

ITT

IM206

Commercial Water

Goulds Pumps

Models GSP

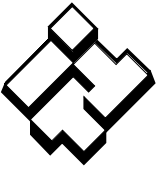
Installation, Operation and Maintenance Instructions



Goulds Pumps is a brand of ITT Corporation.

www.goulds.com

Engineered for life



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GOULDS PUMPS
Commercial Water

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Owners Information

Complete this information for your records.
Model number and serial number may be found
on the tag mounted to the pump casing.

Model Number _____

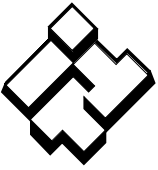
Serial Number _____

Dealer _____

Dealer phone number _____

Date of purchase _____

Date of installation _____



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GOULDS PUMPS
Commercial Water

I. Introduction and Safety

Introduction

Description

This manual provides instructions for the Installation, Operation and Maintenance of the Goulds Model GSP pumps. This manual covers the standard product plus common options that are available.

Requirement

This manual must be read and understood before installation and start-up. Goulds shall not be liable for physical injury, damage or delays caused by a failure to observe the instructions for installation, operation and maintenance contained in this manual.

Content

This instruction manual covers several different pump models that all have similar power end configurations. Most assembly, disassembly and inspection procedures are the same for all the pumps. However, where there are differences, they are called out separately within the manual. The design, materials and workmanship incorporated in the construction of Goulds 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 correct application, proper installation, periodic inspection, condition monitoring and careful maintenance. This instruction manual was prepared to assist operators in understanding the construction and the correct methods of installing, operating and maintaining these pumps.

Key Topics

- Proper Installation
- Start up Procedures
- Operation Procedures
- Routine Maintenance
- Pump Overhaul
- Trouble Shooting
- Identifying spare or repair parts

Safety

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

- personal accidents and health problems
- damage to the product
- product malfunction

Observe all safety messages highlighted in other sections of this manual.





A pump is a pressure-containing device with rotating parts that can be dangerous.



Caution: You must observe the instructions for installation, operation, and maintenance contained in this manual. Failure to do so could result in physical injury, damage, or delays.

Safety message levels

Table 1: Definitions

Safety message level	Indication
 <u>Danger:</u>	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
 <u>Warning:</u>	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
 <u>Caution:</u>	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
<u>Note:</u>	Indicates a potential situation which, if not avoided, may result in undesirable results or state. Indicates a practice not related to personal injury.
 <u>Electrical Hazard:</u>	Indicates the possibility of electrical risks if direction are not applied in a proper manner.

Environmental safety

Preventive measures for the working area

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

Recycling guidelines

Always recycle according to the guidelines listed below:

1. Follow local laws and regulations regarding recycling if the unit or parts are accepted by an authorized recycling company.
2. If the first guideline is not applicable then return the unit or parts to the nearest ITT representative.

Waste and emissions

Observe these safety regulations regarding waste and emissions:

- Dispose appropriately of all waste.
- Handle and dispose of the pumpage 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.

Reference for electrical installation

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

User health and safety

Safety equipment

Use safety equipment according to the company regulations. The following safety equipment should be used within the working area depending on the fluid being pumped:

- helmet
- safety goggles (with side shields)
- protective shoes
- protective gloves
- gas mask
- hearing protection

Note: The noise level of the product is lower than 70 dB. However, the noise level of 70 dB may be exceeded in some installations and at certain operating points on the performance curve. Make sure that you understand the noise level requirements in the environment where the pump is installed. Failure to do so may result in hearing loss or violation of local laws.

The working area

Observe these regulations and warnings in the working area:

- Always keep the work area clean.
- Pay attention to the chemical and physical characteristics of the gas and vapors present in hazardous areas.
- Avoid all electrical dangers. Pay attention to the risks of electric shock or arc flash hazards.

Product and product positioning requirements

Observe these requirements for the product and the product positioning:

- Never operate a pump unless safety devices are installed.
- Three-phase motors must have a properly sized starter with properly sized heaters to provide overload and undervoltage protection. Single-phase motors have built-in overload protectors.
- Never start a pump without the proper priming.
- Never run a pump below the minimum rated flow or with any suction or discharge valve closed.

Electrical connections

Electrical connections must be made by authorized electricians in compliance with all international, national, state, and local rules.

Observe the following regulations and warnings for electrical connections.

- Make sure that the product is isolated from the power supply and can not be energized by mistake. This rule applies to the control circuit as well.
- Make sure that the thermal contacts are connected to a protection circuit according to the product approvals, and that they are in use.

Observe the following regulations for grounding connections.

Table 2: Grounding

Grounding regulation	Comment
All electric equipment must be grounded.	This rule applies to pumps and mixers as well as monitoring equipment.

Precautions before work

Observe the following safety precautions before working with or 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.
- Make sure that the equipment is properly insulated when operating at extreme temperatures.
- 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 has been thoroughly cleaned.
- Make sure that there are no poisonous gases within the work area.
- Make sure that a first-aid kit is close at hand.
- Disconnect and lock out power before servicing.
- Check the explosion risk before welding or using electric hand tools.

Precautions during work

Observe the following safety precautions when working with or in connection with the product:

- Never work alone.
- 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 disassembling the pump.
- Do not exceed the maximum working pressure of the pump.
- Do not open any vent or drain valves or remove any plugs while the system is pressurized. Ensure that the pump is isolated from the system and that pressure is relieved before you disassemble the pump, remove plugs, or disconnect piping.
- Always bear in mind the risk of
 - electrical accidents
 - burn injuries

Clean chemicals from the eyes

1. Forcibly hold the eyelids apart with the fingers.
2. Rinse the eyes for at least 15 minutes. Use an eyewash or running water.
3. Seek medical attention.

Clean chemicals from the body

1. Remove contaminated clothing.
2. Wash the skin with soap and water for at least 1 minute.
3. If required, seek medical attention.

Product approval standards

Regular standards

All electrical ratings and performance of the motors comply with UL, CSA and NEMA standards.

3-A® standards

The GSP is certified to 3-A® 02-10 sanitary food and beverage standards. The GSP platform and legs are certified to 3-A® 88-00 standards.

Product warranty

Personnel requirements

All work on the product must be carried out by certified electricians and ITT authorized mechanics.

ITT disclaims all responsibility for work done by untrained and unauthorized personnel.

Modification and spare parts

Modifications or changes to the product/installation should only be carried out after consulting with ITT. Original spare parts and accessories authorized by ITT are essential for compliance. The use of other parts can invalidate any claims for warranty or compensation and explosion-proof approvals.

Warranty claim

For warranty claim, contact your ITT Fluid Technology representative.

II. Transportation and Storage

Description

This section describes recommended methods for receiving, storing and handling the pump prior to physical installation.

Receiving

The pump should be uncrated or unboxed when it is received so that it can be completely inspected. Carefully check that everything is in good order. Make notes of damaged or missing items on the receipt and freight bill. File any claims with the transportation company as soon as possible.

Storage

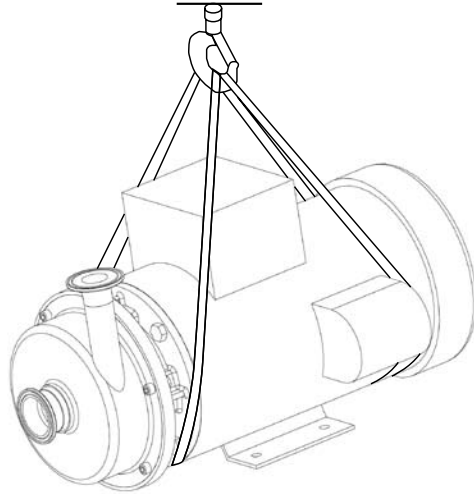
Short Term: For storage of less than six months, the normal packaging procedures used by Goulds Pumps are designed to protect the pump during shipping. After receipt, store in a covered and dry location.

Long Term: For storage of more than six months, preservative treatment of bearings and machined surfaces will be required. Rotate the pump and motor shaft several times every three months. Refer to driver and coupling manufacturers for their long term storage procedures. Store in a covered, dry location.

Handling

Warning: Pump and components are heavy. Failure to properly lift and support equipment could result in serious physical injury or damage to pumps. Steel toed shoes must be worn at all times.

Use care when moving pumps. Lifting equipment must be able to adequately support the entire assembly. Hoist pump using a suitable sling under the motor adapter and motor (Figure 1). For larger pumps, motor lifting rings may be used.



III. Product Description

Description

This section provides a general description of the Goulds Model GSP and key engineering specifications.

Overview

The Goulds model GSP pumps are single stage, end suction, centrifugal pumps designed to meet the rigorous standards of hygiene needed by the food and beverage industries. Pumps are used in the food industry as process or clean in place pumps.

The GSP series meets 3A Sanitary Standards for Centrifugal and Positive Rotary Pumps, Number 02-10 and 3A Sanitary Standard for Machine Leveling Feet and Supports, Number 88-00 for both internal and external hygienic design. This enables operators to insure the purity of their process and the cleanliness of their plant to meet both local and national health and safety regulations. Not all products marked 3A meet these design and clean-ability standards.

Mechanical seals are FDA approved and several versions of the pump have EHEDG European sanitary certification.

Pump impellers are fully open, and either threaded or key driven and held in position by an impeller bolt and o-ring. Impeller hubs are extended through the seal and backplate eliminating the need for shaft sleeves.

Casings are full volute in design. 316 Stainless parts and welds are polished to $Ra < 0.8 \mu m$.

Suction and discharge connections are Tri-clamp sanitary flange type.

Close-coupled units have NEMA standard JM motors with C-face mounting and key driven shaft extension or for smaller pumps, NEMA standard 56J motors with threaded shafts. Pumps are available with standard ODP or TEFC motors with shrouds and pump stands or wash down enclosures. These are provided for hygienic cleaning of the pump and its surroundings.

Engineering Data

Noise level

The noise generated by a pump depends on different factors. Most important are: power, speed and brand name of the motor, whether there is cavitation or not, operating point of the pump, and handling of small quantities of air. A guide value for the sound pressure level measured in dB(A) at a distance of 3 feet from the pump with a 2 pole motor operating at 60 Hz in ideal circumstances with cold water is 78 dB(A) for pumps up to 5 hp, 83 to 85 dB(A) for pumps with motors ranging from 7.5 to 50 hp. For pumps with 4 or 6 pole motors, the value can be decreased with +/- 8 dB(A).

Maximum Liquid Temperature:

250°F (120°C)

Note: Pump and piping should be protected from skin contact if temperature is less than 10°C or higher than 40°C

Maximum Working Pressure (Fluid temperature dependant):

S1 – 125 PSIG (9 Bar); S2 – 150 PSIG (10.5 Bar)

Maximum Suction Pressure:

=125 PSIG/150 PSIG – Pump generated pressure (see performance curve)

Starts per hour:

20 evenly distributed with standard across the line start
Unlimited with soft starter or drive

Connections

The following table shows the discharge and suction sizes in inches for each of the GSP pumps. The Pump designation is the first three characters of the pump model number.

Pump Designation	Fitting Size (discharge x Suction)	Nominal Impeller
S1A	1 x 1.5	5
S1B	2 x 2.5	4
S2A	1.5 x 2	7
S2B	2 x 2.5	7
S2C	2.5 x 3	7
S2D	1.5 x 2	8
S2E	2 x 2.5	8
S2F	2 x 2.5	9
S2G	2.5 x 3	9
S2H	2 x 2.5	11

Name Plate

Model

The various versions of the GSP are identified by a product code number on the pump label. This number is also the catalog number for the pump. The meaning of each digit in the product code number is shown in the Appendix. Not all combinations are possible; consult your Goulds Pumps distributor for specific requirements.

Performance

Performance curves and dimension drawings for your Goulds model GSP may be found in the selection program available on www.goulds.com. The correct performance curve can be determined from the name plate model number as defined above. You will need to know pump size, impeller trim and operating speed.

IV Installation

Description

This section covers the general information and cautions about installing your pump as well as specific steps to take during installation.

Location

Locate the pump as near to the liquid source as practical and below the level of the liquid for automatic self priming. If the pump must be above the liquid source, a foot valve must be provided on the suction pipe.

Allow adequate space around the pump for servicing and ventilation.

Protect the pump and piping from freezing temperatures.

Provide other weather protection consistent with the motor enclosure rating. The maximum ambient temperature for the pump is 40°C (104°F).

For installation at altitudes greater than 3,000 feet, the pump selection should be derated due to the difference in barometric pressure. Contact your Goulds distributor for assistance in selection.

Foundation

The foundation must be able to absorb any vibration and to form a permanent, rigid support for the pumping unit. Close-coupled units may be installed horizontally, inclined or vertically with the motor above the pump.

Your GSP pump has been supplied with a rigid base plate with four legs. As supplied, this is adequate for portable use where the pump may be moved to various places in the plant based on process requirements.

Optional legs are available with flanged bases which can be used for permanent mounting to the floor. Hold down bolts should be sunk in concrete and aligned with the holes in the flanges. When the concrete has dried, tighten nuts to keep the pump firmly in position.

NOTICE: Do not install with motor below pump. Any leakage or condensation will affect the motor.

Initial Assembly

Your GSP pump has been shipped with the pump and motor assembled, but the base, legs and motor cover (if ordered) need to be assembled. Refer to drawings on page 24.

1. Install o-rings into base then install legs using some soapy water or o-ring lubricant.
2. Place the threaded end of one of the legs through the o-ring supplied into the socket provided on the lower corner of the base plate. Thread the leg into the socket until tight.
3. Repeat with the other three legs.
4. Place the pump and motor combination onto the base plate so that the holes in the motor foot align with the holes in the base plate. Insert the motor mounting bolts through the motor foot and base plate.
5. Place a nut on each of the mounting bolts under the base plate and tighten.
6. If a motor cover has been supplied, place it over the pump so that the suction and discharge connections protrude out of the front cut out.

7. Lower the cover over the motor so that the sides of the cover slide over the base plate.

8. Align the slots in the bottom side of the cover with the corresponding holes in the side of the base plate. Insert screws through washers and into each hole and tighten.

Level Pump

1. Remove the motor cover if supplied, and place a level on the side of the pump base next to the motor.

2. Level the pump to within .125 inches (3.2 mm) over length of the pump base and to within .088 inches (1.5 mm) over the width of the base by turning the legs either clockwise or counterclockwise.. Make sure the base is not distorted. Replace the motor cover if supplied.

Note: For portable applications, the level of the pump should be checked and adjusted after each movement.

Piping

General: Guidelines for piping are given in the “Hydraulic Institute Standards” and should be reviewed prior to installation.

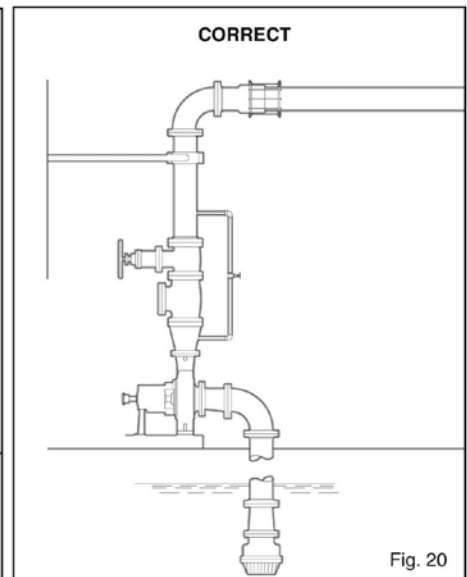
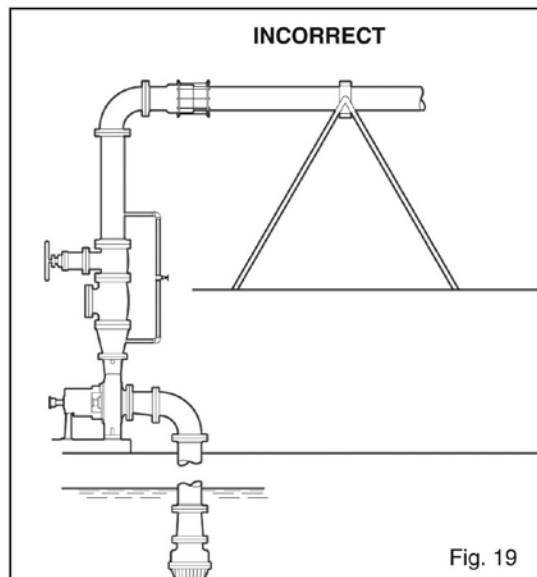
Warning: Never draw piping into place by using force on the suction and discharge connections of the pump. This may impose dangerous strains on the unit causing misalignment, poor operation and physical injury and damage to the equipment.

1. All piping must be supported independently of and line up naturally with the pump suction and discharge. It MUST NOT place piping loads on the pump.

2. Piping should be no smaller than the pump’s suction and discharge connections and kept as short as possible, with minimal fittings to minimize friction losses.

3. DO NOT connect piping to pump until pump and/or driver are securely fastened to a supporting structure.

4. When pumping liquids at elevated temperatures, it is recommended that expansion loops or joints be used in the suction and discharge piping. Refer to the following drawings for correct placement to avoid pump strain or misalignment due to linear expansion of piping.



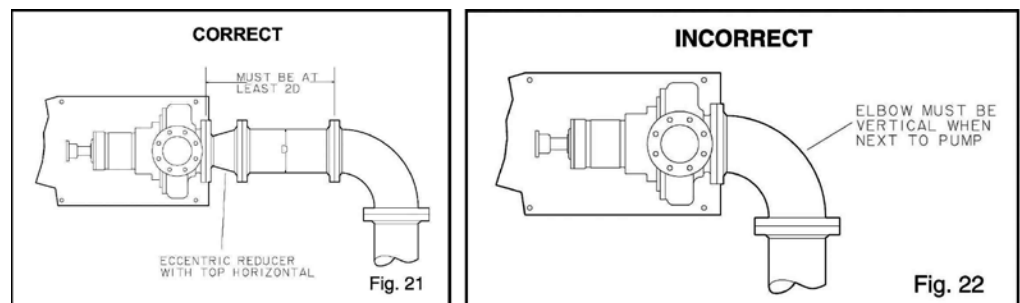
5. The piping should be arranged to permit pump isolation on both the suction and discharge sides so that the pump can be drained during maintenance and repair.
6. Carefully clean all pipe parts, valves and fittings and pump branches prior to assembly.
7. All pipe joints **MUST** be airtight.

Suction Piping

Warning: NPSH available must always exceed NPSH required by the pump. For suction lifts over 10 feet and liquid temperatures over 120 degrees Fahrenheit, consult the performance curve for your pump to determine NPSH required.

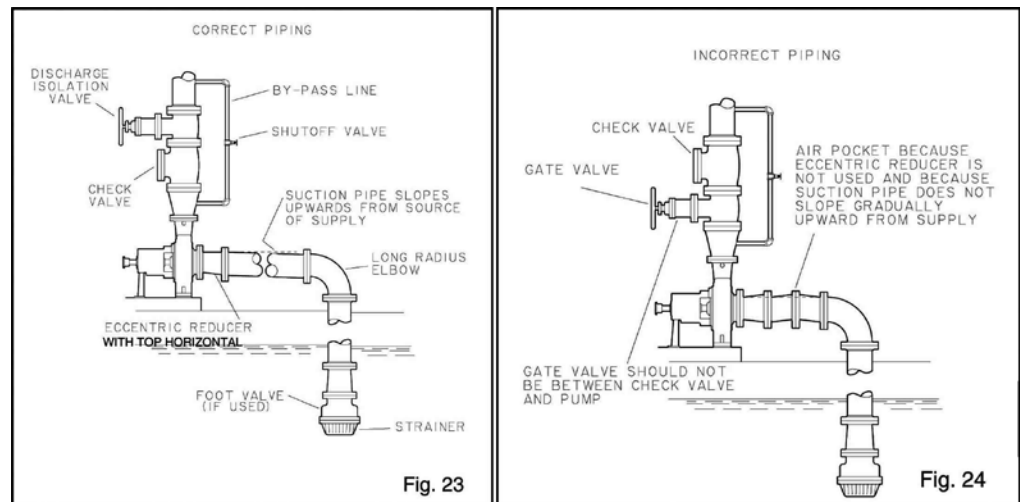
Properly installed suction piping is a necessity for trouble-free pump operation. Suction piping should be flushed **BEFORE** connection to the pump.

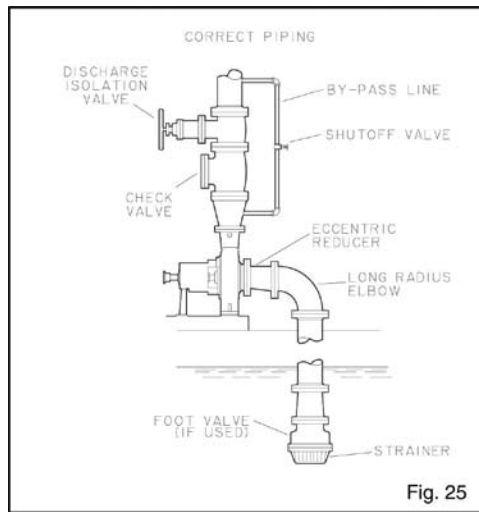
1. Use of elbows close to the pump suction should be avoided. There should be a minimum of two pipe diameters of straight pipe between the elbow and suction inlet. Where used, elbows should be long radius.



2. Use suction pipe one or two sizes larger than the pump suction, with a reducer at the suction. **Suction piping should never be smaller diameter than the pump suction.**

3. Reducers should be eccentric at the pump suction with sloping side down and horizontal side at the top.



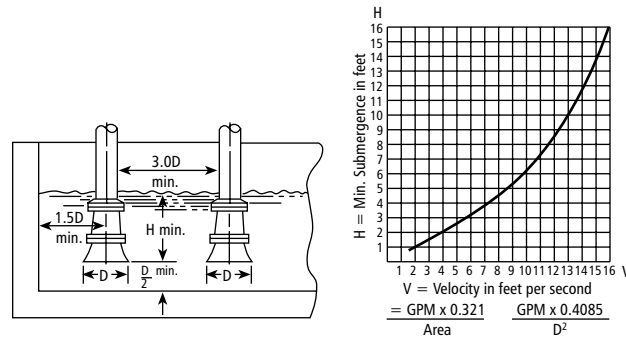
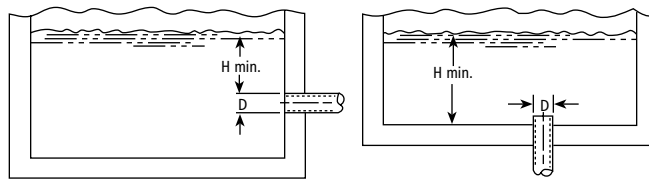


4. Suction strainers, when used, must have a net “free area” of at least three times the suction pipe area.

5. Separate suction lines are recommended when more than one pump is operating from the same source of supply.

Suction Lift Conditions

1. Suction pipe must be free from air pockets.
2. Suction piping must slope upwards to the pump.
3. All joints must be airtight.
4. A means of maintaining prime, such as a foot valve, must be provided.
5. The suction strainer or suction bell MUST be at least three times the diameter of the suction
6. Ensure that the size and minimum submergence over the suction inlet is sufficient to prevent air from entering the pump through a suction vortex.



Suction Head (Flooded Suction) Conditions

1. An isolation valve should be installed in the suction line at least two pipe diameters from the suction to permit closing the line for pump maintenance.

WARNING: Do not use the isolation/gate valve to throttle the pump as this may cause loss of prime, excessive temperatures and damage to pump, voiding warranty.

2. Keep suction pipe free from air pockets.
3. Piping should be level or slope gradually downward from the source of supply.
4. No portion of the piping should extend below pump suction.
5. The size of the entrance from the supply should be one or two sizes larger than the suction pipe.
6. The suction pipe must be adequately submerged below the liquid surface to prevent vortices and air entrainment at the supply. See above illustrations.

Discharge Piping

1. Isolation and check valves should be installed in the discharge line. Locate the check valve between the isolation valve and the pump. This will permit inspection of the check valve. The isolation valve is required for priming, regulation of flow and for inspection and maintenance of the pump. The check valve prevents pump or seal damage due to reverse flow through the pump when the driver is off.
2. Increasers, if used, should be placed between the pump and check valves.
3. Cushioning devices should be used to protect the pump from surges and water hammer if quick closing valves are installed in the system.

Final Piping Check

After connecting the piping to the pump, rotate the motor shaft to make sure that there is no binding.

Wiring

Warning: Install, ground and wire according to local and National Electrical Code requirements.

Install an all leg electrical power disconnect switch near the pump.

Disconnect and lockout electrical power before installing or servicing the pump.

Electrical supply MUST match motor's nameplate specifications. Incorrect voltage can cause fire, damage the motor and void the warranty.

Motors without built-in protection MUST be provided with contactors and thermal overloads for single phase motors, or starters with heaters for three phase motors. See motor nameplate.

Use only copper wire to motor and ground. The ground wire MUST be at least as large as the wire to the motor. Wires should be color coded for ease of maintenance.

Follow motor manufacturer's wiring diagram on the motor nameplate or terminal cover carefully.

Warning: Failure to permanently ground the pump, motor and controls before connecting to electrical power can cause shock, burns or death.

Rotation

Notice: Incorrect rotation may cause damage to the pump and voids the warranty.

Correct rotation is right-hand, clockwise when viewed from the motor end. On three phase close coupled units, remove motor end plug or cover to observe shaft rotation.

To reverse three phase motor rotation, interchange any two power supply leads.

V. Commissioning, Startup, Operation and Shutdown

Overview

This section covers the basic procedures to use in preparing your pump for startup, starting, operating and shutting it down. **DO NOT CONTINUE UNTIL ALL PARTS OF THE INSTALLATION PROCESS (SECTION IV) HAVE BEEN COMPLETED.**

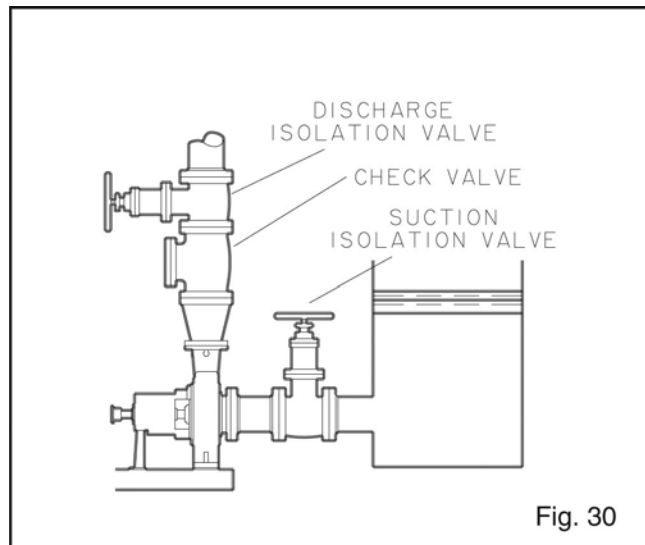
Priming

Never start the pump until it has been properly primed. Several different methods of priming can be used, depending upon type of installation and service involved.

Warning: GSP pumps are not self priming and must be fully primed at all times during operation. Loss of prime can lead to excessive heat and severe damage to the pump and seal.

Flooded suction:

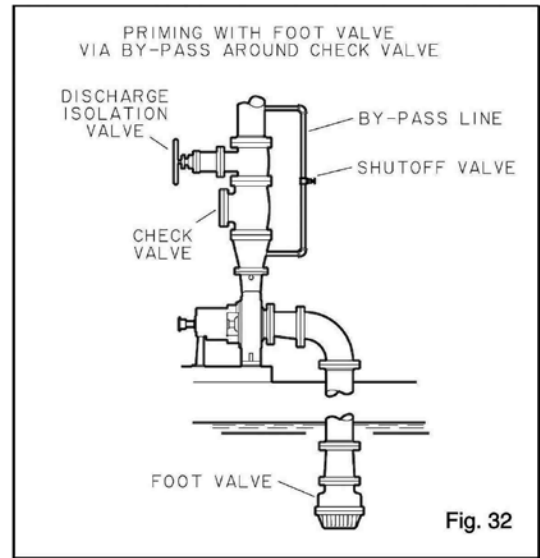
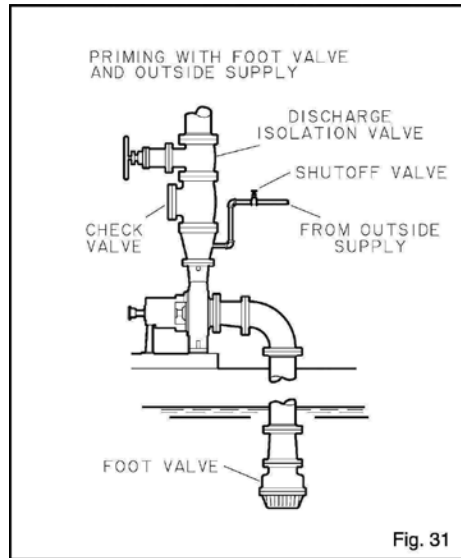
1. Slowly open the suction valve.
2. Open air vents on the suction and discharge piping until liquid flows out.
3. Close the vent valves.



Suction Lift:

A foot valve and outside source of liquid may be used to prime the pump. Outside sources of liquid can come from a priming pump, pressurized discharge line, or other outside supply.

1. Open the discharge connection.
2. Fill the pump casing and suction pipe with liquid by pouring it into the discharge.
3. When full, reattach the discharge connection.



Precautions

Warning: do not operate units without safety guards in place or severe personal injury may result.

Warning: Splashing or immersing open drip proof motors in fluid can cause fire, shock, burns or death. Make sure motor guards are in place.

Warning: Operation at or near zero flow can cause extreme heat, personal injury or property damage.

Starting

1. Make sure suction valve and any recirculation or cooling lines are open.
2. Fully close or partially open discharge valve as dictated by system conditions.
3. Start driver.

Caution: Immediately observe pressure gauges. If discharge pressure is not quickly attained, stop driver, re-prime and attempt to restart.

4. Slowly open discharge valve until the desired flow is obtained.

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

5. After stabilizing the system at normal operating conditions, check the piping and adjust supports if needed.

Operation

General considerations:

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) or viscosity 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 from cavitation or recirculation.

Operating at reduced capacity:

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 can occur from:

1. Increased vibration levels – affects bearings and mechanical seal.
2. Increased radial loads – Stresses on shaft and bearings.
3. Heat build-up – Vaporization causing rotating parts to score or seize.
4. Cavitation – Damage to internal surfaces of pump.

Operating under Freezing Conditions.

Exposure to freezing conditions while pump is idle could cause liquid to freeze and damage the pump. Liquid inside the pump should be drained.

Shutdown

1. Slowly close the discharge valve.
2. Shut down and lock the driver to prevent accidental rotation.

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 environmental regulations.

VI. Maintenance

Overview

This section covers the procedures, precautions and schedule for maintenance of your Goulds pump. A routine maintenance program can extend the life of your pump. Well maintained equipment will last longer and require fewer repairs.

Warnings

Failure to disconnect and lockout electrical power before attempting any maintenance **can cause shock, burns or death.**

Failure to relieve system pressure and drain system before attempting any maintenance **can cause property damage, personal injury or death.**

If piping is hazardous or toxic fluids, system must be flushed prior to performing service involving liquid end disassembly.

Maintenance Schedule

Routine Maintenance

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

Routine Inspections

- Check for unusual noise, vibration and bearing temperatures
- Inspect pump and piping for leaks
- Check seal leakage
 - Mechanical seal: should be no leakage

3 Month Inspections

- Check the foundation and hold-down bolts for tightness.
- If the pump has been left idle, check the seal and replace if needed.

Annual Inspections

- Check the pump capacity, pressure and power. If pump performance does not satisfy your process requirements and the process requirements have not changed, the pump should be disassembled, inspected and worn parts should be replaced. Otherwise, a system inspection should be done.

Inspection intervals: Inspection intervals should be shortened appropriately if the pumpage is abrasive or corrosive, or if the environment is classified as potentially explosive.

Bearing Maintenance

Close coupled units: Bearings are located in and are part of the motor.

Smaller motors used on S1 sizes are equipped with bearings greased for life and need no maintenance. From frame size 180 onwards motors are equipped with grease nipples for greasing the bearings. For some motor brand names, the frequency of greasing is indicated on the nameplate of the motor and must be followed. For motors where this is not mentioned, it is best to grease every 2000 operating hours when the ambient temperature is 25 °C. If the ambient temperature is 40 °C, the interval must be halved.

Note: When re-greasing there is danger of impurities entering the bearing housing. The grease container, the greasing device and fittings must be clean.

Note: The bearing temperature usually rises after re-greasing due to an excess supply of grease. Temperatures will return to normal after the pump has run and purged the excess from the bearings, usually two to four hours.

For most operating conditions a lithium based mineral oil grease of NLGI consistency No. 2 is recommended. This grease is acceptable for bearing temperatures of 5-230 degrees Fahrenheit. Bearing temperatures are generally about 20 degrees higher than the bearing housing surface temperature.

Caution: Never mix greases of different consistency (NGLI 1 or 3 with NGLI 2) or different thickener. For example, never mix a lithium base grease with a polyurea base grease.

Mechanical Seal

Check the mechanical seal for leakage every week. When starting up a new pump, a few drops of liquid leakage per hour is possible because the seal surfaces need to be run in. This leakage should fully disappear after ten operating hours. In case of any damage to the mechanical seal, it should always be replaced, both the stationary part, rotating part and rubber parts. When opening the pump casing, the pump casing seal should also be replaced at the same time.

Spare Parts

Only use original spare parts to assure reliable operation.

When ordering spare parts, always mention type and serial number of the pump. Mechanical seals and O-rings are to be kept in a cool and dry space without temperature fluctuations. It is advisable to have the mechanical seal and O-rings in stock as a spare part.

Internal Cleaning

GSP pumps are designed to be CIP-cleanable (cleaning in place). Several tests have shown they are as cleanable as a tube with the same diameter of the pump and a roughness $R_a = 0.8 \mu\text{m}$.

Pumps are used for several liquids. This makes it impossible to give a general valid CIP cleaning procedure. The efficiency of the cleaning procedure has to be checked during the validation of the installation in which the pump is incorporated. The following are some general recommendations.

Warning: It is important to check if the internal seals of the pump are resistant to the cleaning media. If steam is used during one of the cleaning phases, the pump must not run at the same time. Check if the elastomers used are steam resistant.

Product expelling phase - With gas (N_2 in the pharmaceutical industry and CO_2 in the beverage industry) or liquid (water or solvent) the rest of the product can be removed out of the pump and piping. **If the system is blown empty with gas, the pump first must be switched off to prevent dry running.**

Pre-rinse - The pre-rinsing is done with hot solvent or liquid ($45 - 55 \text{ }^\circ\text{C}$) in the food industry. In the food industry, hot water prevents the residue hardening (fat), whereas higher temperatures lead to denaturising of proteins, which are very difficult to remove. Pulsating the liquid flow (switching on and off the pump) can improve the cleaning. The pre-rinsing liquid is nearly always drained. The pre-rinse can be done with tap water and is very important because it can remove most of the residue.

Cleaning with detergent and alkali - This cleaning has to remove the organic or inorganic dirt based on the chemical or physical action of the detergent. The residue has to be desolved in the cleaning liquid. The return temperature is normally approximately $75 \text{ }^\circ\text{C}$ and the lye concentration between 0.5 and 3 %. Most of the residue is loosening early in this phase. The cleaning can be done with tap water. Since the wash-step is based on the solution of residue, the temperature of the water and detergent mixture is very important. If sequentially an alkaline and acid cleaning is used, normally there is a rinse in between.

Acid cleaning - Acid cleaning is used for removal of inorganic residue and normally only occasionally necessary. Often, inorganic acids are used with a concentration between 0.5 and 3 %. The temperature is less than $65 \text{ }^\circ\text{C}$. Afterwards a rinse is done with lukewarm water.

After rinse - The reason for the after rinse is to remove all loosened residue and detergent.

Disinfection - The disinfection reduces the number of toxic micro-organisms to an acceptable level. However, the disinfection does not guarantee full sterility and is only sensible after a good cleaning.

After rinse - The after rinse has to be done with germ-free water with a total hardness below $5 \text{ }^\circ\text{D}$ (90 mg/l CaCO_3). The after rinse water is often used for pre rinse.

External Cleaning

The GSP pump is designed to be washed down with detergent spray and rinse. The built in motor cover and all stainless steel construction allow plant operators to clean the outside of the pump with the same procedures used for other processing equipment. The pump legs allow the floor under the pump to be cleaned as well. In order to meet 3A 2007, pumps need to have no external seams or rough surfaces which could encourage bacteria growth or make it difficult to clean. The GSP meets these standards.

Disassembly

Required Tools: The following tools should be available for use during pump disassembly and assembly.

Wrenches, screwdrivers, lifting sling, rubber mallet, snap-ring pliers, torque wrench with sockets, allen wrenches, cleaning agents, and feeler gauges.

Warning: Pump components can be heavy. Proper methods of lifting must be employed to avoid physical injury and/or equipment damage. Steel toed shoes must be worn at all times.

Warning: The pump may handle hazardous and/or toxic fluids. Proper personal protective equipment should be worn. Precautions must be taken to prevent physical injury. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.

Note: Before disassembling the pump for overhaul, ensure all replacement parts are available.

Warning: Lock out power supply to driver motor to prevent accidental startup and physical injury.

1. Shut off all valves controlling flow to and from the pump.
2. Drain liquid from piping and flush pump if necessary.

Warning: Allow all system and pump components to cool before handling them to prevent physical injury.

3. Disconnect all auxiliary piping and tubing.
4. On close coupled pumps, remove motor hold down bolts.

S1 Series

For the replacement of the mechanical seal a 5 % soap solution is needed.

1. Remove casing bolts.
2. Remove back pull-out assembly from casing . On close coupled units, the back pull out assembly consists of everything but the casing.
3. On close-coupled units, remove the motor end plug or cover to expose a screwdriver slot or flats on the end of the motor shaft. Some motors may have flats on the drive end to be held with an open ended wrench.
4. While restraining the shaft with an appropriate tool (close coupled units) unscrew the impeller counterclockwise from the shaft. Hold the impeller with a soft cloth during this process to avoid scratches to the surface. Tapping with a rubber mallet is acceptable if needed to free the impeller threads. Red Loctite is applied in the factory to the threads. Some heat may be needed to break it free.
5. Remove the rotary seat by carefully sliding it off the impeller.

6. Remove the backplate.
7. Remove the old stationary seat out of the backplate.
8. For motor replacement, remove the bolts holding the motor adapter to the front of the motor. Remove bolts holding the motor to the base.
9. Clean all stainless steel parts with a clean cloth and if necessary some acetone. Check if the O-ring is still in good condition and replace if necessary.
10. Reassemble the motor to the base and motor adapter if necessary.
11. Put the backplate in the adaptor. Submerge the stationary part of the mechanical seal in the 5 % soap solution and press it with your hands in the front side of the backplate. Apply an equally spread pressure and press it completely into place. Never use an oil-based lubricant, it can damage the rubber parts of the seal.
12. Submerge also the rotating part of the same seal in the soap solution and slide it on the shaft of the impeller (sealing face away from the vanes). Clean both sealing faces with a clean lint free cloth.
13. Apply a light coating of thread lubricant to the end of the motor shaft. Screw the impeller on the shaft and fasten it with a torque wrench set on 28 Nm, while holding the motor shaft at the back of the motor. The impeller should have a .5mm clearance to the backplate.
14. Put the casing O-ring and pump casing back on the front of the pump. Fasten the bolts.

Refer to exploded view drawings on page 24 for added detail.

S2 Series

For the replacement of the mechanical seal a 5 % soap solution is needed.

1. Remove casing bolts.
2. Remove back pull-out assembly from casing. On close coupled units, the back pull out assembly consists of everything but the casing.
4. On close-coupled units, remove the motor end plug or cover to expose a screwdriver slot or flats on the end of the motor shaft.
5. While restraining the shaft with an appropriate tool (close coupled units) remove impeller bolt.
6. While wearing work gloves, move the impeller from side to side until it is free and slides from the shaft. A 1/2-13 bolt may be threaded into the impeller bolt hole to assist in driving off the impeller.
7. Remove the impeller and the backplate. Inspect the condition of the o-ring on the back of the impeller. If it is still in good condition, only the rotary and stationary elements need to be replaced. If the o-ring appears to be damaged, follow the steps at the end of this section.
8. Remove the old seal out of the backplate and from the impeller shaft.
9. For motor replacement, remove the bolts holding the motor adapter to the front of the motor. Remove bolts holding the motor to the base.

10. Clean all stainless steel parts with a clean cloth and if necessary some acetone. Check if the O-rings are still in good condition and replace if necessary.

11. Reassemble motor to base and motor adapter to motor if necessary.

12. Submerge the stationary part of the mechanical seal in the 5 % soap solution and press it with your hands in the front side of the backplate. Apply an equally spread pressure and press it completely into place.

13. Submerge also the rotating part of the same seal in the soap solution and slide it on the shaft (sealing face away from the vanes). Clean both sealing faces with a clean cloth.

14. Put the key in the shaft and slide the impeller onto the shaft. Be careful the key fits in the keyway in the impeller and the rotating part of the mechanical seal remains on its seat.

15. Fasten the impeller screw.

16. Replace the casing O-ring and pump casing (1). Fasten the bolts.

Seal replacement with damaged rotary o-ring

1. The upper part of the S-2 rotary is a pressed fit to the impeller shaft. A bearing puller may be used, or a tool available from Goulds Pumps may be purchased.

2. If using the Goulds Pumps tool, place the tool over the end of the impeller shaft, align the set screw with the holes in the seal sleeve and tighten them.

3. Use a 1/2-13 bolt through the front of the impeller to drive against the base of the tool and remove the seal sleeve.

4. To install a new seal sleeve on the impeller, use an arbor press to push the sleeve up the impeller shaft until the o-ring seats against the base of the impeller.

VII. Troubleshooting

Overview

This section provides a chart of potential problems along with their probable cause and remedies which will correct the problem.

Warning

Disconnect and lockout electrical power before attempting any maintenance. Failure to do so can cause a shock, burn or death.

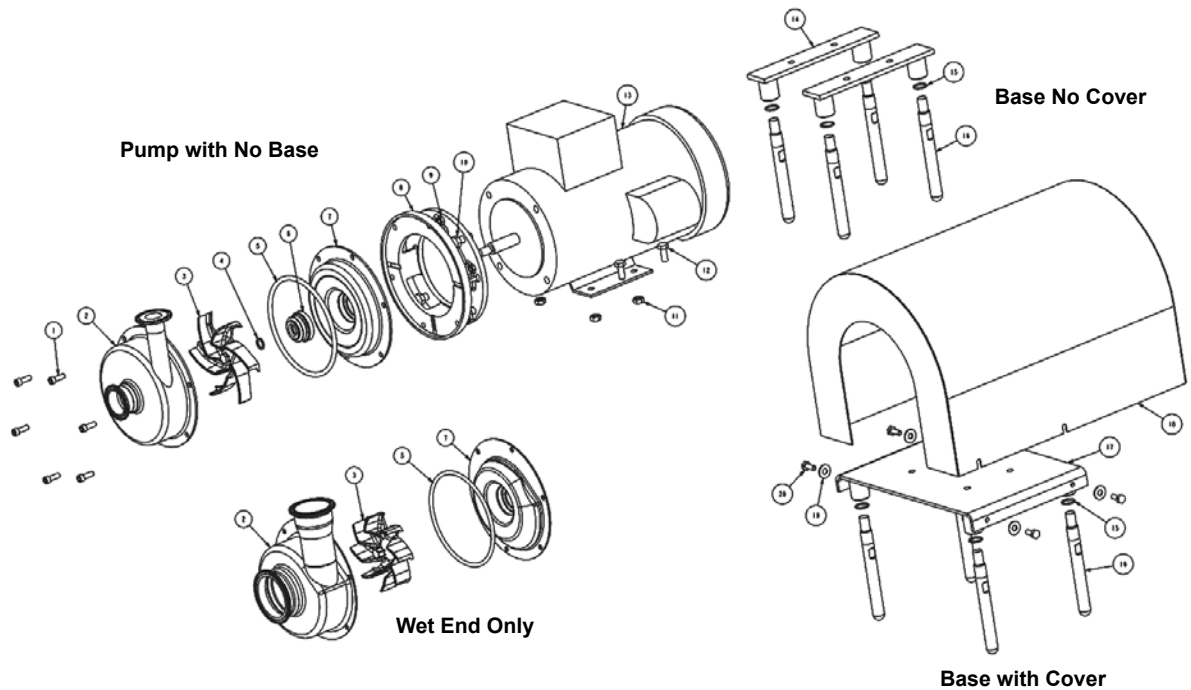
Failure	Possible cause	Solution
There is no suction	<ul style="list-style-type: none"> × Wrong direction of rotation × Valve in suction line or pressure line closed × Synthetic plugs are still in inlet or outlet × Insufficient de-aeration 	<ul style="list-style-type: none"> × Change two terminals × Open valves × Remove plugs × De-aerate better × Open all valves completely, decrease pressure in discharge vessel, make provisions so that no liquid column can be built up on the outlet of the pump

Pump flow is too low	<ul style="list-style-type: none"> × There is no suction × Wrong direction of rotation × Valves are not opened enough × Impurities in the pipe work × Pump draws air × Air pockets in the suction line × Wrong motor connection 	<ul style="list-style-type: none"> × See above × Change two terminals × Open valves × Clean pipes × Stop leakages in suction line, raise level in suction tank × De-aerate × Reconnect in the right way
Pump produces low pressure	<ul style="list-style-type: none"> × Wrong direction of rotation × Cavitation × Motor is running too slow (frequency converter) × Wrong motor connection 	<ul style="list-style-type: none"> × Change two terminals × See below × Raise frequency × Reconnect in the right way
Cavitation (pumps make a cracking noise, floating of the pump pressure)	<ul style="list-style-type: none"> × Friction losses in suction line too high × Liquid temperature too high × Liquid level in suction tank too low 	<ul style="list-style-type: none"> × All valves in suction line must be completely open, enlarge diameters × Cool down liquid × Fill up tank or lower pump
Pump flow too high	<ul style="list-style-type: none"> × Friction losses too low 	<ul style="list-style-type: none"> × Close valve in discharge pipe
Pump blocked	<ul style="list-style-type: none"> × Pump wrongly assembled × Foreign body in the pump 	<ul style="list-style-type: none"> × Disassemble and assemble in the correct way × Clean
Motor uses too much current (Amperes)	<ul style="list-style-type: none"> × Wrong direction of rotation × Flow too high × Pump blocked × Voltage too low 	<ul style="list-style-type: none"> × Change two terminals × See above × See above × Repair electrical failure
Motor overheats	<ul style="list-style-type: none"> × Motor uses too much current × Ambient temperature too high × Not enough cooling 	<ul style="list-style-type: none"> × See above × Cool down × Do not let the motor run slower than on 25 Hz, improve air supply
Pump vibrates	<ul style="list-style-type: none"> × Cavitation × Pump draws air × Motor bearings worn 	<ul style="list-style-type: none"> × See above × Stop leakages in suction line, raise level in suction tank × Replace motor (bearings)
Pump leaks	<ul style="list-style-type: none"> × Mechanical seal broken × Pump casing seal broken 	<ul style="list-style-type: none"> × Replace mechanical seal × Replace pump casing seal
Pump makes abnormal noise	<ul style="list-style-type: none"> × Cavitation × Two touching parts or pumps blocks × Pump flow too high × Motor bearings worn 	<ul style="list-style-type: none"> × See above × See above × See above × Replace motor (bearings)

VIII. Parts Listing and Cross Sectional Drawings

Overview

This section provides cross sectional and exploded view drawings of the various parts of the GPS pumps.



Pump with No Base

Location	Description	Quantity
1	Capscrew	6
2	Casing	1
3	Impeller	1
5	O-ring	1
6	Mechanical seal	1
7	Back plate	1
8	Motor adapter	1
9	Hex nut – plated	6
10	Hex head cap screws	4
11	Hex nut – plated	4
12	Hex head cap screws	4
13	NEMA motor	1

Wet End Only

Location	Description	Quantity
2	Casing	1
3	Impeller	1
5	O-ring	1
7	Back plate	1

Base with Cover

Location	Description	Quantity
15	O-rings	4
16	Foot - motor base	4
17	Base assembly	1
18	Motor cover	1
19	Washer	4
20	Hex head cap screw	4

Base No Cover

Location	Description	Quantity
14	Base assembly	2
15	O-rings	4
16	Foot – motor base	4

IX. Appendix

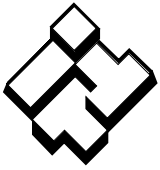
The following table explains the meaning of the model number shown on the nameplate of your pump. This model number provides information on pump size, horsepower, impeller size, motor voltage, phase, RPM, etc.

GSP Nomenclature Complete

Model	Size		Motor Options						Imp Trim	Seal/ Elastomer			
			Hz/RPM/PH	HP	Voltage		Enclosure						
S	1	A	1	60/3500/1	C	0.5	1	115/208-230	1	ODP	A	0	EPDM/Car/SilCar
	1	B	2	60/3500/3	D	0.75	2	115/230	2	TEFC	B	2	Viton/Car/SilCar
	2	A	3	60/1750/1	E	1	3	230	4	PE-ODP	C		
	2	B	4	60/1750/3	F	1.5	4	230/460	5	PE-TEFC	D		
	2	C	5	50/2900/1	G	2	5	208-230/460	7	WD			
	2	D	6	50/2800/3	H	3	6	460	8	PE-WD			
	2	E	7	1/50/1450	J	5	7	575	9	SS-WD			
	2	F	8	3/50/1450	K	7.5	8	208					
	2	G			L	10	9	208-230					
	2	H			M	15	A	190/380					
					N	20	B	380					
					P	25	C	110/220					
					Q	30	D	220					
					R	40	E	200					
					S	50	F	380-415					
					T	50	G	220-380 WYE					
				U	75	H	380-460 WYE						
				V	100								

Notes

Notes



ITT

Commercial Water



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