE
332A	1	OUTBOARD SEAL, INSIDE
333	1	INBOARD SEAL, OUTSIDE
333A	1	INBOARD SEAL, INSIDE
351	1	O-RING (CASING-SUCTION COVER)
353	2	GLAND STUD
360	1	O-RING (CASING-STUFFING BOX)
360N	1	GASKET (INBOARD END COVER)
370A	8	SQ. HD BOLT (CASING, SUCTION SIDE)
370B	8	SQ. HD BOLT (CASING - FRAME)
370C	8	BEARING HOUSING LOCKING SCREW
370D	1	IMPELLER ADJUSTING SCREW
370H	2	STUDS (STUFFING BOX-FRAME)
370N	6	HEX CAP SCREWS (OUTBOARD END COVER)
370P	6	HEX CAP SCREWS (INBOARD END COVER)
382A	1	OUTBOARD BEARING LOCKWASHER
400	1	DRIVE KEY
402	8	BEARING HOUSING CLAMP
452	1	SUCTION COVER CLAMP
459	4	HEX SOCKET CAP SCREW
496	1	O-RING (OUTBOARD END COVER)
563	1	GASKET (EXPELLER - IMPELLER)

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