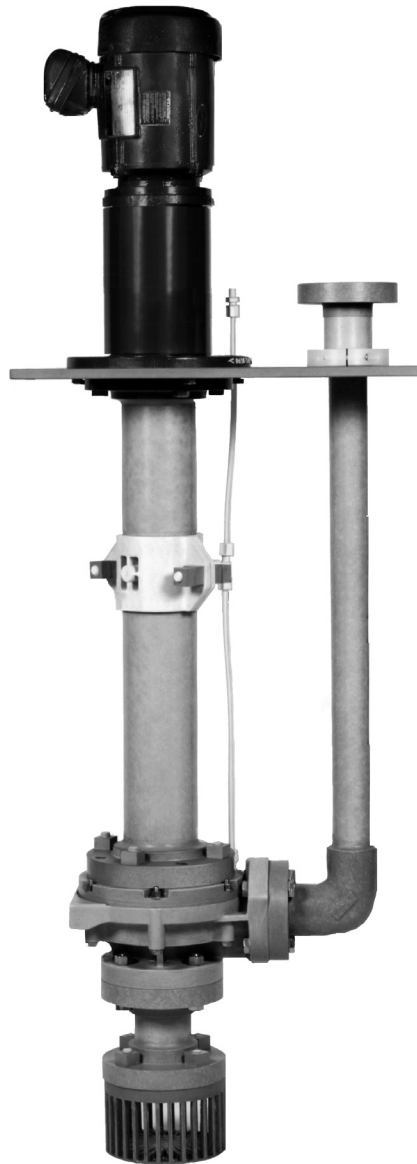


# **GOULDS PUMPS**

## **Installation, Operation, and Maintenance Instructions**

**Model 4550**



**ITT**



# FOREWORD

This manual provides instructions for the Installation, Operation, and Maintenance of the ITT Goulds Model 4550 Non-Metallic Vertical Process Pump. This manual covers the standard product plus common options that are available. For special options, supplemental instructions are supplied. **This manual must be read and understood before installation and start-up.**

The design, materials, and workmanship incorporated in the construction of ITT 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.

**ITT 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.**

**Warranty is valid only when genuine ITT Goulds parts are used.**

Use of the equipment on a service other than stated in the order will nullify the warranty, unless written approval is obtained in advance from ITT Goulds Pumps.

Supervision by an authorized ITT Goulds' representative is recommended to assure proper installation. Additional manuals can be obtained by contacting your local ITT Goulds representative or by calling 1-800-446-8537.

## THIS MANUAL EXPLAINS

- **Proper Installation**
- **Start-up Procedures**
- **Operation Procedures**
- **Routine Maintenance**
- **Pump Overhaul**
- **Troubleshooting**
- **Ordering Spare or Repair Parts**



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## IMPORTANT SAFETY NOTICE

*To: Our Valued Customers*

User safety is a major focus in the design of our products. Following the precautions outlined in this manual will minimize your risk of injury.

ITT Goulds pumps will provide safe, trouble-free service when properly installed, maintained, and operated.

Safe installation, operation, and maintenance of ITT Goulds Pumps equipment are an essential end user responsibility. This *Pump Safety Manual* identifies specific safety risks that must be considered at all times during product life. Understanding and adhering to these safety warnings is mandatory to ensure personnel, property, and/or the environment will not be harmed. Adherence to these warnings alone, however, is not sufficient — it is anticipated that the end user will also comply with industry and corporate safety standards. Identifying and eliminating unsafe installation, operating and maintenance practices is the responsibility of all individuals involved in the installation, operation, and maintenance of industrial equipment.

Please take the time to review and understand the safe installation, operation, and maintenance guidelines outlined in this Pump Safety Manual and the Instruction, Operation, and Maintenance (IOM) manual. Current manuals are available at [www.gouldspumps.com/literature\\_ioms.html](http://www.gouldspumps.com/literature_ioms.html) or by contacting your nearest Goulds Pumps sales representative.

**These manuals must be read and understood before installation and start-up.**

For additional information, contact your nearest Goulds Pumps sales representative or visit our Web site at [www.gouldspumps.com](http://www.gouldspumps.com).

# SAFETY WARNINGS

Specific to pumping equipment, significant risks bear reinforcement above and beyond normal safety precautions.

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 **WARNING**

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A pump is a pressure vessel with rotating parts that can be hazardous. Any pressure vessel can explode, rupture, or discharge its contents if sufficiently over pressurized causing death, personal injury, property damage, and/or damage to the environment. All necessary measures must be taken to ensure over pressurization does not occur.

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 **WARNING**

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Operation of any pumping system with a blocked suction and discharge must be avoided in all cases. Operation, even for a brief period under these conditions, can cause superheating of enclosed pumpage and result in a violent explosion. All necessary measures must be taken by the end user to ensure this condition is avoided.

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 **WARNING**

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The pump may handle hazardous and/or toxic fluids. Care must be taken to identify the contents of the pump and eliminate the possibility of exposure, particularly if hazardous and/or toxic. Potential hazards include, but are not limited to, high temperature, flammable, acidic, caustic, explosive, and other risks.

---

 **WARNING**

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Pumping equipment Instruction, Operation, and Maintenance manuals clearly identify accepted methods for disassembling pumping units. These methods must be adhered to. Specifically, applying heat to impellers and/or impeller retaining devices to aid in their removal is strictly forbidden. Trapped liquid can rapidly expand and result in a violent explosion and injury.

ITT Goulds Pumps will not accept responsibility for physical injury, damage, or delays caused by a failure to observe the instructions for installation, operation, and maintenance contained in this Pump Safety Manual or the current IOM available at [www.gouldspumps.com/literature](http://www.gouldspumps.com/literature).



# SAFETY

## DEFINITIONS

Throughout this manual the words **WARNING**, **CAUTION**, **ELECTRICAL**, and **ATEX** are used to indicate where special operator attention is required.

**Observe all Cautions and Warnings highlighted in this Pump Safety Manual and the IOM provided with your equipment.**



### **WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

**Example:** Pump shall never be operated without coupling guard installed correctly.

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### **CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**Example:** Throttling flow from the suction side may cause cavitation and pump damage.

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### **ELECTRICAL HAZARD**


Indicates the possibility of electrical risks if directions are not followed.

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

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When installed in potentially explosive atmospheres, the instructions that follow the Ex symbol must be followed. Personal injury and/or equipment damage may occur if these instructions are not followed. If there is any question regarding these requirements or if the equipment is to be modified, please contact an ITT Goulds Pumps representative before proceeding.







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














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## GENERAL PRECAUTIONS

### WARNING

A pump is a pressure vessel with rotating parts that can be hazardous. Hazardous fluids may be contained by the pump including high temperature, flammable, acidic, caustic, explosive, and other risks. Operators and maintenance personnel must realize this and follow safety measures. Personal injuries will result if procedures outlined in this manual are not followed. ITT Goulds Pumps will not accept responsibility for physical injury, damage or delays caused by a failure to observe the instructions in this manual and the IOM provided with your equipment.

General Precautions		
WARNING		NEVER APPLY HEAT TO REMOVE IMPELLER. It may explode due to trapped liquid.
WARNING		NEVER use heat to disassemble pump due to risk of explosion from tapped liquid.
WARNING		NEVER operate pump without coupling guard correctly installed.
WARNING		NEVER run pump below recommended minimum flow when dry, or without prime.
WARNING		ALWAYS lock out power to the driver before performing pump maintenance.
WARNING		NEVER operate pump without safety devices installed.
WARNING		NEVER operate pump with discharge valve closed.
WARNING		NEVER operate pump with suction valve closed.
WARNING		DO NOT change service application without approval of an authorized ITT Goulds Pumps representative.
WARNING		<p><b>Safety Apparel:</b></p> <ul style="list-style-type: none"> <li>♦ Insulated work gloves when handling hot bearings or using bearing heater</li> <li>♦ Heavy work gloves when handling parts with sharp edges, especially impellers</li> <li>♦ Safety glasses (with side shields) for eye protection</li> <li>♦ Steel-toed shoes for foot protection when handling parts, heavy tools, etc.</li> <li>♦ Other personal protective equipment to protect against hazardous/toxic fluids</li> </ul>
WARNING		<p><b>Receiving:</b></p> <p>Assembled pumping units and their components are heavy. Failure to properly lift and support equipment can result in serious physical injury and/or equipment damage. Lift equipment only at specifically identified lifting points or as instructed in the current IOM. Current manuals are available at <a href="http://www.gouldspumps.com/literature_ioms.html">www.gouldspumps.com/literature_ioms.html</a> or from your local ITT Goulds Pumps sales representative. Note: Lifting devices (eyebolts, slings, spreaders, etc.) must be rated, selected, and used for the entire load being lifted.</p>
WARNING		<p><b>Alignment:</b></p> <p>Shaft alignment procedures must be followed to prevent catastrophic failure of drive components or unintended contact of rotating parts. Follow coupling manufacturer's coupling installation and operation procedures.</p>

<b>General Precautions</b>		
<b>WARNING</b>		Before beginning any alignment procedure, make sure driver power is locked out. Failure to lock out driver power will result in serious physical injury.
<b>CAUTION</b>		<b>Piping:</b> Never draw piping into place by forcing at the flanged connections of the pump. This may impose dangerous strains on the unit and cause misalignment between pump and driver. Pipe strain will adversely effect the operation of the pump resulting in physical injury and damage to the equipment.
<b>WARNING</b>		<b>Flanged Connections:</b> Use only fasteners of the proper size and material.
<b>WARNING</b>		Replace all corroded fasteners.
<b>WARNING</b>		Ensure all fasteners are properly tightened and there are no missing fasteners.
<b>WARNING</b>		<b>Startup and Operation:</b> When installing in a potentially explosive environment, please ensure that the motor is properly certified.
<b>WARNING</b>		Operating pump in reverse rotation may result in contact of metal parts, heat generation, and breach of containment.
<b>WARNING</b>		Lock out driver power to prevent accidental start-up and physical injury.
<b>WARNING</b>		The impeller clearance setting procedure must be followed. Improperly setting the clearance or not following any of the proper procedures can result in sparks, unexpected heat generation and equipment damage.
<b>WARNING</b>		If using a cartridge mechanical seal, the centering clips must be installed and set screws loosened prior to setting impeller clearance. Failure to do so could result in sparks, heat generation, and mechanical seal damage.
<b>WARNING</b>		The coupling used in an ATEX classified environment must be properly certified and must be constructed from a non-sparking material.
<b>WARNING</b>		Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.
<b>WARNING</b>		Make sure to properly lubricate the bearings. Failure to do so may result in excess heat generation, sparks, and / or premature failure.
<b>CAUTION</b>		The mechanical seal used in an ATEX classified environment must be properly certified. Prior to start up, ensure all points of potential leakage of process fluid to the work environment are closed.
<b>CAUTION</b>		Never operate the pump without liquid supplied to mechanical seal. Running a mechanical seal dry, even for a few seconds, can cause seal damage and must be avoided. Physical injury can occur if mechanical seal fails.
<b>WARNING</b>		Never attempt to replace packing until the driver is properly locked out and the coupling spacer is removed.
<b>WARNING</b>		Dynamic seals are not allowed in an ATEX classified environment.
<b>WARNING</b>		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.

<b>General Precautions</b>		
<b>WARNING</b>		Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
<b>WARNING</b>		<b>Shutdown, Disassembly, and Reassembly:</b> 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.
<b>WARNING</b>		The pump may handle hazardous and/or toxic fluids. Observe proper decontamination procedures. 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.
<b>WARNING</b>		Operator must be aware of pumpage and safety precautions to prevent physical injury.
<b>WARNING</b>		Lock out driver power to prevent accidental startup and physical injury.
<b>CAUTION</b>		Allow all system and pump components to cool before handling them to prevent physical injury.
<b>CAUTION</b>		If pump is a Model NM3171, NM3196, 3198, 3298, V3298, SP3298, 4150, 4550, or 3107, there may be a risk of static electric discharge from plastic parts that are not properly grounded. If pumped fluid is non-conductive, pump should be drained and flushed with a conductive fluid under conditions that will not allow for a spark to be released to the atmosphere.
<b>WARNING</b>		Never apply heat to remove an impeller. The use of heat may cause an explosion due to trapped fluid, resulting in severe physical injury and property damage.
<b>CAUTION</b>		Wear heavy work gloves when handling impellers as sharp edges may cause physical injury.
<b>CAUTION</b>		Wear insulated gloves when using a bearing heater. Bearings will get hot and can cause physical injury.

## ATEX CONSIDERATIONS and INTENDED USE

Special care must be taken in potentially explosive environments to ensure that the equipment is properly maintained. This includes but is not limited to:

1. Monitoring the pump frame and liquid end temperature.
2. Maintaining proper bearing lubrication.
3. Ensuring that the pump is operated in the intended hydraulic range.

The ATEX conformance is only applicable when the pump unit is operated within its intended use. Operating, installing or maintaining the pump unit in any way that is not covered in the Instruction, Operation, and Maintenance manual (IOM) can cause serious personal injury or damage to the equipment. This includes any modification to the equipment or use of parts not provided by ITT Goulds Pumps. If there is any question regarding the intended use of the equipment, please contact an ITT Goulds representative before proceeding. Current IOMs are available at [www.gouldspumps.com/literature\\_ioms.html](http://www.gouldspumps.com/literature_ioms.html) or from your local ITT Goulds Pumps Sales representative.

All pumping unit (pump, seal, coupling, motor and pump accessories) certified for use in an ATEX classified environment, are identified by an ATEX tag secured to the pump or the baseplate on which it is mounted. A typical tag would look like this:



The CE and the Ex designate the ATEX compliance. The code directly below these symbols reads as follows:

- II = Group 2
- 2 = Category 2
- G/D = Gas and Dust present
- T4 = Temperature class, can be T1 to T6 (see Table 1)

<b>Code</b>	<b>Max permissible surface temperature °F (°C)</b>	<b>Max permissible liquid temperature °F (°C)</b>
T1	842 (450)	700 (372)
T2	572 (300)	530 (277)
T3	392 (200)	350 (177)
T4	275 (135)	235 (113)
T5	212 (100)	Option not available
T6	185 (85)	Option not available

The code classification marked on the equipment must be in accordance with the specified area where the equipment will be installed. If it is not, do not operate the equipment and contact your ITT Goulds Pumps sales representative before proceeding.

# PARTS



The use of genuine Goulds parts will provide the safest and most reliable operation of your pump. ITT Goulds Pumps ISO certification and quality control procedures ensure the parts are manufactured to the highest quality and safety levels.

Please contact your local Goulds representative for details on genuine Goulds parts.

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## PUMP DESCRIPTION

ITT Goulds Model 4550 pumps are centrifugal wet pit type pumping units for installation in a pit or a tank vented to atmospheric pressure. All pump parts in contact with the fluid are constructed of glass reinforced vinyl ester (VR-1) or epoxy (EY-1) resin with the exception of the shaft and hardware, which are of an alloy selected for

compatibility with the fluid pumped. Vertical pumps contain one or more nonmetallic line bearings which require a source of fluid flush to lubricate and cool the bearings. Cantilever pumps are of the overhung shaft type and do not contain any bearings below the mounting plate.

## GENERAL INFORMATION

### IMPORTANCE OF INSTRUCTIONS

This instruction manual is intended to assist those involved with the installation, operation and maintenance of ITT Goulds Model 4550 pump. It is recommended that this manual be thoroughly reviewed prior to installing or performing any work on the pump or motor.

Study thoroughly and carefully follow the instructions for installation and operation. Keep this instruction manual available for reference.

Further information may be obtained by contacting the Seneca Falls Operations at ITT Goulds Pumps, Seneca Falls, N.Y. 13148, or your nearest ITT Goulds sales office or representative.

### PRECAUTIONS



#### WARNING

*Personal injuries will result if procedures outlined in this manual are not followed.*

1. Do not over tighten bolts and nuts. Tighten according to chart in Appendix I.

2. Never rotate pump in the wrong direction. Severe pump damage can be caused by wrong rotation. Proper rotation direction is indicated on the motor support (240).
3. Never force pump parts during disassembly or assembly.
4. Avoid undue impacts or shocks to pump while hanging.
5. Do not put pipe strain or bending moments on discharge pipe and flange (195). Piping should be independently supported and should line up naturally with the discharge. Use properly restrained expansion joints between pump and piping.
6. Clean liquid must be applied to the column bearings (213) at a rate of 0.25 - 0.50 GPM (0.16 - 0.32 I/s)
7. Never operate pump without coupling guard correctly installed.
8. Never operate pump beyond the rated conditions to which the pump was supplied.
9. Never operate pump without safety devices installed.

10. Lower ends of pumps must be braced in turbulent sumps.
11. Always lock out power to the driver before performing pump maintenance.

## SPECIAL WARNINGS

ITT Goulds Pumps will not be liable for any damages or delay caused by failure to comply with the provisions of this instruction manual.

This pump is not to be operated at speeds, working pressures, discharge pressures or temperatures higher than, or used with liquids other than, that stated in original order acknowledgement without written permission of ITT Goulds Pumps.

## RECEIVING INSPECTION - SHORTAGES

Care should be taken when unloading pumps. If shipment is not delivered in good order and in accordance with the bill of lading, note the damages or shortages on both receipt and freight bill. **Make any claims to the transportation company promptly.**

Instruction sheets on various components, as well as the installation, operation and maintenance instructions for the pump, are included in the shipment.

**Do not discard!**

## PRESERVATION AND STORAGE

ITT Goulds' normal domestic storage preparation is suitable for protecting the pump during shipment in covered trucks. It also provides protection during covered storage at the job site and for a short period before installation and start-up.

Motor manufacturers should be contacted for their recommendations on preservation and protection procedures.

## HANDLING TECHNIQUES



### 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.*

Care should be used in moving pumps. Slings should be put under the mounting plate (189) to properly support the unit.

**The best method of lifting unit is with parallel straps attached to a horizontal bar.**



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## LOCATION OF UNIT

Vertical sump pumps are to be mounted directly in a sump or tank, with proper support under the polyester mounting plate (189). Floor space and head room allotted to the unit must be sufficient for removal from the sump or tank.

## PREPARATION FOR INSTALLATION

Vertical units are shipped completely assembled except for level controls and motors. Make sure all bolts are securely tightened. Use a torque wrench on all non-metallic joints. Bolt and nut torque values should not exceed those shown in the chart in Appendix I.

Install level controls per the manufacturer's recommendations included with the controls.

## INSTALLATION OF UNIT IN PIT

1. Inspect pump and any accessories packed with the unit to assure no damage has occurred during transit.

**NOTE: Motors are shipped separately and should also be inspected.**

Install the pump assembly in the pit before mounting the motor to prevent damage.

### ⚠ CAUTION

**When handling the pump unit, it is very important to pick up the unit by the top to prevent damage to the pump.**

2. A rope or sling should be attached to the bearing pedestal (108) or the mounting plate (189). Serious damage may result if the unit is picked up by the column shaft (192) or discharge pipe (195). The

pump assembly must be lowered carefully into the pit. Care must be taken to guide the pump as it is lowered into the pit to avoid striking the sides.

3. When the mounting plate (189) is resting in the proper position, check the level of the plate, and shim if necessary to level the unit. The pump shaft must be vertical to avoid a bending stress on the shaft column, and to avoid bearing damage during operation. Check the shaft column (192) with a level to be sure the unit is straight and plumb.
4. Bolt down the mounting plate, and be sure it is supported on all four sides.

**NOTE: There should be a minimum of 4 to 12 inches between the bottom of the suction strainer and the bottom of the tank of pit.**

For higher flow pumps, this clearance may be specified as greater; check your outline drawing.

- Be sure the source of lubrication to the line bearings on 4550 Series vertical pumps has been connected if an external flush source is required. Check all fittings at the line bearings to be sure no damage has occurred during shipment.
- Connect level control, if the pump is so equipped.

## ASSEMBLY OF MOTOR TO MOTOR SUPPORT

If motor is shipped from ITT Goulds' factory, both coupling halves will be assembled on shafts in their correct positions. If motor is shipped direct or furnished by customer, the motor half coupling must be fitted on motor shaft.

Place motor on motor support (240) and tighten hex cap screws snugly.

## ROTATION CHECK

Before coupling is connected, motor should be wired and the direction of rotation checked. A rotation arrow is located on the motor support (240).

Standard rotation for Model 4550 is clockwise (CW) as viewed from the driver.



### CAUTION

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

## CONNECTION OF PIPING

Connect discharge piping to discharge pipe flange (195) above mounting plate (189). This piping should be independently supported, should align naturally with the discharge flange, should be as direct as possible, and should have a minimum number of fittings. A gate valve should be used for flow control. There should be no strain on the piping, and a properly restrained expansion joint must be used.



### WARNING

*Never draw piping into place by forcing at the flange connections of the pump. This may impose dangerous strains on the unit and adversely affect the operation of the pump resulting in physical injury and damage to the equipment.*

## ALIGNMENT OF FLEXIBLE COUPLING

Check for coupling alignment by laying a straight edge across both coupling rims at four points 90 degrees apart. When the straight edge rests evenly at all four points, the coupling will be in correct alignment. Tighten hex cap screws (370U).

## IMPELLER ADJUSTMENT - ALL MODELS

*NOTE: All models are preadjusted before leaving the factory. Check to see if shaft turns freely by hand. If no binding is noted, no further adjustment is needed. If binding is noted, follow adjustment procedure below.*



### WARNING

*Never adjust impeller with coupling connected.*

The impeller must be adjusted with the pump mounted in the vertical position.

### Impeller Adjustment for 4550 Series Vertical Sizes

1x1.5-6	3x4-8
1.5x3-6	1.5x3-10
2x3-6	2x3-10
1x1.5-8	3x4-10
1.5x3-8	4x4-10
2x3-8	

- Loosen bearing cap set screw.
- Loosen clamping screw in adjusting collar (283A).
- Slowly rotate adjusting collar counterclockwise while pushing down on shaft, and rotate shaft until you feel the impeller touch the casing face.
- Place a dial indicator on the end of the shaft. Rotate the collar clockwise (CW), raising the shaft to the clearance specified in Table 1.

*NOTE: For "Quick Field" adjustment, rotate the collar 90° clockwise, while securing the shaft.*

- Re-lock adjusting collar clamping screw (283A).
- Tighten set screw.
- Rotate shaft by hand to insure that there is no binding or rubbing of parts.

**Table 1**

Impeller Diameter (Inches)	Clearance (Inches)
Up to 8"	.015
8" to 10"	.020
10" to 15"	.025

### Impeller Adjustment for Vertical Sizes:

4x6-10	6x8-13
2x3-13	8x10-15
3x4-13	10x12-16
4x6-13	All Cantilever Sizes

1. Loosen three adjusting screws evenly.
2. Tighten up equally on outer screw until you can feel the impeller just starting to rub on the casing face. Rotate the shaft frequently while taking up on these bolts, so you know when it begins to bind.
3. Now loosen the outer screw evenly until you can insert a feeler gauge, corresponding to the impeller clearance from Table 1 above, under each of the three bolt heads.

***NOTE: For “Quick Field” adjustment, loosen outer screw two flats.***

4. Tighten adjusting screw evenly until the bearing housing is backed up against the outer screw.
5. Check to be sure the shaft turns freely.



# OPERATION

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## PREPARATION FOR OPERATION

### MOTOR ASSEMBLY

When the motor is furnished by the customer, the motor coupling half must be installed. Place motor on motor support, start the mounting bolts into the motor, and securely tighten the motor mounting bolts.

### MOTOR BEARINGS

Check and follow motor manufacturer's lubrication instructions.

### ROTATION CHECK

Before coupling sleeve is connected, the motor should be wired and the direction of rotation checked. The motor should be rotating in a clockwise (CW) direction when looking down on top of the motor.

 **WARNING**  
*Serious damage could occur if pump is operated in the wrong direction.*

After the proper motor rotation direction is established, loosen the motor coupling half and install the coupling sleeve. Adjust the motor coupling half and tighten. Rotate the coupling to insure no binding occurs and install the coupling guard. Proper alignment of the pump and motor is of extreme importance for trouble free mechanical operation. Check the coupling alignment by laying a straight-edge across both coupling hubs at four points, 90 degrees apart.

### PIPING THE PUMP

The pump discharge pipe is connected to the process piping above the mounting plate. The piping should be as direct as possible with a minimum number of fittings. It is recommended that a check valve be installed in the pump discharge line as close as possible to where the discharge pipe comes through the mounting plate. This will prevent backflow from the discharge line upon pump shutdown and reverse rotation of the pump shaft, which could cause serious pump damage. This is particularly critical when the pump is on level control operation with frequent start/stop cycles.

*NOTE: It is also highly recommended for long pump life that properly anchored bellows type expansion joints be installed at the discharge flange connection. See Figure 1 in Disassembly Section for typical installations.*

## COUPLING

Assure that the coupling is properly lubricated if required by the coupling manufacturer's instructions.

## CHECK FOR FREE TURNING

Before pump is started, rotate shaft by hand to be sure it is free. If pump cannot be turned by hand, or binding or rubbing is noticed, refer to *Installation of Unit in Pit*.

Install coupling guard securely before starting the pump to prevent serious injury.

## PRIMING

The pump must be full of liquid with specified submergence head above centerline of impeller.

## PUMP BEARINGS

### Pump Bearings - Vertical 4550 Series

#### 1. Upper Ball Type (Pedestal)

All vertical pumps have one ball type thrust bearing (112) located above the mounting plate. With the exception of sizes 4x6-10, 2x3-13, 3x4-13, 4x6-13, 6x8-13 and 8x10-15, the bearings are permanently lubricated sealed bearings, and require no further lubrication. To lubricate the bearing, shut off the pump and remove the coupling guard. Remove the grease vent plug opposite the grease fitting. Inject grease through the fitting until it appears at the opposite vent hole. Reinstall the coupling guard and run the pump until it reaches operating temperature (approximately 1-2 hours). This will allow excess grease to purge from the bearing cavity. Shut off the pump and reinstall the grease vent plug.

#### 2. Lower Sleeve Type

4550 Series vertical pumps have one or more sleeve type line shaft bearings (197B). The bearings are nonmetallic and are self-lubricating, but must have continuous clean liquid injected to flush the bearing surface to clean and cool the bearing. The various methods of flushing the bearing (s) are described as follows:

*External Clean Flush* - In this arrangement the pump unit is provided with flush tubing to all the line bearings through the mounting plate where a connection is provided for a **continuous source of clean liquid at a rate of 1/4 to 1/2 gpm per bearing at 10-20 psi**. This is the most desirable method of bearing flush and will offer the greatest bearing life.

*From the Pump Discharge* - Bearings may be flushed in this manner when the pumped fluid is clean and free of solids. The flush tubing can be connected to the discharge pipe to provide the lubricating and cooling.

*Cyclone Separator* - When it is impossible to use an external clean flush and the pumped fluid is not clean, a cyclone separator may be used. The flush tubing is run from the pump discharge to the cyclone separator mounted on top of the mounting plate. The clean fluid out of the separator is run to the line bearings, and solids are returned back into the sump. This method will prolong bearing life, but eventual clogging of bearings must be expected, due to solid buildup. Clean external flush is the best bearing flush method.



### CAUTION

*Regardless of the method of bearing flush, the flush system must be checked periodically to insure fluid is being supplied to all the line bearings to prevent damage to the pump.*

## OPERATION



### WARNING

*Check motor rotation before coupling motor to pump. Refer to Rotation Check for instructions.*



### CAUTION

*Serious damage may result if pump is run in the wrong rotation.*

## START-UP PROCEDURE

Before the pump is started, turn pump by hand at the coupling to insure it is free and does not rub or bind, and reinstall the coupling guard. Turn on the flush to the steady bearings if provided from an external source. Inspect the pump casing to be sure it is submerged before engaging the motor.



### CAUTION

*DO NOT operate pump at reduced capacity or with discharge valve closed. At this point, all energy developed by the pump will convert to heat, which may cause either mechanical damage, or vaporizing of pump liquid in the impeller eye, causing cavitation.*



### CAUTION

*DO NOT operate pump when tank level drops below minimum pump submergence.*



### CAUTION

*DO NOT operate pump if surging occurs.*



### CAUTION

*DO NOT operate pump if motor overloads. This will cause overheating of the motor and possible motor damage.*

## STARTING THE PUMP

1. Connect coupling, following instructions for the particular make of coupling used. This data is supplied separately, giving complete instructions for connection, lubrication, alignment and maintenance.
2. Check for free turning.
3. Install coupling guard.



### WARNING

*Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.*

4. Before pump is started, the flushing flow specified in *Pump Bearings* should be started. Do not run the pump without flush to the column bearings (197B). (Internal for clean liquids - external for dirty liquid).
5. Starting: Pump is now ready to start. Start pump with closed or slightly opened discharge valve. Open immediately after starting.

## OPERATIONAL CHECKS

Inspect pump carefully and frequently during the first few hours of operation. Check motor for excessive heating. Check motor for excessive vibration or unusual noise.



### WARNING

*Do not run pump at greatly reduced flow because all the motor power will go into heating the liquid in the pump and damage may result. If this condition exists over a long period, the temperature of the liquid in the pump may increase until the boiling point is reached. If this occurs, the rotating parts are exposed to vapor with no lubrication, and they may score or even seize to the stationary parts. Continued operation under these conditions may create an explosive hazard due to the confined vapor under high pressure and temperature.*

## OPERATING WITH SURGE CONDITIONS IN LINE



### CAUTION

*If the pump is installed with a quick-acting valve in the discharge line that could close when the pump is running, dangerous pressure surges may be built up that can cause damage to the pump or line. In services of this kind, some cushioning arrangement must be provided to protect the pumping equipment.*

5

## FREEZING CONDITIONS

If exposed to freezing conditions while the pump is standing idle, liquid inside the pump must be drained.

## SHUTDOWN PRACTICE

When a check valve is installed in the discharge, the pump can be shut off without closing any valves. When no check valve is used, the discharge valve must be closed before the pump is stopped to prevent back flow through the pump.



### 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 regulation.*





# PREVENTIVE MAINTENANCE

**GENERAL COMMENTS . . . . . 21**  
**Lubrication . . . . . 21**  
**Maintenance. . . . . 21**  
**Vibration. . . . . 21**

## GENERAL COMMENTS

### LUBRICATION

The ball bearing (112) supplied is greased for life. No further lubrication is required. Column bearings (197B) must be lubricated by an integral pumpage flush or clean source of external liquid flush. Consult ITT Goulds Pumps for appropriate option. Follow motor and coupling manufacturers lubrication instructions.

### VIBRATION

It is good practice to periodically monitor vibration of the pump. Normally, vibration level will be well below accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Troubleshooting in the *Disassembly & Reassembly Section*.

### MAINTENANCE

1. Periodically lubricate the upper ball bearing(s) when equipped with grease fittings.
2. Check for noise (mechanical or hydraulic) and vibration.
3. Check float switch operation.
4. Check flush line to the line shaft bearings for buildup.
5. Check discharge pressure gauge periodically.



# DISASSEMBLY & REASSEMBLY

<b>DISASSEMBLY</b> . . . . .	<b>23</b>
Disassembly - Vertical 4550 Series . . . . .	23
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## DISASSEMBLY



### WARNING

*Lockout driver power to prevent accidental start up and physical injury.*



### WARNING

*Operator must be aware of pump and safety precautions to prevent physical injury.*



### 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.*

### DISASSEMBLY - VERTICAL 4550 SERIES

1. Shut off motor. Shut off all valves controlling flow of liquid from the pump. Disconnect the power to the motor.
2. Disconnect discharge pipe and flush piping.
3. Unbolt motor and remove from motor support.
4. Remove the pump unit from the pit unless the pit can be drained and the pump can be worked on from the pit.
5. When the pump is lying in the horizontal position, the pump column and shaft should be supported to remove any bending stress from the shaft.
6. Disconnect discharge pipe flange at the pump casing.
7. Remove casing bolts (370) and remove casing (100) from cover (180).

8. Fix the pump shaft at the coupling and remove the impeller (101) by turning the impeller in a counterclockwise (CCW) direction facing the impeller. A strap wrench or similar device may be required to disengage the screw threads. Remove the sleeve cap and O-ring if the pump is so equipped.

- 9A. Shaft removal for sizes: 1x1.5-6, 1.5x3-6, 2x3-6, 1x1.5-8, 1.5x3-8, 2x3-8, 3x4-8, 1.5x3-10, 2x3-10, 3x4-10, 4x4-10.

- a) Remove coupling from the pump shaft and remove slinger and bearing snap ring (496).
- b) Slide pump shaft (126) up through the column and pedestal. If resistance is encountered, tap on the impeller end with a soft mallet, or use wood as a buffer.



### CAUTION

*Be careful not to damage screw threads at the impeller end.*

- c) Remove set screw.
  - d) Loosen lock screw in the threaded collar (283A) and unscrew from shaft.
  - e) Slide bearing holder and bearing off shaft. If bearing (197B) is to be replaced, it must be pressed off the bearing holder (213).
  - f) Unscrew the shaft sleeve if the pump is so equipped. Care must be taken not to mar or scratch the shaft in removal or handling.
- 9B) Shaft removal for sizes: 4x6-10, 3x4-13, 6x8-13, 2x3-13, 4x6-13, 8x10-15.
- a) Remove coupling and outer screws.

- b) Turn adjusting screws (283A) clockwise completely and jack shaft and bearing assembly until bearing is clear.
  - c) Pull shaft and bearing assembly through the pedestal.
  - d) Remove bearing housing snap-ring (496).
  - e) Slide bearing housing from thrust bearing.
  - f) Remove snap-ring and press bearing off shaft.
- 10) Remove the bearing flush line(s).
  - 11) Remove the column-cover nuts (317W) and disengage cover (180) from the column. Note position of cover relative to column flange.
  - 12) Remove cover snap-ring and slide cover sleeve bearing (849) and pin from the cover.
  - 13) Remove bearing holder nuts (372B) and remove bearing holders (213) from the column. Slide the sleeve bearing (197B) from the bearing holder.

*Save all bolts, nuts, screws and miscellaneous hardware. they are of alloy construction for corrosion resistance.*

## INSPECTION AND PARTS REPLACEMENT GUIDELINES

**Impeller (101)** - Replace if impeller shows excessive erosion, corrosion, extreme wear or vane breakage. O-ring groove and impeller hub must be in good condition. Check impeller balance if possible.

**Shaft (122)** - Check for runout (.005" MAX) to see that the shaft has not been bent. Shaft surface and threads must be in good condition. Replace if necessary.

**Casing (100)** - Replace if casing shows excessive erosion, corrosion or extreme wear.

**Lip Seals** - upper (332) and lower (333A) - Replace if damaged.

**Vapor Seal (215A)** - Replace if damaged.

**Column Bearing Assembly (213)** - Assure flush passages are clean. Check clearance. Assembly should be replaced if diametral clearance exceeds 0.062" (1.6mm).

**Flush Tubing (190)** - Make sure tubing is clear and clean.

**Ball Bearing (112)** - Renew at each overhaul and when damage is obvious (through vibration, etc.).

**NOTE: Refer to Spare Parts for information on ordering spare parts.**

# REASSEMBLY

## VERTICAL 4550 SERIES

Replace all worn or defective parts as required. Clean all those to be reused. Reassemble in reverse order of disassembly, with the following notes:

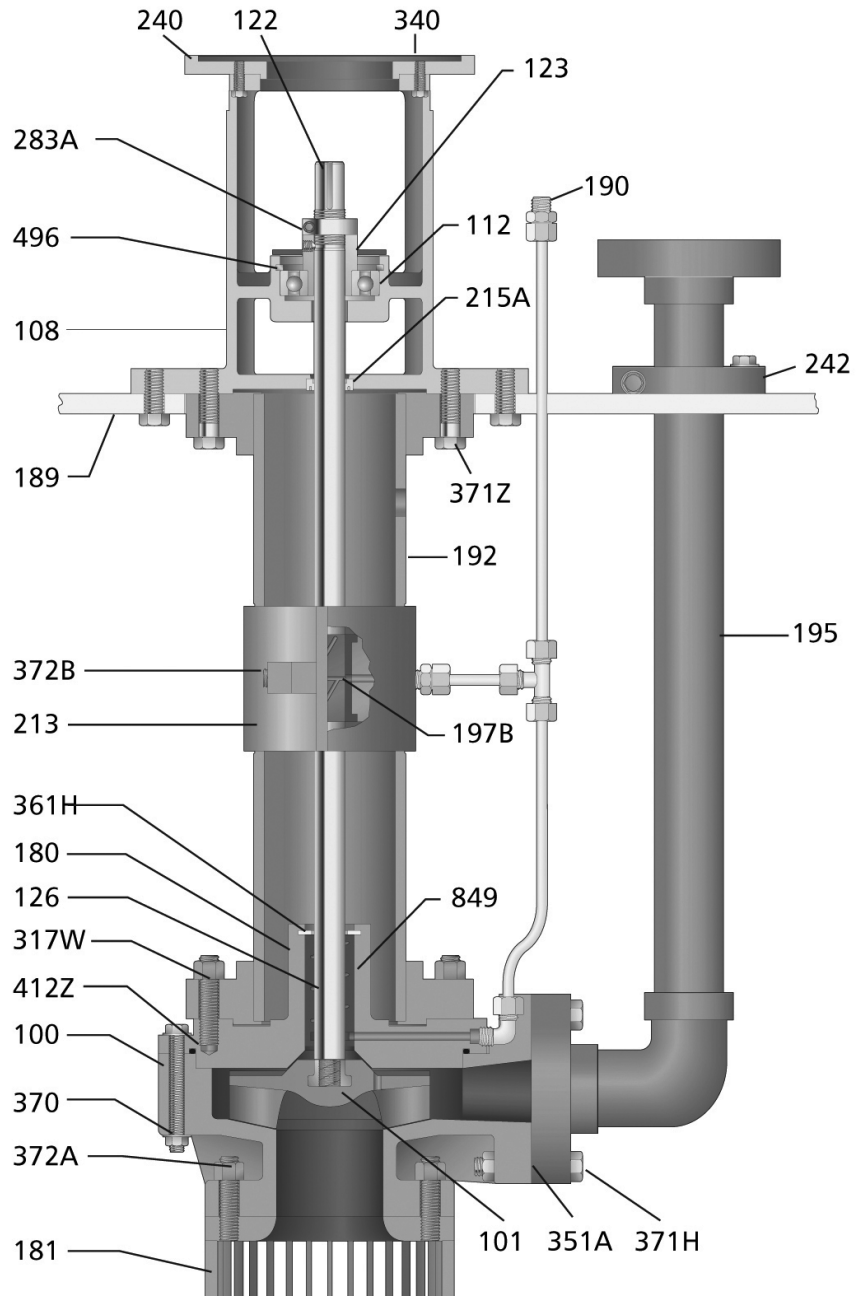
1. After the shaft is installed in the pedestal and column, adjust the shaft downward, prior to installing the impeller.
2. When the impeller (and shaft sleeve, if so provided) is installed, be certain the threads are firmly seated against the shaft shoulder.
3. After the impeller is installed, adjust the shaft upward until the back of the impeller starts to touch the face of the cover, before the casing is installed.
4. With the casing assembled, check discharge pipe and shaft column alignment. Trim or shim thrust collar (283A) as required.
5. Adjust impeller as outlined under "Impeller Adjustment" in the *Installation Section*.
6. Check motor rotation prior to connecting and adjusting the coupling.
7. Install coupling guard.

# TROUBLESHOOTING

Problem	Possible Causes & Corrections
No liquid delivered, not enough liquid delivered or not enough pressure	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 15, 16, 17
Pump works a while and then quits	4, 5, 7, 8, 9, 17
Pump takes too much power	6, 10, 11, 12, 13, 14, 18, 19, 20, 22
Pump is noisy or vibrates	4, 12, 13, 14, 21, 22

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Priming - Liquid level in sump not equal to or greater than minimum submergence.</li> <li>2. Speed too low - check whether motor wiring is correct and receives full voltage.</li> <li>3. System discharge head too high - check system head, particularly friction losses.</li> <li>4. Suction lift too high - check sump level.</li> <li>5. Impeller or piping obstructed - check for obstructions.</li> <li>6. Wrong direction of rotation - check rotation.</li> <li>7. Air pocket in casing increasing - increase level in sump.</li> <li>8. Float controls operating incorrectly - check operation.</li> <li>9. Entrained air or gases in liquid - consult factory.</li> <li>10. Impeller clearance too great - check for proper clearance.</li> <li>11. Impeller damaged - inspect and replace as required.</li> <li>12. Rotating parts bind - check internal wearing parts for proper clearances.</li> </ol> | <ol style="list-style-type: none"> <li>13. Shaft bent - straighten or replace as required.</li> <li>14. Coupling or pump and driver misaligned - check alignment and realign if required.</li> <li>15. Impeller diameter too small - consult factory for proper impeller diameter.</li> <li>16. Improper pressure gauge location - check correct position and discharge nozzle or pipe.</li> <li>17. Pump cover O-ring damaged - check O-ring and replace as required.</li> <li>18. Speed too high - check motor winding voltage.</li> <li>19. Head lower than rating; pumps too much liquid -consult factory. Install throttle valve, cut impeller.</li> <li>20. Liquid heavier than anticipated - check specific gravity and viscosity.</li> <li>21. Cavitation - Consult factory. Increase NPSH available.</li> <li>22. Bearings worn out - inspect and replace as required. Assure bearings have proper lubrication.</li> </ol> |
|--|---|

# 4550 CROSS SECTIONAL



# MATERIALS OF CONSTRUCTION

Item No.	Part Name	Material
100	Casing	Fiberglass Reinforced Vinyl Ester
108	Adapter	Cast Iron
112	Thrust Bearing	Steel
122	Shaft	316 SS
123	Flinger	Buna N
126	Journal Sleeve (Optional) not shown	316SS
180	Pump Cover	Fiberglass Reinforced Vinyl Ester
181	Strainer	Fiberglass Reinforced Vinyl Ester
189	Mounting Plate	Fiberglass Reinforced Vinyl Ester
190	Flush Tubing	Polypropylene
192	Column Pipe	Fiberglass Reinforced Vinyl Ester
195	Discharge Pipe	Fiberglass Reinforced Vinyl Ester
197B	Radial Bearing, Split	Carbon/Teflon PPS
213	Bearing Holder, Split	Fiberglass Reinforced Vinyl Ester
215A	Vapor Seal	Teflon
222J	Set Screw - Pipe Collar / Discharge Assembly	304 SS
240	Motor Support	Steel
242	Pipe Collar	Polypropylene
283A	Adjusting Nut	Steel
317W	Stud and Nut, Column to Cover	Fiberglass Reinforced Vinyl Ester
340	Motor Adapter	Steel
351A	Gasket	Viton
361H	Snap Ring	Polypropylene
370	Bolt, Casing to Cover	316SS
370C	Hex Bolt, Bearing Housing	303SS
371Z	Hex Bolt, Column to Plate	316SS
372A	Bolt, Strainer to Casing	Fiberglass Reinforced Vinyl Ester
372B	Stud and Nut Assembly	Fiberglass Reinforced Vinyl Ester
496	Snap-Ring	Steel
849	Lower Bearing Assembly	Carbon/Teflon PPS

# TYPICAL VERTICAL PUMP INSTALLATIONS

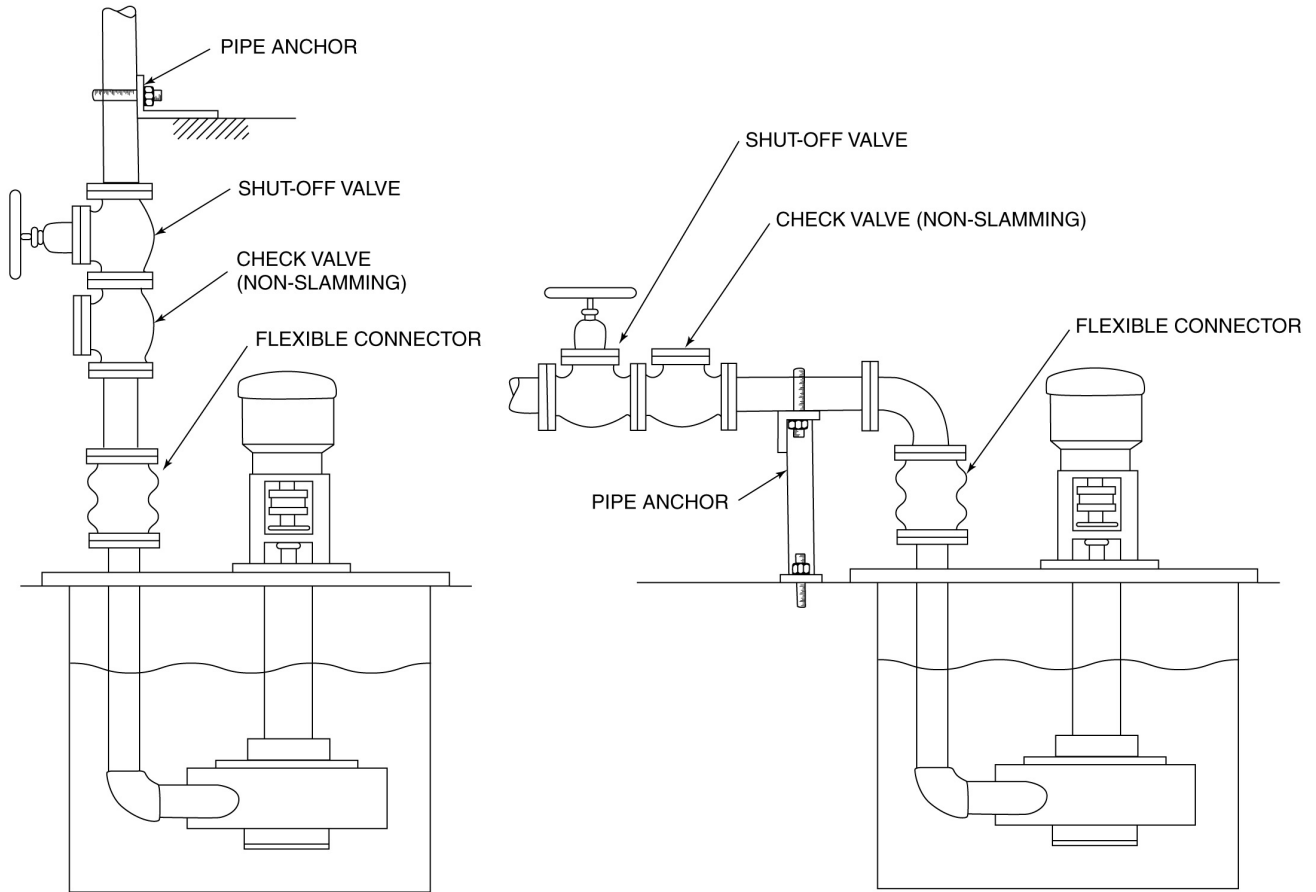


Fig. 1



# SPARE PARTS

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    **Spare Parts . . . . . 29**  
    **Instructions for Ordering Spare Parts. . . . . 29**  
**HOW TO ORDER . . . . . 29**  
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## GENERAL COMMENTS

### SPARE PARTS

To insure against possible long and costly down time periods, it is advisable to have spare parts on hand.

The recommended spare parts for the 4550 are:

- 1. Impeller (101)
- 2. Shaft Assembly (122)
- 3. Ball Bearing (112)
- 4. Column Bearing Assembly (213)
- 5. Complete set of O-rings and gaskets

### INSTRUCTIONS FOR ORDERING SPARE PARTS

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

- 1. Give model number, size of pump, and serial number. These can be obtained from the nameplate.
- 2. Write plainly the names, part numbers and materials of the parts required. The names and numbers should agree with those on the sectional view.
- 3. Give the number (quantity) of each part required.
- 4. Give complete shipping instructions.



# APPENDIX I

## RECOMMENDED FASTENER TORQUE . . . . . 31

### RECOMMENDED FASTENER TORQUE

#### Model 4550 Vertical Pumps

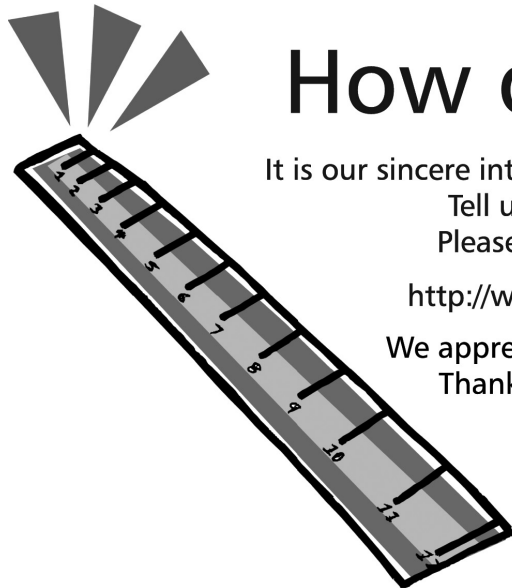
Fastener(s)	Item #	Recommended Torque – ft-lbs (N-m)					
		Group 1		Group 2		Group 3	
Casing	370	10 (13.6)		1/2 - 13UNC	20 (27.2)	35 (47.6)	
				5/8 - 11UNC	35 (47.6)		
Cover Nut	317W	15 (20.4)		5/8 - 11UNC	15 (20.4)	20 (27.2)	
				3/4 - 10UNC	20 (27.2)		
Adjusting Bolt	370	N/A		15 (20.4)		40 (54.4)	
Pipe Collar	242	20 (27.2)		3/8 – 16UNC	20 (27.2)	5/8 - 11UNC	35 (47.6)
				5/8 – 11UNC	35 (47.6)	3/4 - 10UNC	50 (68)
Pipe Collar to Coverplate	N/A	20 (27.2)		1/2 – 13UNC	20 (27.2)	50 (68)	
				5/8 – 11UNC	35 (47.6)		
Column to Pedestal	371Z	40 (54.4)		5/8 - 11UNC	40 (54.4)	60 (81.6)	
				3/4 - 10UNC	60 (81.6)		
Pedestal to Coverplate	N/A	25 (34)		1/2 - 13UNC	25 (34)	40 (54.4)	
				5/8 - 11UNC	40 (54.4)		
Discharge Elbow	371H	1/2 - 13UNC	10 (13.6)	1/2 - 13UNC	10 (13.6)	3/4 - 10UNC	30 (40.8)
		5/8 - 11UNC	20 (27.2)	5/8 - 11UNC	20 (27.2)	7/8 - 9UNC	40 (54.4)
Pedestal to Motor Adapter	340			3/8 – 16UNC	10 (13.6)		
		3/8 – 16UNC	10 (13.6)	1/2 - 13UNC	25 (34)	1/2 - 13UNC	25 (34)
		1/2 – 13UNC	25 (34)	5/8 - 11UNC	40 (54.4)	5/8 - 11UNC	40 (54.4)
Strainer Nut	372A			1/2 - 13UNC	10 (13.6)		
		1/2 - 13UNC	10 (13.6)	5/8 - 11UNC	15 (20.4)	3/4 - 10UNC	20 (27.2)
		5/8 - 11UNC	15 (20.4)	3/4 - 10UNC	20 (27.2)	7/8 - 9UNC	30 (40.8)
Tailpipe	N/A			1/2 - 13UNC	10 (13.6)		
		1/2 - 13UNC	10 (13.6)	5/8 - 11UNC	20 (27.2)	3/4 - 10UNC	30 (40.8)
		5/8 - 11UNC	20 (27.2)	3/4 - 10UNC	30 (40.8)	7/8 - 9UNC	40 (54.4)

## HOW TO ORDER

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

## EMERGENCY SERVICE

Emergency parts service is available  
**24 hours/day, 365 days/year . . .**  
Call **1-800-446-8537**



## How did we measure up?

It is our sincere intention to exceed our customer's expectations on every order.

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Thank you for buying ITT pumps, parts, and controls.



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