

# **GOULDS PUMPS**

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



**Model 3100**



**ITT**



## 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.

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 **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>		<b>DO NOT</b> 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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# FOREWORD

This manual provides instructions for the Installation, Operation, and Maintenance of the Goulds Model 3100 Close-Coupled Pump. **This manual must be read and understood before installation and maintenance.**

The design, materials, and workmanship incorporated in the construction of Goulds pumps make them capable of giving long, trouble-free service. The life and satisfactory service of any mechanical unit, however, is enhanced and extended by 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.

**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 Goulds Pumps 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 Goulds Pumps, Inc.**

**Supervision by an authorized Goulds Pumps representative is recommended to assure proper installation.**

**Additional manuals can be obtained by contacting your local Goulds Pumps 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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# SAFETY

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## DEFINITIONS

This pump has been designed for safe, reliable operation when properly used and maintained in accordance with instructions contained in this manual. A pump is a pressure containing device with rotating parts that can be hazardous. Operators and maintenance personnel must realize this and follow safety measures. Goulds Pumps, Inc. shall not be liable for physical injury, damage or delays caused by a failure to observe instructions in this manual.

Throughout this manual the words **WARNING**, **CAUTION**, and **NOTE** are used to indicate procedures which require special operator attention:

**! WARNING**

*Warning is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial equipment damage if the warning is ignored.*

**⚠ CAUTION**

*Caution is used to indicate the presence of a hazard which will or can cause minor personal injury or equipment damage if the caution is ignored.*

*NOTE: Operating procedure, condition, etc. which is essential to observe.*

### EXAMPLES:

**! WARNING**

*Lock out driver power to prevent accidental start-up that could result in serious personal injury.*

**⚠ CAUTION**

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

*NOTE: Be careful not to damage the stationary portion of the mechanical seal.*

## GENERAL PRECAUTIONS

**! WARNING**

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

- NEVER operate pump beyond the rated conditions to which the pump was sold.
- NEVER start pump without proper prime (sufficient liquid in pump casing).
- NEVER run pump below recommended minimum flow or when dry.
- ALWAYS lock out power to the driver before performing pump maintenance.

- NEVER operate pump without safety devices installed.
- NEVER operate pump with discharge valve or suction valve closed.
- DO NOT change conditions of service without approval of an authorized Goulds representative.
- NEVER apply heat to remove impeller. It may explode due to trapped liquid.
- NEVER use heat to disassemble pump due to risk of explosion due to trapped liquid.





# GENERAL INFORMATION

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## PUMP DESCRIPTION

The Model 3100 is a horizontal close-coupled centrifugal pump. The pump is designed to utilize standard **NEMA JM motors**.

The pump line is made up of six (6) hydraulic pump sizes as follows:

**S-Group:** 1 x 1½ - 6, 2 x 3 - 6, 1 x 1½ - 8

**M-Group:** 2 x 3 - 8, 1 x 2 - 10, 2 x 3 - 10

**Casing** - the casing is a top centerline discharge and is self-venting. Material of construction is cast 316 stainless steel (ASTM A743 CF8M). Flanges are ANSI Class 150 flat face. The casing includes integral foot supports to provide maximum resistance to misalignment and distortion from pipe loads.

**Impeller** - The impeller is an enclosed design which is key driven by a NEMA JM motor shaft. Material of construction is cast 316 stainless steel. The impeller is held on the motor shaft by a cast 316 stainless steel impeller nut which is sealed by a O-ring against the face of the impeller to protect the motor shaft from the pumpage.

**Seal Chamber, Seal Chamber/Adapter** - The seal chamber is constructed of cast 316 stainless steel. A tapered bore design is provided with four (4) integrally cast axial ribs to maximize seal life. The tapered bore design is self-venting. As standard a machined internal seal flush is provided on all sizes except the 6" S Group sizes to ensure positive flushing of the mechanical seal. The seal chamber is designed to accept a *John Crane* Type 21 mechanical seal.

For **S Group size pumps** the motor adapter is integral to the seal chamber. (**S Group pumps may be bolted to NEMA 140JM - 210JM motors**)

**Motor Adapter** - A ductile iron motor adapter is provided on **M Group pumps** only. The motor adapter includes machined rabbetted fits and bolt holes to facilitate bolting to NEMA JM 250 and 280/320 motor frames only! (**M Group pumps cannot be bolted to a NEMA motor frame smaller than a NEMA 250JM**)


**Direction of Rotation** - Clockwise (right hand) as viewed from the motor end looking at the pump.

# NAMEPLATE INFORMATION

Every pump has a Goulds nameplate that provides information about your pump. The tag is located on the casing.

**Pump Casing Tag** - provides information relative to the pump's characteristics. The format of pump size information is: Discharge x Suction - Nominal Impeller Diameter, (ex. 1 x 1 ½-6).

When ordering spare parts, you will need to know the pump model, size, serial number, and the item number of the required parts. Information can be taken from the pump casing tag. Item number information can be found in this manual.

 GOULDS PUMPS, INC., SENECA FALLS, NY  
ASSEMBLED IN USA

IMPLR DIA.  MAX. DIA.

GPM  FT HD  RPM

MODEL 3100 MATL. CONSTR. 316 S/S SIZE

SER. NO.  MAX. DSGN. PSI @ 100F 275

CAUTION: AFTER STARTING DO NOT OPERATE AGAINST CLOSED VALVE

## RECEIVING THE PUMP

Inspect the pump as soon as it is received. 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 REQUIREMENTS

**Short Term (Less than 3 months)** - Goulds normal packaging procedure is designed to protect pump during shipping. Upon receipt, store in a covered and dry location.

**Long Term (More than 6 months)** - Rotate shaft several times every 3 months. Store in a covered and dry location.

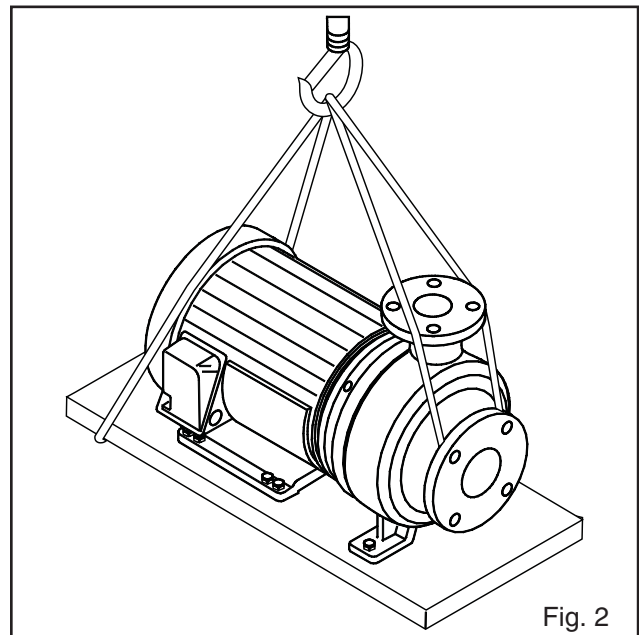
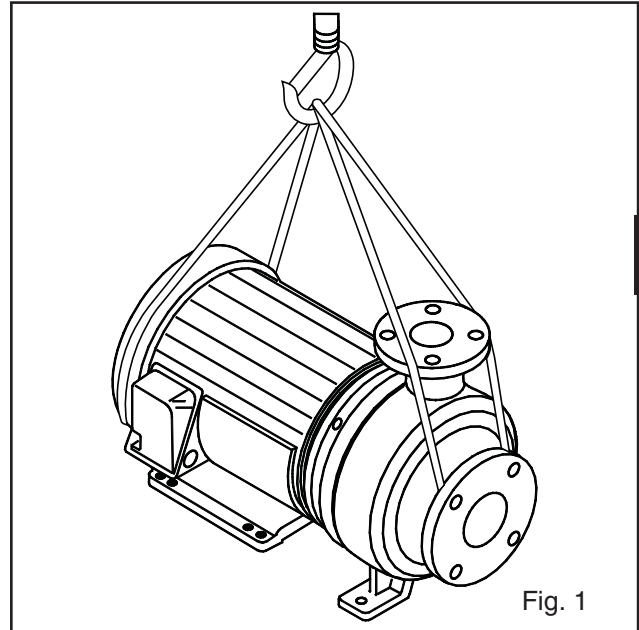
### HANDLING

#### **! WARNING**

*Pump and components are heavy. Failure to properly lift and support equipment could result in serious physical injury, or damage to pumps.*

Use care when moving pumps. Lifting equipment must be able to adequately support the entire assembly. Hoist bare pumps using suitable slings under the suction and under the motor frame (Fig. 1).

Baseplate mounted units are moved with slings under the suction flange and baseplate (Fig. 2).





# INSTALLATION

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## SITE/FOUNDATION

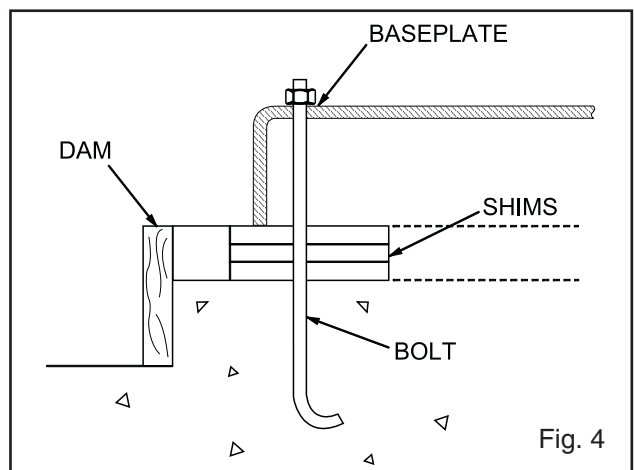
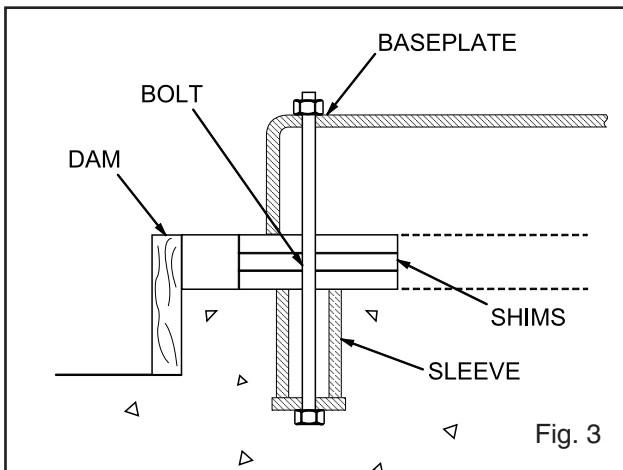
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A pump should be located near the supply of liquid and have adequate space for operation, maintenance, and inspection. Be sure to allow for crane or hoist service.

Baseplate mounted pumps are normally grouted on a concrete foundation which has been poured on a solid footing. The foundation must be able to absorb any vibration and to form a permanent, rigid support for the pumping unit.

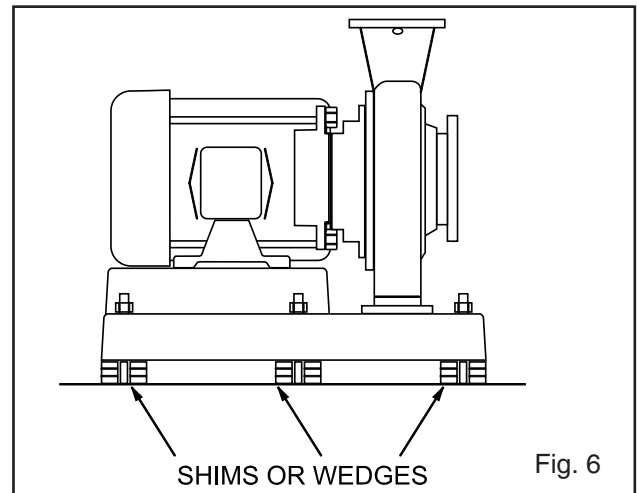
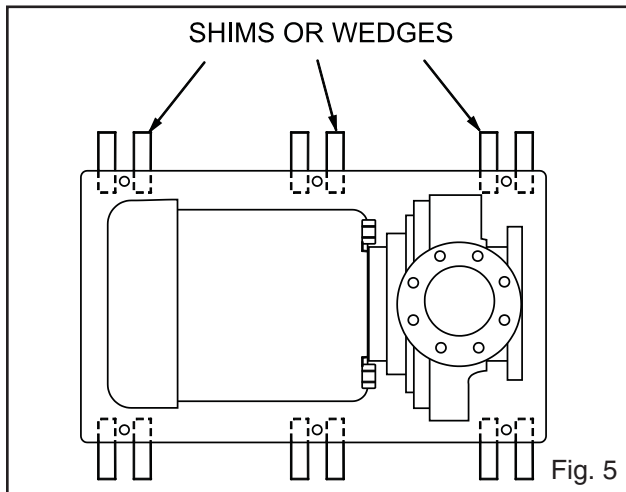
The location and size of foundation bolts are shown on the outline assembly drawing provided with the pump data package.

Foundation bolts commonly used are sleeve type (Fig. 3) and J type (Fig. 4).



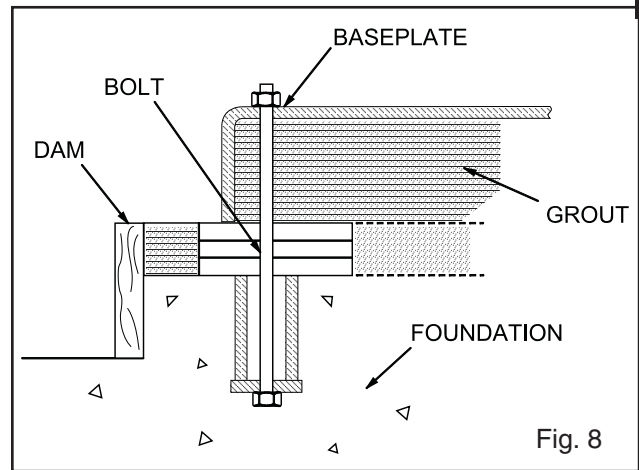
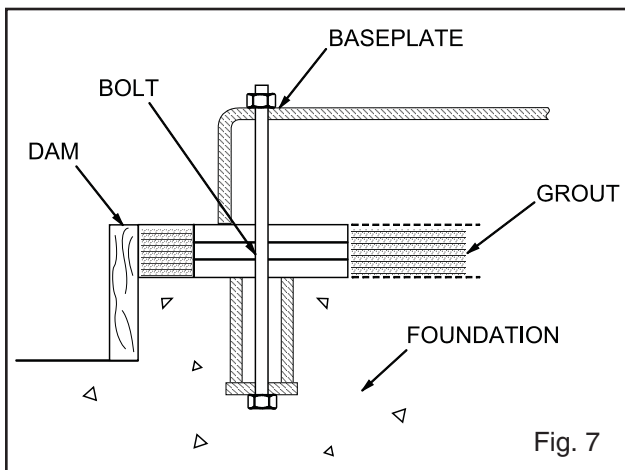
## LEVEL BASEPLATE

1. Place 2 sets of wedges or shims on the foundation, one set on each side of every foundation bolt. The wedges should extend .75 in. (20 mm) to 1.5 in. (40 mm) above the foundation, to allow for adequate grouting (Fig. 5 and Fig. 6). This will provide even support for the baseplate once it is grouted.
2. Remove water and/or debris from anchor bolt holes/sleeves prior to grouting. If the sleeve type bolts are being used, fill the sleeves with rags to prevent grout from entering.
3. Carefully lower baseplate onto foundation bolts.
4. Level baseplate to within .125 in. (3 mm) over the length of the base and .062 in. (1.5 mm) over the width of the base by adjusting shims or wedges.
5. Hand tighten bolts.



## GROUT BASEPLATE

1. Clean areas of baseplate that will contact grout. Do not use an oil-based cleaner because grout will not bond to it.
2. Build a dam around foundation (Fig. 7). Thoroughly wet foundation.
3. Pour grout slowly until level with the top of the dam. The use of non-shrink epoxy grout is recommended; follow manufacturer's recommendations. If cementitious grout is used, remove air by puddling or with a vibrator. (Fig. 7).
4. Allow grout to set.
5. Fill remainder of baseplate with grout. Remove air as before (Fig. 8).
6. Allow grout to set at least 48 hours.
7. Tighten foundation bolts.



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## MOUNTING PROCEDURE

The Model 3100 is supplied in a close-coupled configuration. As such, pump and motor alignment are not required. It is important, however, that the pump and motor are rigidly mounted such that no external loading/vibration is present. It is recommended that any "soft-foot" condition be eliminated as follows:

1. Bolt the pump to the baseplate or mounting plate at the case mounting feet.
2. Add or remove shims under each motor foot such that a rigid support is provided. Prying of the motor or the use of excessive force should be avoided as this could result in damage to the motor bearing and/or pump seal during operation.
3. Tighten each of the motor mounting screws.

# PIPING

Guidelines for piping are given in the “Hydraulic Institute Standards” (Edition 14, Centrifugal Pump section) and should be reviewed prior to pump installation.

1. Pump must be supported independently and must line up naturally with the pump flanges.

## **! WARNING**

***Never draw piping into place by forcing the flanged connections to the pump. This will impose dangerous strains on the unit and cause misalignment between pump and driver. Pipe strain can adversely effect the operation of the pump. That could result in serious personal injury and damage to equipment.***

2. Piping runs shall be designed to minimize friction losses.
3. DO NOT make final connection of piping to pump until grout has hardened and pump and driver hold-down bolts have been tightened.
4. Piping should be arranged to allow pump flushing and draining prior to removal of the pump for servicing.
5. System should be thoroughly cleaned prior to installation.
6. Gasket installation and materials must be suitable for the service.

## **SUCTION PIPING**

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 should be avoided. There should be a minimum of 2 pipe diameters of straight pipe between the elbow and the suction inlet. Any elbows used should be long radius (Fig. 9).
2. Use suction pipe one or two sizes larger than pump suction, with a reducer at suction flange. Suction piping must never be of smaller diameter than the pump suction.
3. Reducers, if used, must be eccentric at pump suction flange with sloping side down (Fig. 9).
4. Suction strainers, when used, must have a net “free area” of at least three times the suction pipe area (Fig. 9).

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 continuously slope upwards towards pump suction to eliminate air pockets.
2. All joints must be air tight.
3. A means of priming the pump must be provided, such as a foot valve.

## **Suction Head/Flooded Suction Conditions**

1. An isolation valve should be installed in suction line to permit closing of the line for pump inspection and maintenance (Fig. 10).
2. Piping should be level or slope gradually downward from source of supply.
3. No portion of piping should extend below pump suction flange.
4. The suction pipe shall be submerged sufficiently below the liquid surface to prevent vortices and air entrainment at the supply (Fig. 10).

## **DISCHARGE PIPING**

1. Isolation and check valves should be installed in the discharge line. Locate check valve between isolation valve and pump which will permit inspection of check valve. An isolation valve is required for isolating, priming, regulation of flow, inspection and maintenance of the pump. A check valve prevents pump damage due to reverse flow when driver is turned off (Fig. 11).
2. Increasesers, if used, should be placed between the pump and check valves.
3. Cushioning devices should be used to protect pump from surges and water hammer, if quick-closing valves are installed in the system.



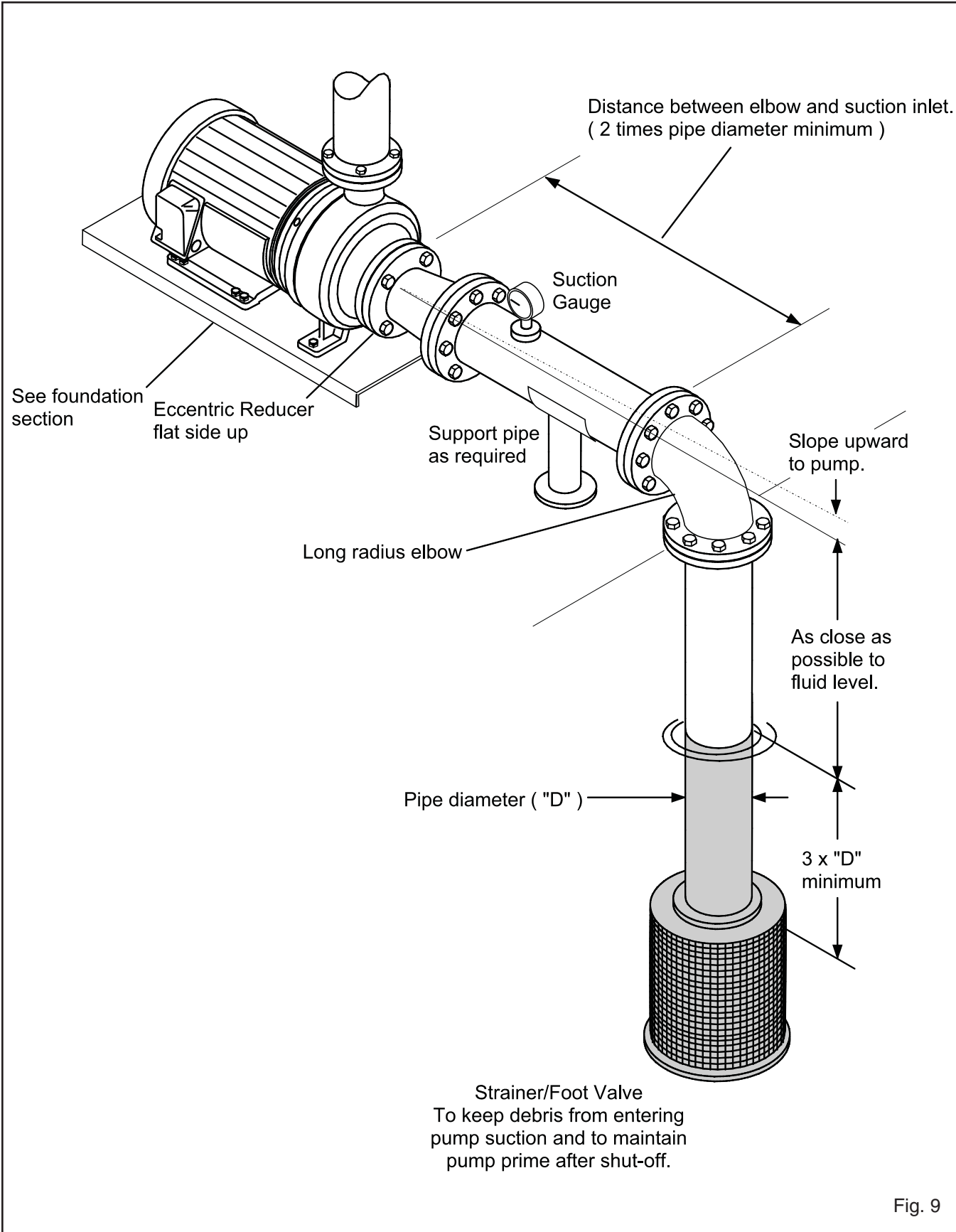


Fig. 9

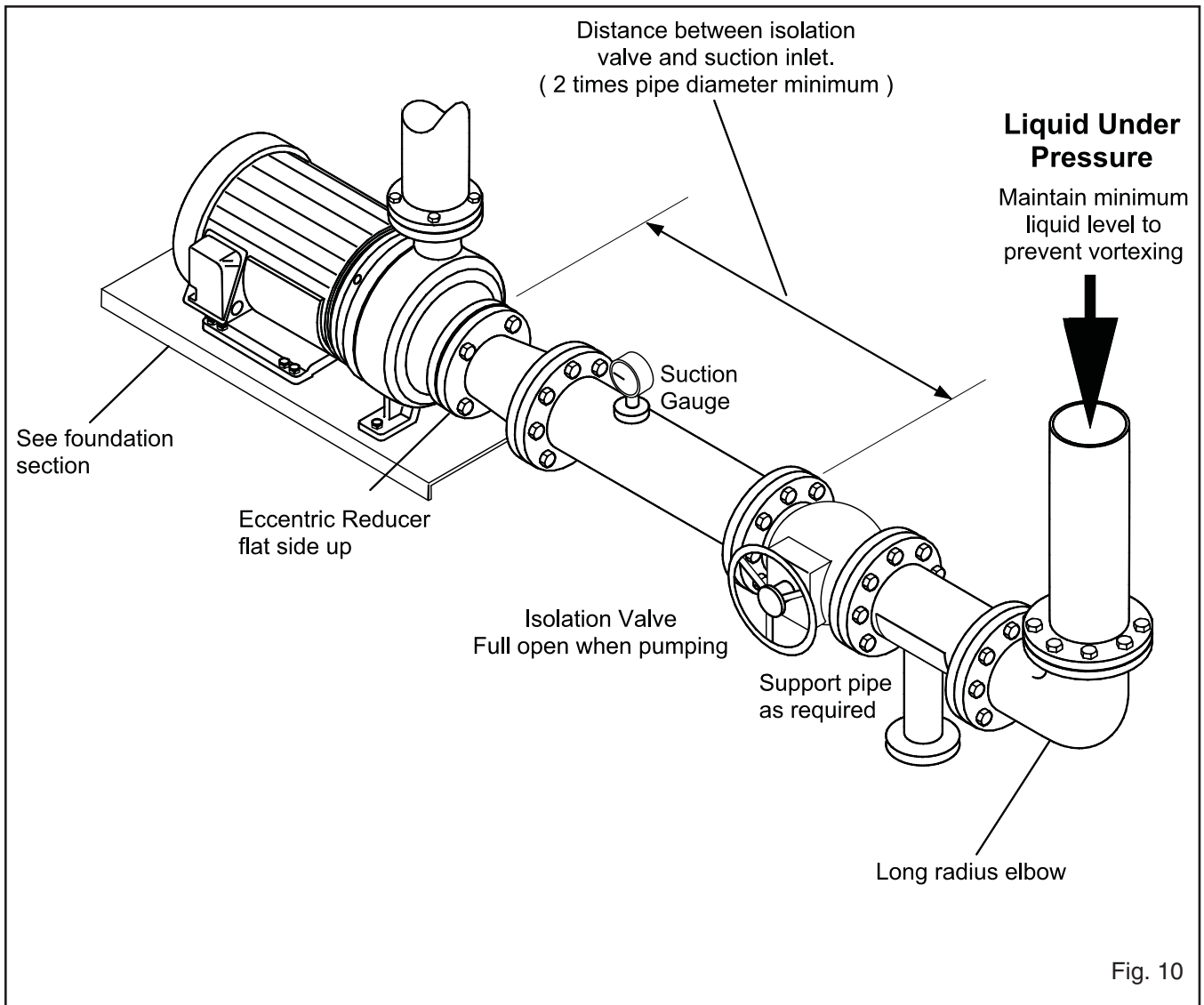


Fig. 10

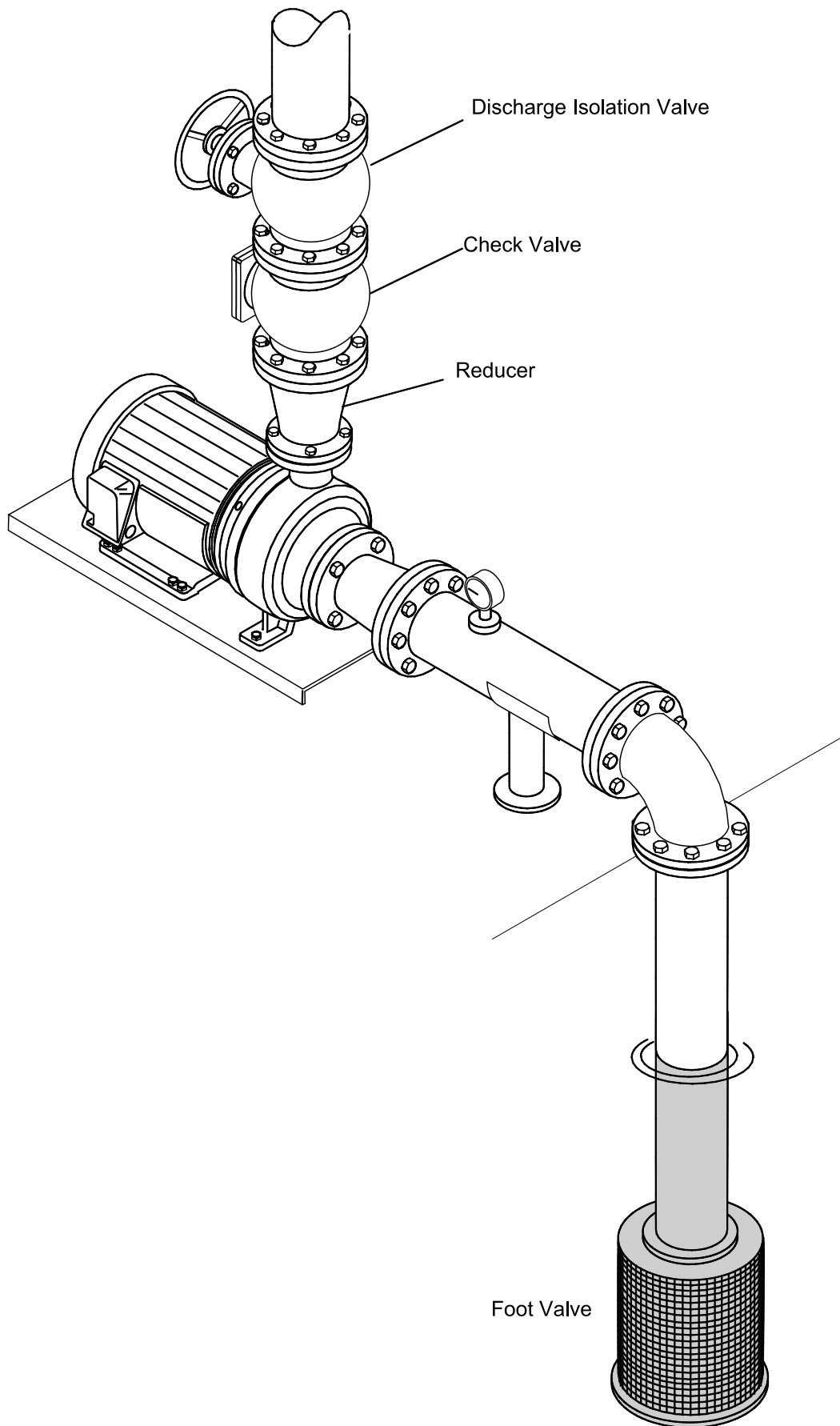


Fig. 11



# OPERATION

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## PREPARATION FOR START-UP

### CHECKING ROTATION



#### CAUTION

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

1. Unlock driver power.
2. Ensure all personnel are clear of area. Jog driver just long enough to determine direction of rotation. Rotation must corresponding to arrow on pump casing.

### PRIMING PUMP

Never start pump until properly primed (pump casing and suction piping are full of liquid).



#### CAUTION

*Operation without liquid in the pump will damage the mechanical seal.*

Your particular system will dictate method used to prime pump.

## STARTING PUMP

1. Make sure suction valve and any recirculation 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, reprime pump, and attempt to restart.*

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



#### WARNING

*Continuous operation against closed discharge valve may vaporize liquid creating an explosive hazard due to confined vapor under high pressure and temperature.*



#### CAUTION

*Continuous operation against closed discharge valve will cause pump to overheat.*

# OPERATION

## GENERAL CONSIDERATIONS

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

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

**Table 1  
Minimum Allowable Flow**

Pump Size	Group	GPM (m <sup>3</sup> /h)			
		RPM			
		3600	3000	1800	1500
1 x 1½-6	S	10 (2.3)	5 (1.1)	3 (0.7)	1 (0.2)
2 x 3-6	S	40 (9.1)	26 (5.9)	9 (2.0)	3 (0.7)
1 x 1½-8	S	20 (4.5)	13 (3.0)	5 (1.1)	2 (0.5)
2 x 3-8	M	60 (13.6)	35 (8.0)	—	—
1 x 2-10	M	40 (9.1)	22 (5.0)	—	—
2 x 3-10	M	200 (45.5)	73 (16.6)	—	—

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 (listed in Table 1) or with suction and/or discharge valve closed. These conditions may vaporize liquid creating an explosive hazard due to confined vapor under high pressure and temperature, and can quickly lead to pump failure and physical injury.*

## DRAINING TANKS

### ! WARNING

*After pump has drained tank, it should be shut down immediately. Operating pump after tank has been drained of liquid will damage the mechanical seal.*

## DISCHARGE VALVE CLOSED

### ! WARNING

*Do not operate pump with discharge valve closed.*

## OPERATING UNDER FREEZING CONDITIONS

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

# SHUTDOWN

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

### ! WARNING

*When handling hazardous and/or toxic fluids, skin, eye and respiratory protection are required. If pump is being drained, precautions must be taken to prevent injury or environmental contamination. Pumpage must be handled and disposed of in conformance with applicable environmental regulations.*

# PREVENTIVE MAINTENANCE

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**MAINTENANCE OF BEARINGS**..... 23  
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## GENERAL COMMENTS

**A routine maintenance program can extend the life of your pump. Well maintained equipment will last longer and require fewer repairs. You should keep maintenance records; this will help pinpoint potential causes of problems.**

## MAINTENANCE SCHEDULE

### Routine Maintenance

- Vibration Analysis
- Discharge Pressure

### Routine Inspections

- Check for unusual noise, vibration, and bearing temperatures.
- Inspect pump and piping for leaks.

### 3 Month Maintenance

- Check foundation hold-down bolts of motor and pump for tightness.

### Yearly Inspections

- Check pump capacity, pressure, and power. If the pump performance does not satisfy your process requirements, the pump should be disassembled and inspected. Worn parts should be replaced.

## MAINTENANCE OF BEARINGS

The Model 3100 pump does not have any internal bearings which require lubrication, rather the pump utilizes the motor bearing for support. As such, it is recommended that you follow the motor manufacturer's recommendation for proper lubrication of the motor bearings.

# TROUBLESHOOTING

**Table 2  
Troubleshooting Pump**

Problem/Malfunction	Probable Cause	Remedy
No Liquid Delivered	Pump not primed.	Reprime pump, check that pump and suction line are full of liquid.
	Suction lift too high.	Shorten suction pipe.
	Suction line clogged.	Check suction line pressure. If low, locate and remove obstruction.
	Foot valve or suction pipe opening not submerged enough.	Consult factory for proper depth. Use baffle to eliminate vortices.
	Impeller clogged with foreign material.	Disassemble and remove blockage.
Pump not producing rated flow or head	Air leak in suction line.	Check for leakage and correct.
	Impeller partly clogged.	Backflush pump to clean impeller.
	Insufficient suction head.	Ensure that suction line shutoff valve is fully open and line is unobstructed. Check suction pressure.
	Wrong rotation.	Correct wiring.
	Worn or broken impeller.	Inspect and replace if necessary.
Pump starts then stops pumping	Improperly primed pump.	Reprime pump.
	Air or vapor pockets in suction line.	Rearrange piping as necessary to eliminate air pockets.
	Air leak in suction line.	Check for leakage and correct.
Pump is noisy or vibrates	Partly clogged impeller causing imbalance.	Disassemble and remove blockage.
	Worn motor bearings.	Replace defective part as required.
	Base not rigid enough.	Tighten hold down bolts of pump and motor or adjust stilts. Check grout.
	Suction or discharge piping not anchored or properly supported.	Anchor per Hydraulic Institute Standards recommendations (Edition 14, Centrifugal pump section).
	Pump is cavitating.	Increase NPSH available.
Motor requires excessive power	Head lower than rating; pumps too much liquid.	Install throttle valve.
	Liquid heavier than expected.	Check specific gravity and viscosity.
	Head higher than rating, capacity at rating.	Check impeller diameter.
	Wrong rotation.	Correct wiring.
	Rotating parts binding or severely worn.	Check internal wearing parts for proper clearances.



# DISASSEMBLY & REASSEMBLY

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## REQUIRED TOOLS

- Open end wrenches (1/4", 5/16", 3/8", 9/16", 1/2", 5/8")
- Torque wrench with sockets
- Spanning type puller
- Soft face hammer
- Breaker bar extension
- Cleaning agents
- Lifting sling
- Dial indicator

## DISASSEMBLY

### ! 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 3100 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 environment 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 pump.

### ! WARNING

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

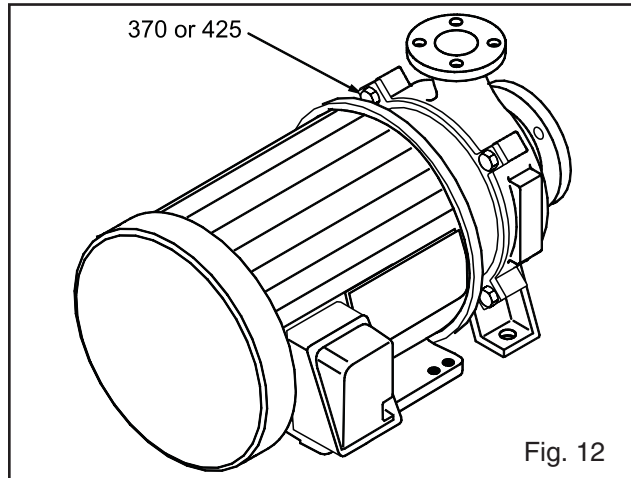
2. Drain liquid from piping, flush pump if necessary.

**NOTE:** To perform maintenance on mechanical seal only, it is not necessary to disassemble auxiliary piping to the casing.

3. Disconnect all auxiliary piping or tubing. Loosen and remove motor mounting bolts.

## MAINTENANCE ON MECHANICAL SEAL

- Place sling from hoist through webbing of motor adapter (504) or seal chamber/adaptor (184).
- Remove casing bolts (370) or casing nuts (425), then slide back pull-out assembly away from casing (Fig. 12).



### ! WARNING

*Never apply heat to remove parts. Use of heat may cause an explosion due to trapped fluid, resulting in severe physical injury and property damage.*

- Remove casing O-ring (412K) and discard. (Replace with new O-ring during reassembly).

## REMOVAL OF IMPELLER

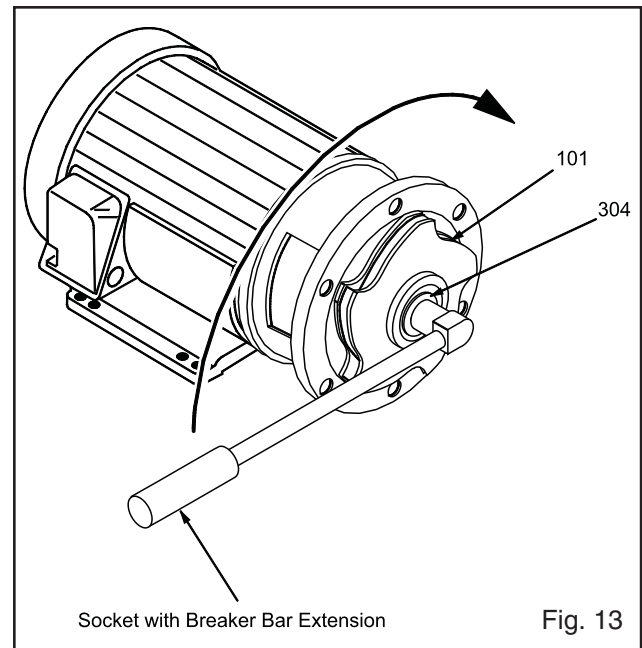
### ! WARNING

*Never apply heat to remove parts. Use of heat may cause an explosion due to trapped fluid, resulting in severe physical injury and property damage.*

### ! WARNING

*Wear heavy work gloves when handling impeller (101) as sharp edges may cause physical injury.*

- Rotate impeller (101) clockwise (viewed from impeller end of shaft) raising breaker bar off work surface to the 9 o'clock position.
- Quickly turn breaker bar clockwise (viewed from impeller end of shaft) until the breaker bar handle impacts against the work bench and loosens the impeller nut (304) (Fig. 13).



- Remove impeller nut (304) (Fig. 13).
- Remove O-ring (412A) from impeller nut (304) and discard. (Replace with new O-ring during reassembly.)
- Remove impeller (101) from motor shaft.

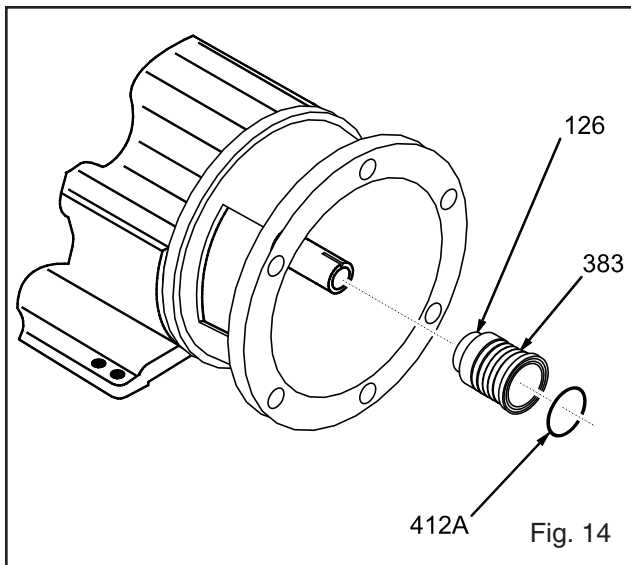
**NOTE:** *It may be necessary to use a puller. Puller must be placed under vanes so as not to damage the impeller. Protection for motor shaft should also be provided.*

- Remove and discard sleeve O-ring (412A). (Replace with new O-ring during reassembly.)

## REMOVAL OF SLEEVE/ MECHANICAL SEAL (M GROUP)

- Remove shaft sleeve (126) and rotary portion of mechanical seal (383) (Fig. 14).

**NOTE:** *Mechanical seal (383) is mounted to shaft sleeve (126). Rotary portion of mechanical seal must be removed by sliding it off the sleeve.*



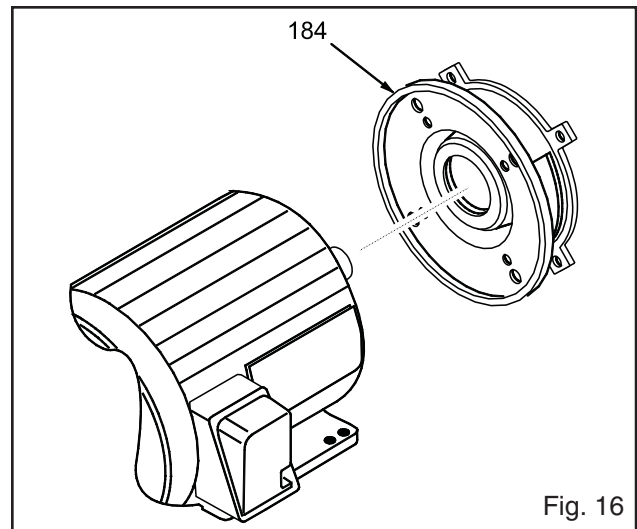
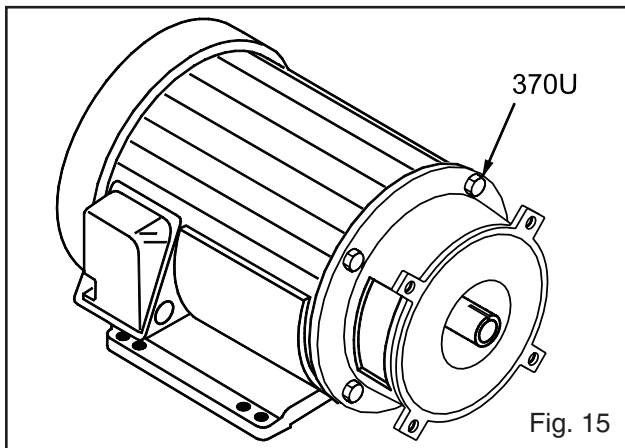
14. Remove mechanical seal (383).

**NOTE:** For complete pump disassembly, continue with removal of seal chamber/adapter.

### REMOVAL OF SEAL CHAMBER/ ADAPTER-S GROUP (1 x 1½-6, 1 x 1½-8, 2 x 3-6)

15. Remove motor-mounting hex cap screws (370U) (Fig. 15).

16. Remove seal chamber/adapter (184)(Fig. 16).



**CAUTION**  
Be careful not to damage stationary portion of the mechanical seal.

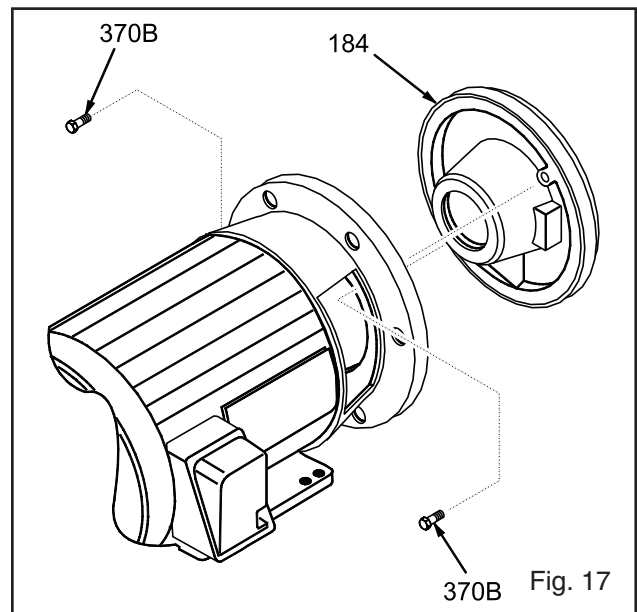
17. If required, remove mechanical seal stationary seat.

### REMOVAL OF SEAL CHAMBER - M GROUP (2 x 3-8, 1 x 2-10, 2 x 3-10)

18. Remove seal chamber hex cap screws (370B).

19. Remove seal chamber(184) (Fig. 17).

**CAUTION**  
Be careful not to damage stationary portion of the mechanical seal.



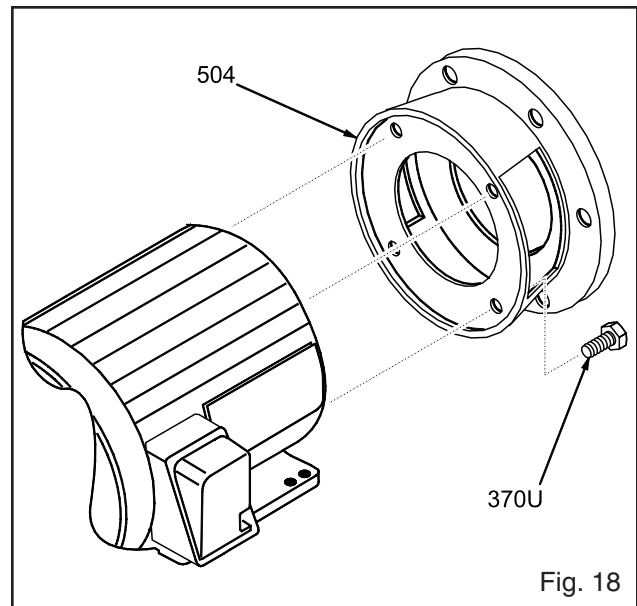
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19a. If required, remove mechanical seal stationary seat from seal chamber (184).

## REMOVAL OF MOTOR ADAPTER - M GROUP

**NOTE:** Removal of motor adapter (504) is only required if repairing or replacing the motor.

20. Remove hex cap screws (370U) from motor.
21. Remove motor adapter (504)(Fig. 18).



## INSPECTIONS

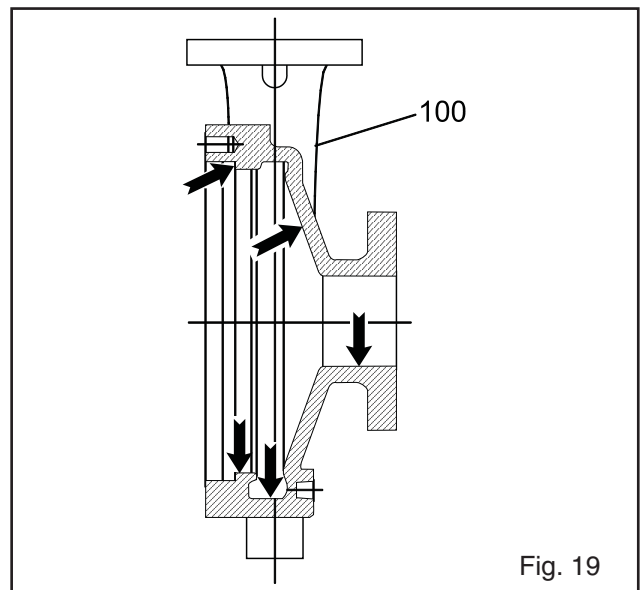
Model 3100 parts must be inspected to the following criteria before they are reassembled to ensure the pump will run properly. Any part not meeting the required criteria should be replaced.

**NOTE:** Clean parts to remove oil, grease, or dirt. Protect machine surfaces against damage during cleaning.

### CASING (100)

The casing (100) should be inspected for excessive wear or pitting. It should be repaired or replaced if it exceeds the following criteria (Fig. 19)

1. Localized wear or grooving greater than 1/8" (3.2 mm) deep.
2. Pitting greater than 1/8" (3.2 mm) deep.
3. Inspect case O-ring seat surface for irregularities.

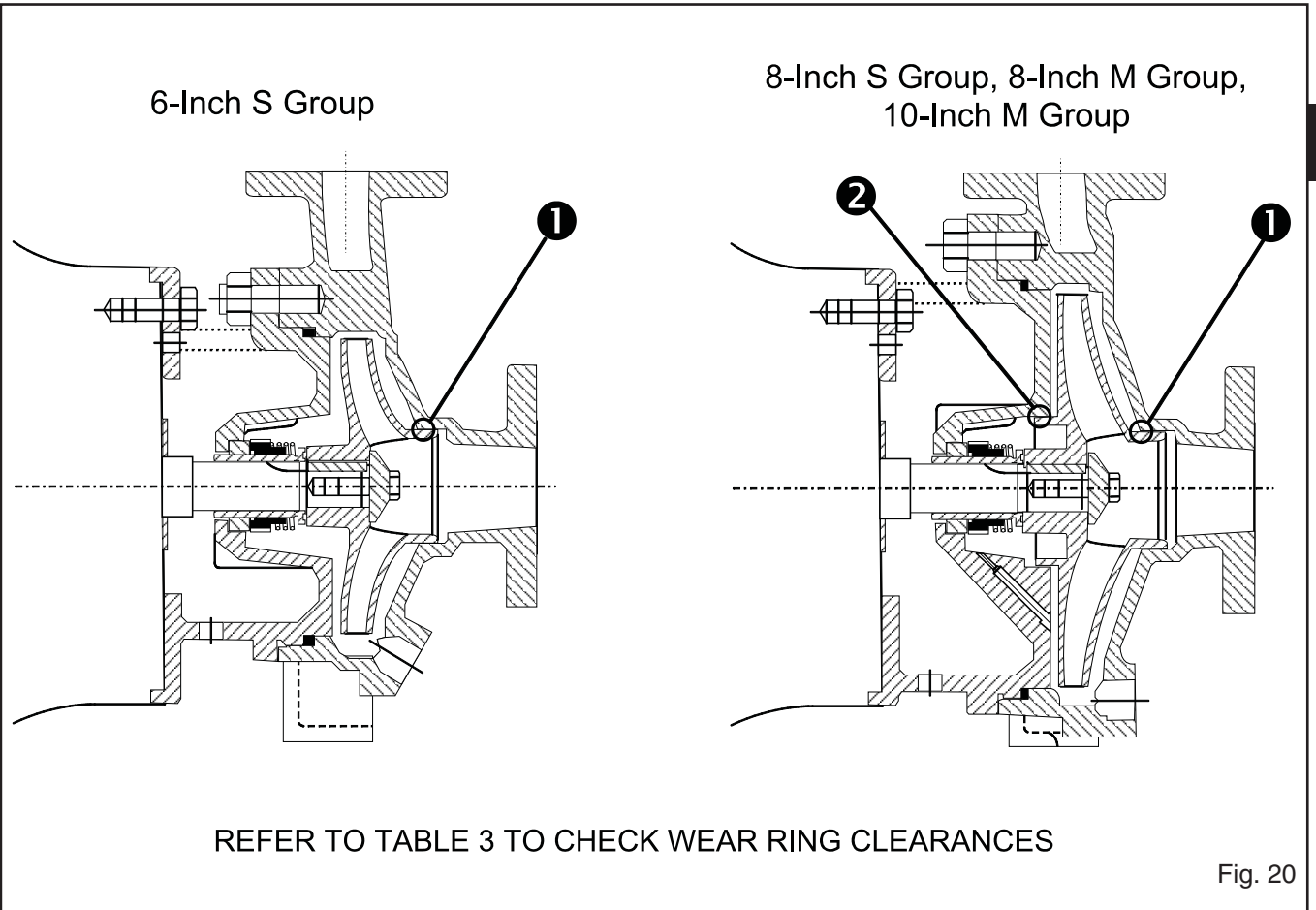


### IMPELLER (101)

1. Inspect wear ring surface for signs of pitting
2. Inspect front and back wear ring clearance per Table 3 (Fig. 20).

**Table 3  
 Diametrical Wear Ring Clearance**

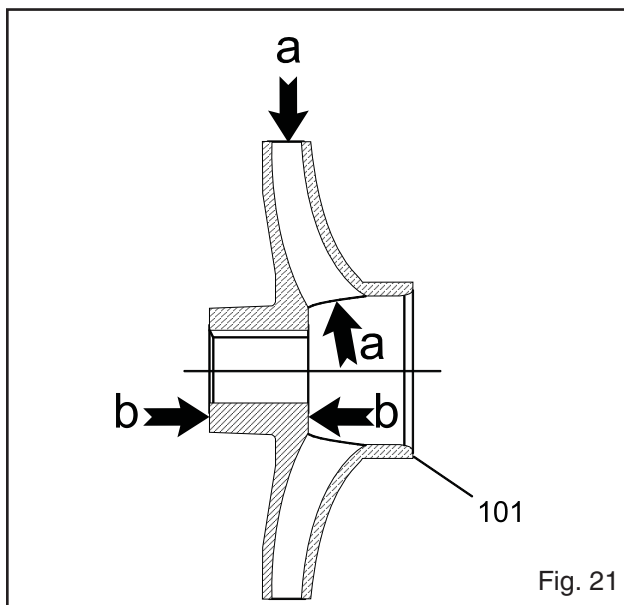
Group	Size	LOCATION			
		Impeller to Casing in. (mm)		Impeller to Seal Chamber in. (mm)	
		New	Replace	New	Replace
S	1 x 1½-6	.017-.021 (.43-.53)	.034 (.86)	N/A	N/A
	2 x 3-6	.027-.031 (.69-.79)	.054 (1.37)	N/A	N/A
	1 x 1½-8	.017-.021 (.43-.53)	.034 (.86)	.018-.022 (.46-.56)	.036 (.91)
M	2 x 3-8	.032-.036 (.81-.91)	.064 (1.63)	.024-.028 (.61-.71)	.048 (1.22)
	1 x 2-10	.017-.021 (.43-.53)	.034 (.86)	.019-.023 (.48-.58)	.038 (.97)
	2 x 3-10	.032-.036 (.81-.91)	.064 (1.63)	.024-.028 (.61-.71)	.048 (1.22)



- Inspect leading and trailing edges of vanes for pitting and erosion or corrosion damage (Area "a" in Fig. 21).
- Check impeller bore and key way. Refer to Table 4 for bore measurement. If oversized, replace impeller.

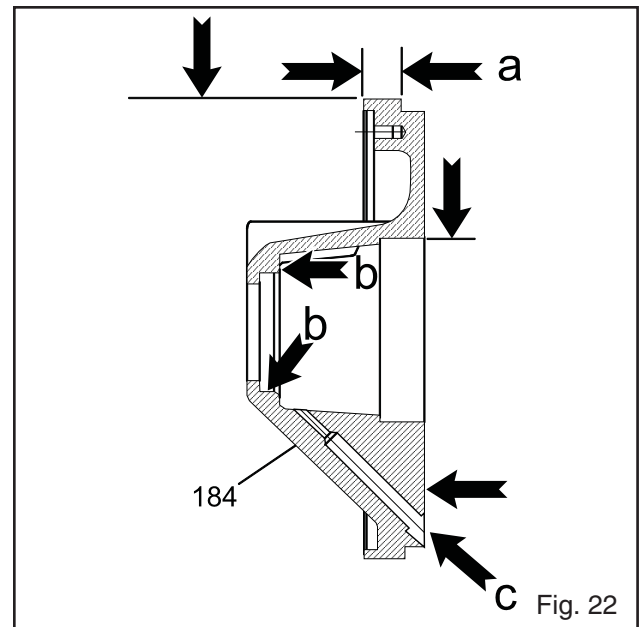
Table 4 Impeller Bores	
Group	Impeller Bore
S	.875/.976
M	1.250/1.251

- Check impeller key way and key (178) for fit and damage.
- Inspect hub faces (Area "b" in Fig. 21). Surface should be free of pits, grooves, and scratches.
- Inspect hydraulic balance holes (drilled holes near impeller hub, not valid for 2x3-6). Remove any obstructions.



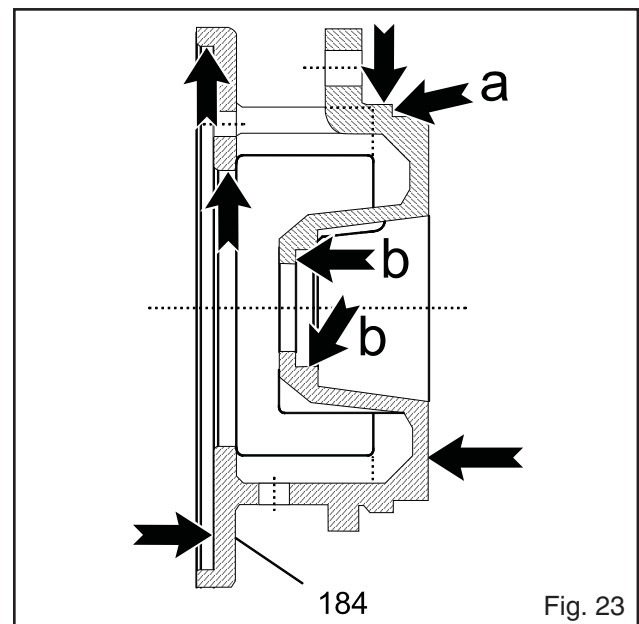
### SEAL CHAMBER (184) - M GROUP ONLY

- Make sure seal chamber (184) is clean at adapter face (Fig. 22).
- Inspect all sealing surfaces (Areas "a" and "b" in Fig. 22). Surfaces should be clean and free of pits, grooves, scratches and wear.
- Replace if there is any pitting wear greater than 1/8 in. (3.2 mm) deep.
- Inspect internal seal flush (Area "c" in Fig. 22). Remove any obstructions.



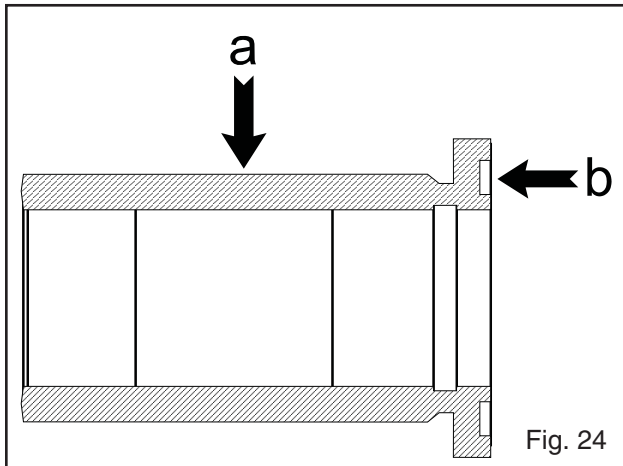
### SEAL CHAMBER/ADAPTER (184) - S GROUP ONLY

- Make sure seal chamber (184) is clean at adapter face (Fig. 23).
- Inspect all sealing surfaces (Areas "a" and "b" in Fig. 23). Surfaces should be clean and free of pits, grooves, scratches and wear.
- Replace if there is any pitting wear greater than 1/8 in. (3.2 mm) deep.
- Check Seal chamber/adapter (184) for cracks or excessive corrosion. Replace if any of these conditions exist (Fig. 23).



## SHAFT SLEEVE (126)

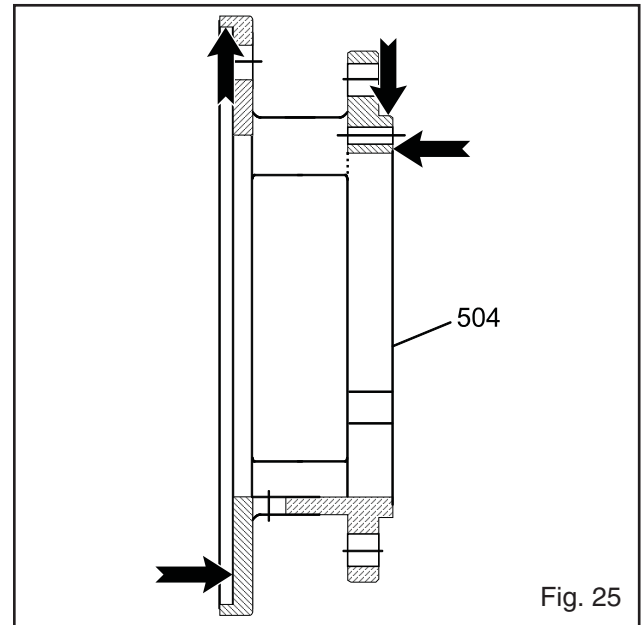
1. Check shaft sleeve surface for grooves and/or pitting (Area "a" in Fig. 24). Replace if any are found.



2. Inspect O-ring groove on face of shaft sleeve. (Area "b" in Fig. 24). Surface should be free of pits, grooves and scratches.

## MOTOR ADAPTER (504) - M GROUP ONLY

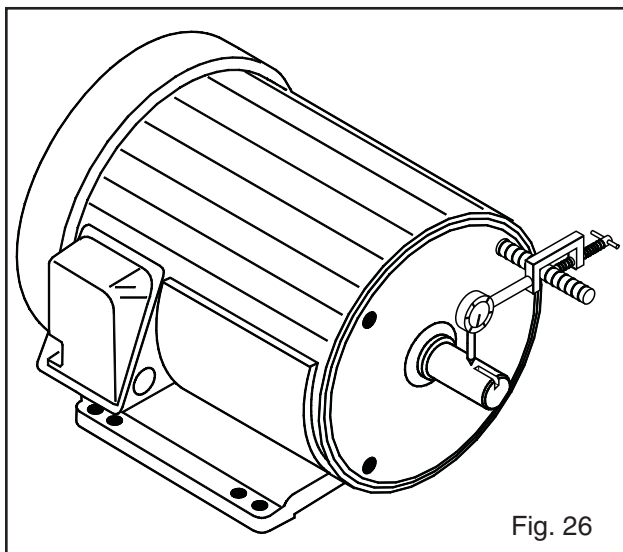
1. Check motor adapter (504) for cracks or excessive corrosion damage. Replace if any of these conditions exist. (Fig. 25)



# REASSEMBLY

## MOTOR INSPECTION

1. Check shaft runout. Rotate shaft by hand 360 degrees (Fig. 26). If total indicator reading (TIR) is greater than the values indicated in Table 5, check the motor for cause of the runout (possible bent shaft).



**Table 5**  
**Motor Inspection Specifications**

Motor Size	Shaft Runout (TIR)	Shaft End Play
140JM-250JM	.002	.004
280JM-320JM, 364TZC	.003	.006

2. Check shaft endplay on the motor (Fig. 27). Move shaft forward and backward by hand, noting indicator movement. If movement is greater than values indicated in Table 6, check the motor for cause of looseness (possible failed motor bearings).

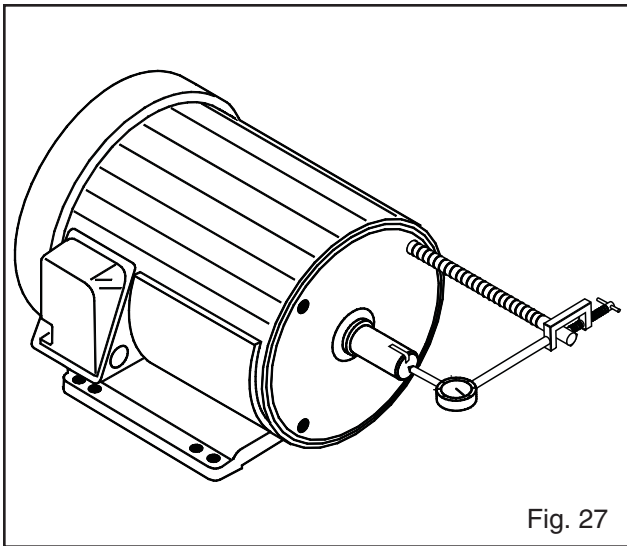


Fig. 27

### MECHANICAL SEAL STATIONARY SEAT INSTALLATION

3. Lubricate elastomer outside diameter of stationary seat, using a lubricant which is compatible with the seal elastomer and the pumpage for the intended service (Table 6).

<b>Elastomer</b>	<b>Acceptable Lubricant</b>
Viton®	P-80® Rubber Lubricant**
	Polywater®***
	Vegetable Oil
	Soap Solutions
EPR	P-80® Rubber Lubricant**
	Polywater®***
	Vegetable Oil
	Soap Solutions

NOTES:  
 \* Verify compatibility with process liquid and/or local regulation.  
 \*\* P-80® International Products Corp., Burlington, NJ  
 \*\*\* Polywater® American Polywater Corp., Stillwater, MN

4. Carefully install stationary seat into locating bore of seal chamber/adapter (184) or seal chamber (184) using a flat, non-metallic driver. Care should be taken not to chip or crack surface.

**CAUTION**  
*Excessive force can damage seal faces which could result in seal failure and/or leakage.*

### MOTOR ADAPTER (504) AND SEAL CHAMBER (184) INSTALLATION - M GROUP ONLY

5. Install motor adapter (504) onto motor. Align bolt holes with those on motor.
6. Install bolts (370U).
7. Install seal chamber (184) on motor adapter (504) using two hex cap screws (370B).
8. Check seal chamber cover run-out (Figure 28). Rotate indicator through 360 degrees. If TIR is greater than 0.015 in. determine cause and correct before proceeding.

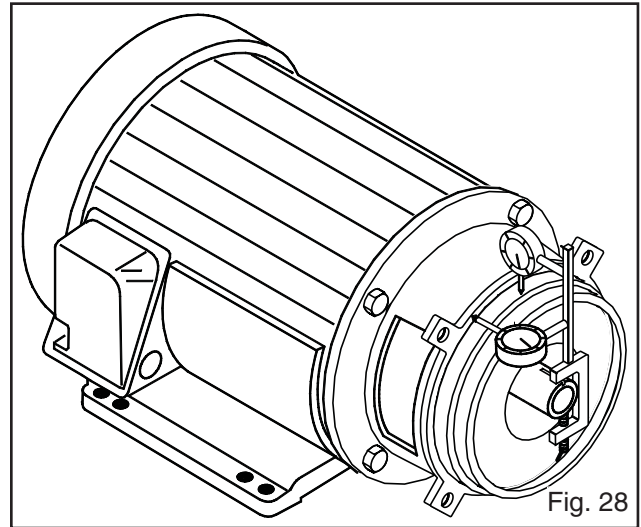


Fig. 28

### SEAL CHAMBER/ADAPTER (184) INSTALLATION - S GROUP ONLY

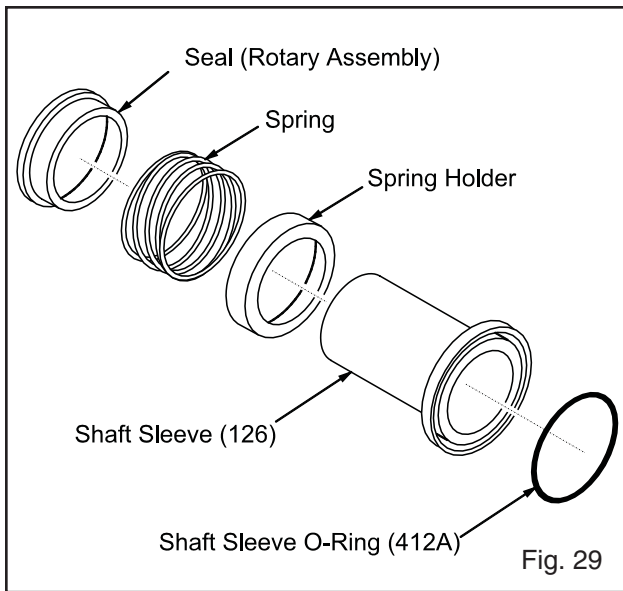
**NOTE:** Care should be taken not to contact stationary seat of mechanical seal, which is pressed onto the seal chamber/adapter (184).

9. Install seal chamber/adapter (184) onto motor. Align bolt holes with those on motor.
10. Install bolts (370U).
11. Check seal chamber cover run-out (Figure 28). Rotate indicator through 360 degrees. If TIR is greater than 0.010 in. determine cause and correct before proceeding.

### INSTALLATION OF MECHANICAL SEAL (383) ON SHAFT SLEEVE (126)

12. Lubricate shaft sleeve outside diameter with the same lubricant used on the stationary seal (Table 6).
13. Install spring holder against shoulder of shaft sleeve (126) (Fig. 29).





14. Install spring over shaft sleeve (126) against spring holder.
15. Install seal (rotary assembly) onto shaft sleeve (126) until face of seal is flush to open end of sleeve.

### SHAFT SLEEVE (126) INSTALLATION

16. Lubricate sleeve O-ring (412A) with the same lubricant used for mechanical seal parts (Table 6).
17. Install O-ring (412A) into O-ring groove on shaft sleeve (126).

**NOTE: Anti-galling compound can be applied to shaft sleeve bore to aid in future disassembly.**

18. Install shaft sleeve (126) on motor shaft with mechanical seal face towards the motor.

### IMPELLER (101) INSTALLATION

19. Place impeller key (178) in keyway on motor shaft.

**NOTE: Impeller Key (178) will extend beyond end of motor shaft at this point in the reassembly procedure.**

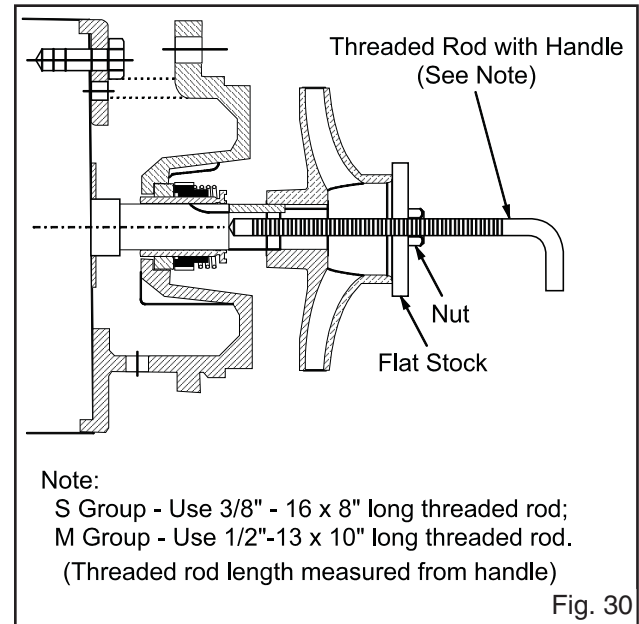
20. Apply anti-galling compound to motor shaft outside diameter to aid in assembly and future disassembly.

## ! WARNING

**Wear heavy work gloves when handling impeller (101) as sharp edges may cause physical injury.**

21. Align keyway in impeller (101) with impeller key (178) on motor shaft. Install impeller (101) onto shaft far enough to engage impeller nut (304).

**NOTE: Do not force impeller onto shaft. If fit is tight between motor shaft and impeller bore, use puller (Fig. 30).**



**Note:**  
 S Group - Use 3/8" - 16 x 8" long threaded rod;  
 M Group - Use 1/2"-13 x 10" long threaded rod.  
 (Threaded rod length measured from handle)

22. Lubricate impeller nut O-ring (412A) with the same lubricant used for mechanical seal parts (Table 6).
23. Install O-ring (412A) into O-ring groove on impeller nut (304).
24. Thread impeller nut (304) into motor shaft. Tighten impeller nut (304).

### CASING (100) INSTALLATION

25. Install casing O-ring (412K) into casing (100).

**NOTE: Anti-galling compound can be applied to outside diameter of the seal chamber (184) to aid in future disassembly.**

26. Install casing:
  - M-Group - use hex cap screws (370).
  - S-Group - use hex cap screws (370) on 8-inch pump, or hex nuts (425) and studs (356A) on 6-inch pump.
27. Tighten bolts in a criss-cross pattern to values indicated in Table 7.

**Table 7  
Torque Values for Case Mounting  
Hex Cap Screws and Nuts**

<b>Pump Sizes</b>	<b>Torque (ft. - lb.)</b>
1 x 1½-6	20
2 x 3-6	20
1 x 1½-8	59
2 x 3-8	59
1 x 2-10	59
2 x 3-10	59

## POST ASSEMBLY CHECKS

After completion of these operations, check if it is possible to rotate shaft easily by hand. If all is proper, continue with pump start-up.

## ASSEMBLY TROUBLESHOOTING

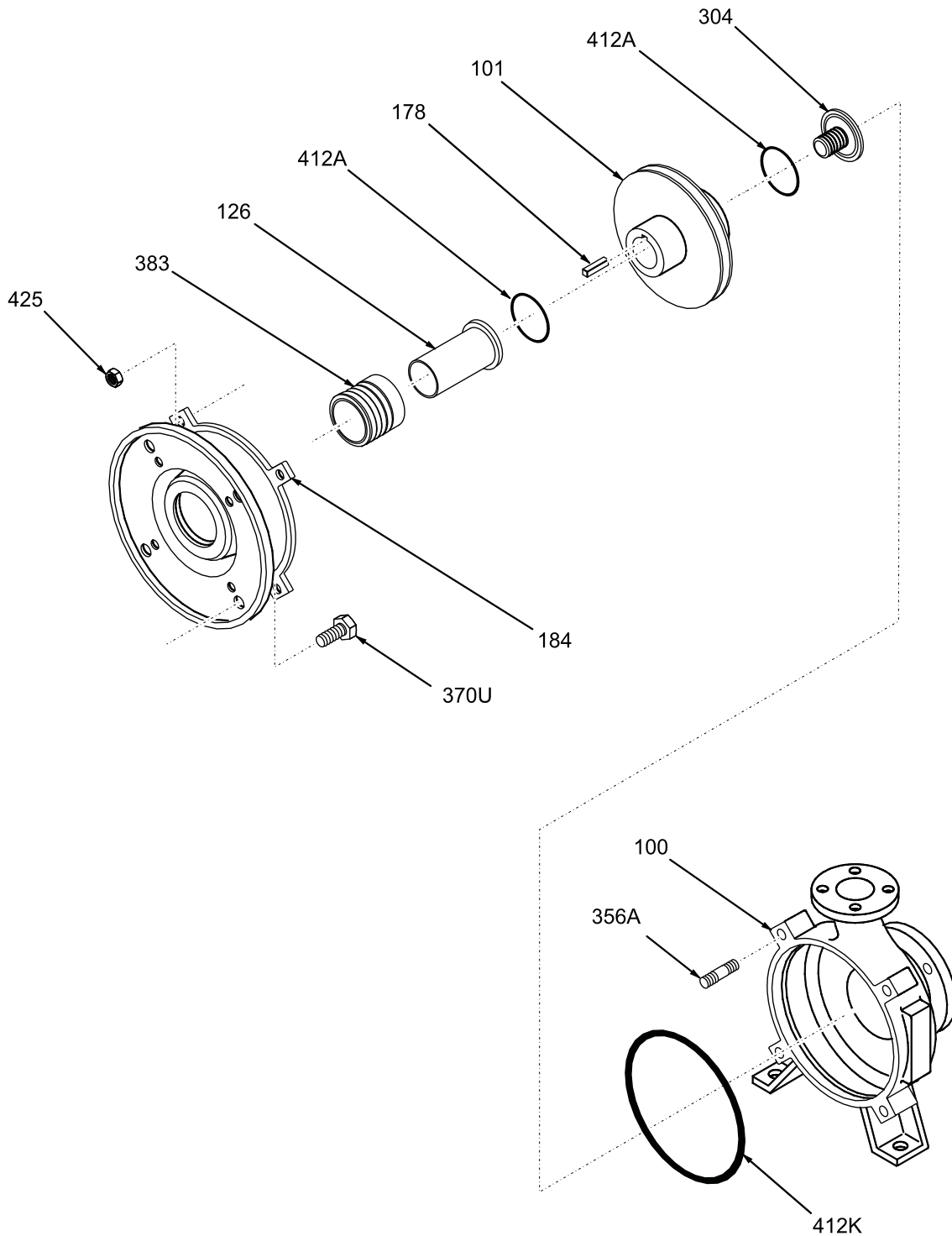
<b>Symptom</b>	<b>Cause</b>	<b>Remedy</b>
Excessive frame adapter runout.	Corrosion.	Replace frame adapter.
Excessive seal chamber runout.	Seal chamber not properly seated in frame adapter.	Reseat seal chamber.
	Corrosion or wear.	Replace seal chamber/stuffing box cover.

# PARTS LIST WITH MATERIALS OF CONSTRUCTION

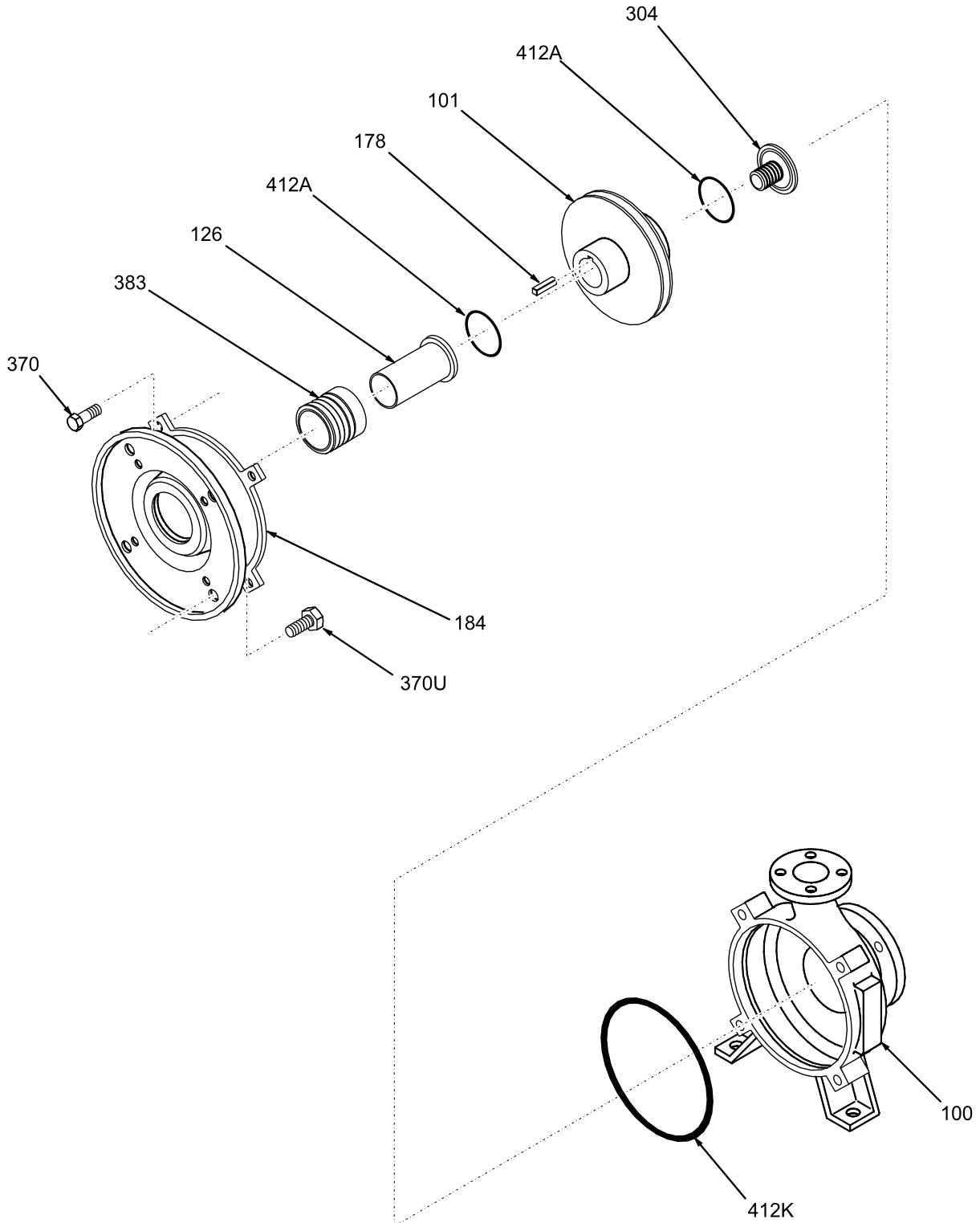
Item	Qty per Pump	Part Name	Material	
			S Group	M Group
100	1	Casing	316SS	316SS
101	1	Impeller	316SS	316SS
126	1	Shaft Sleeve	316SS	316SS
178	1	Key, Impeller	303SS	303SS
184	1	Seal Chamber/Adapter	316SS	—
184	1	Seal Chamber	—	316SS
304	1	Nut, Impeller Assembly	316SS	316SS
356A	4	Stud (Seal Chamber to Casing)	304SS	304SS
370	4	Hex Cap Screw (Adapter to Casing)	304SS	304SS
370B	2	Hex Cap Screw (Seal Chamber to Adapter)	—	304SS
370U	4	Hex Cap Screw (Motor Mounting)	304SS	304SS
383	1	Mechanical Seal	Car/Cer/Viton <sup>®</sup> - Std.	Car/Cer/Viton <sup>®</sup> - Std.
			Car/Cer/EPR - Opt.	Car/Cer/EPR - Opt.
			Carbon/TnCar/Viton <sup>®</sup> -Opt.	Carbon/TnCar/Viton <sup>®</sup> -Opt.
412A	2	O-ring (Impeller Nut & Sleeve)	Viton <sup>®</sup> - Std.	Viton <sup>®</sup> - Std.
			EPR - Opt.	EPR - Opt.
412K	1	O-ring (Seal Chamber to Casing)	Viton <sup>®</sup> - Std.	Viton <sup>®</sup> - Std.
			EPR - Opt.	EPR - Opt.
425	4	Hex Nut (Seal Chamber to Casing)	303SS	303SS
504	1	Adapter	—	Ductile Iron

# MODEL 3100 - S GROUP

## 6-INCH PUMP

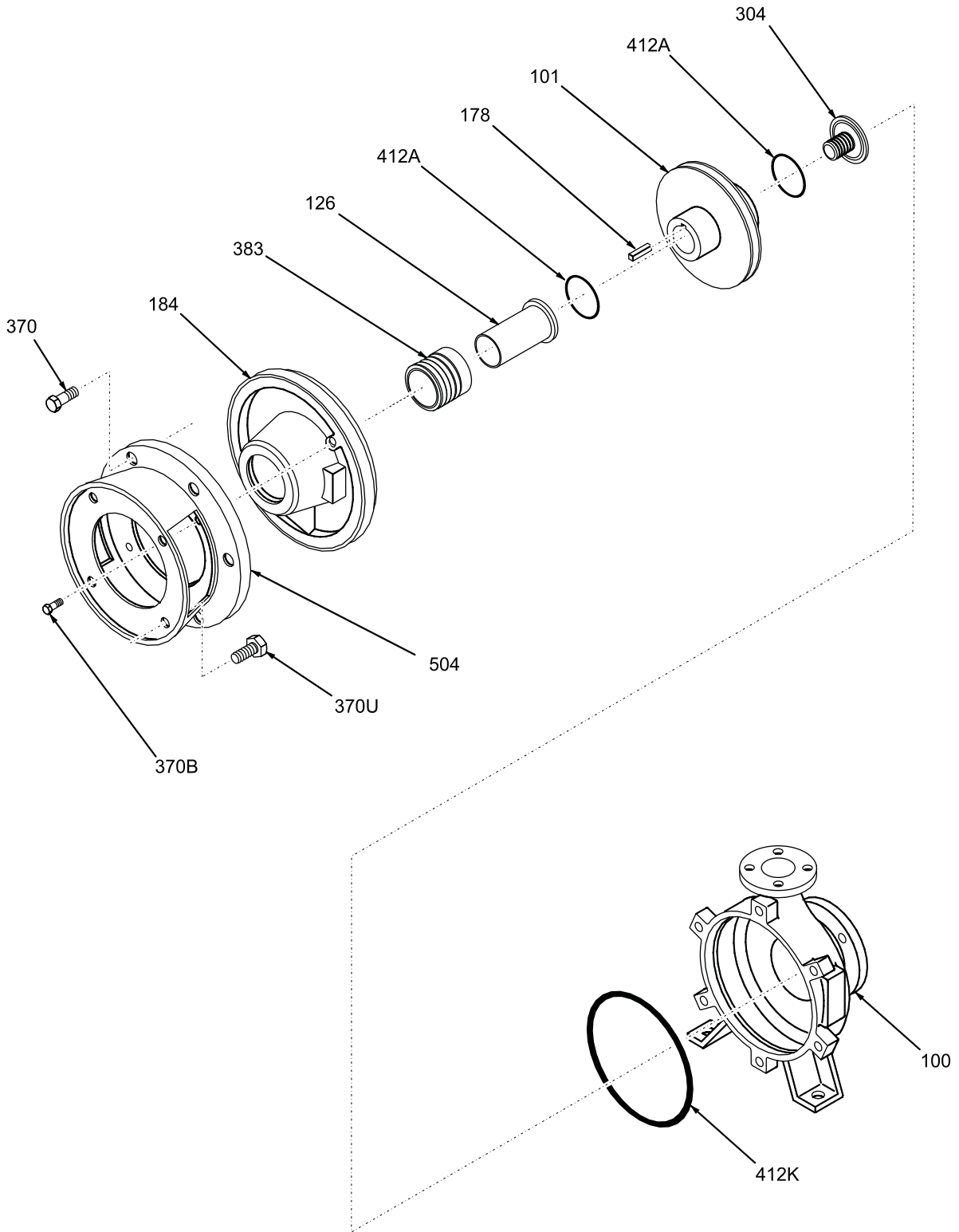


# MODEL 3100 - S GROUP 8-INCH PUMP



6

# MODEL 3100 - M GROUP



# SPARE PARTS

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INTERCHANGEABILITY .....	40

## GENERAL COMMENTS

When ordering spare parts, always state Goulds Serial Number, and indicate part name and item number from relevant sectional drawing. It is imperative for service reliability to have a sufficient stock of readily available spares.

## RECOMMENDED SPARE PARTS

Suggested spare Parts

- Impeller (101)
- Shaft Sleeve (126)
- Casing O-Ring (412K)
- Impeller O-Ring (412A)
- Mechanical Seal (383)

7

## HOW TO ORDER PARTS

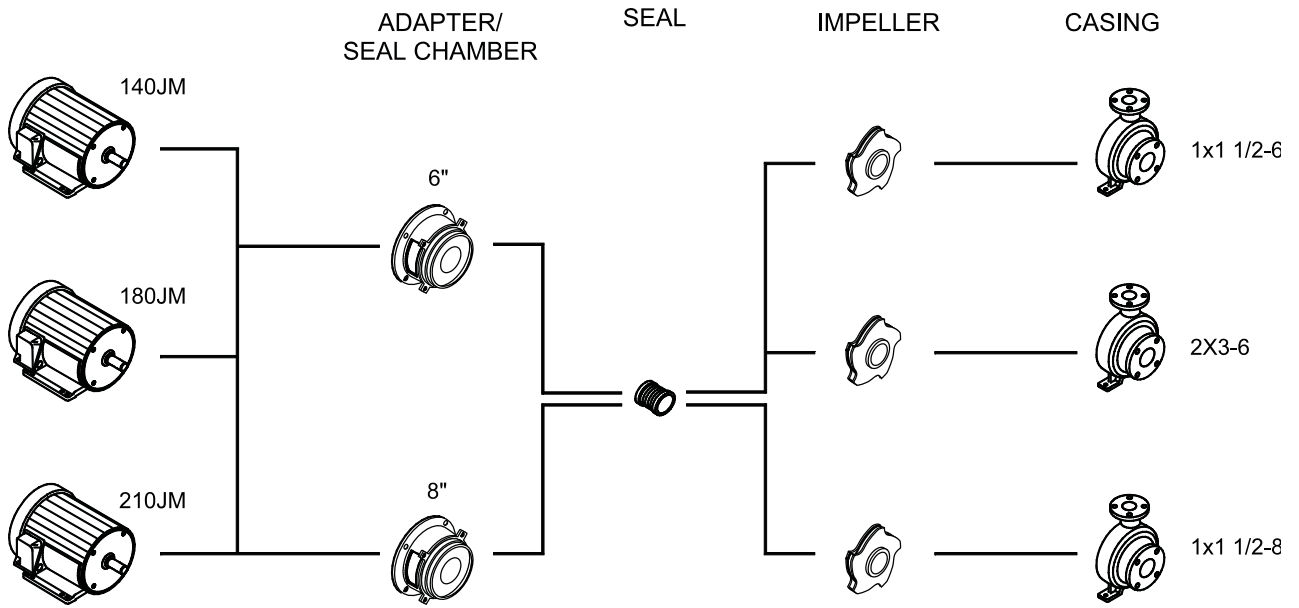
When ordering parts call  
**1-800-446-8537**  
or your local Goulds Representative

## EMERGENCY SERVICE

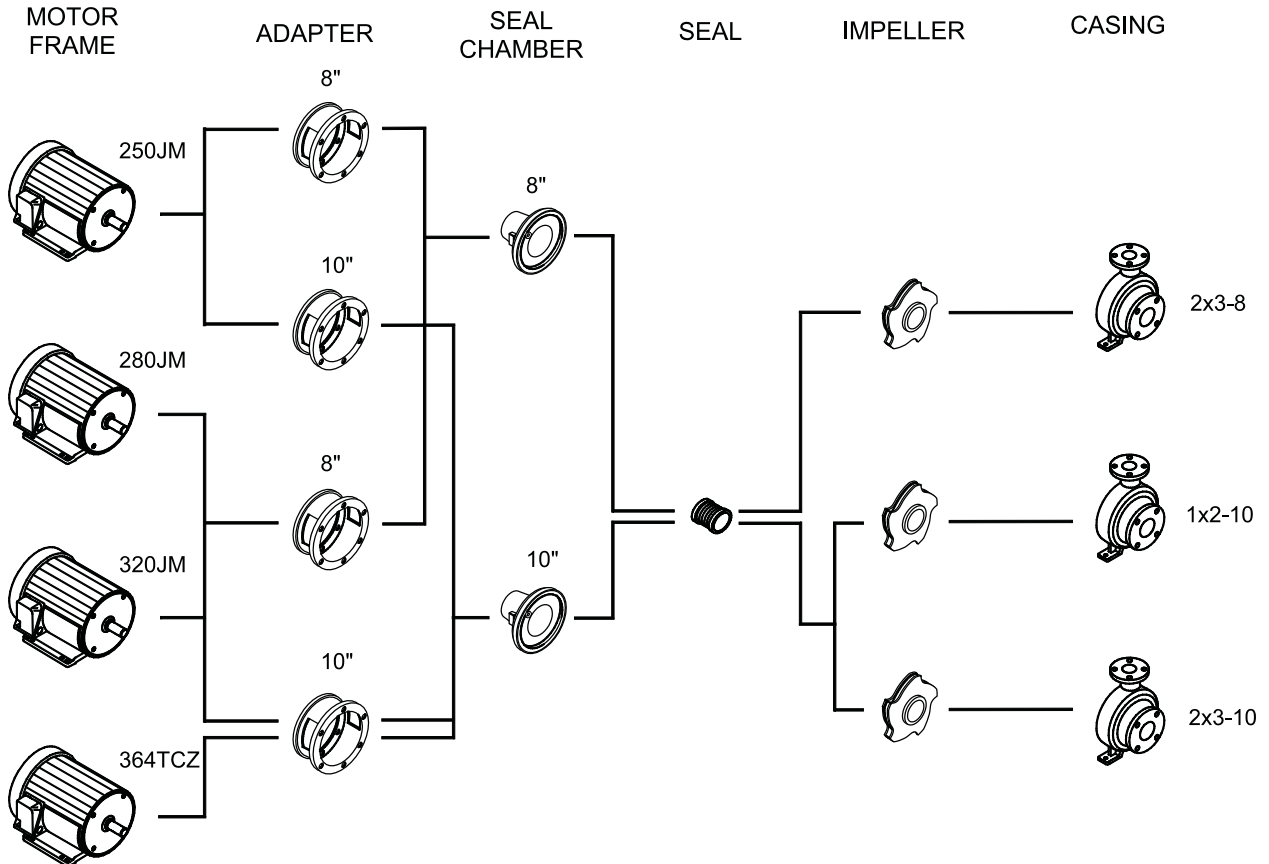
Emergency parts service is available  
24 hours/day, 365 days/year. . .  
Call 1-800-446-8537

# INTERCHANGEABILITY

## MODEL 3100 S GROUP



## MODEL 3100 M GROUP





## MODEL 3100 Limited Warranty

Goulds Pumps, Inc. warrants that its products when properly installed and cared for as stated in the appropriate instruction manuals issued by the company will operate in accordance with its proposal.

Goulds Pumps are warranted to be made of first class material and in a skillful and workmanlike manner. They are additionally warranted against defective material or workmanship and any part proven to be defective within (24) months from the date of installation or (30) months from date of sale, whichever comes first, after inspection by and to the satisfaction of the Company will be replaced free of charge FOB shipping point on return of such defective part to the Company, transportation charges prepaid. No parts, however shall be returned to the Company without the express authority of the Company to do so.

There are no warranties, expressed or implied, except such warranties as are definitely set forth herein. The company shall not be liable for damage or wear to the product caused by abnormal conditions, vibrations, failure to properly prime or to operate product without flow or caused by corrosives, abrasives or foreign objects, improper voltage, or acts of nature. No obligations other than those herein set forth shall be binding upon the Company. No warranties apply to other than the "Ultimate Consumer"; defined as the purchaser who first uses the product after its initial installation. It is the purchaser's or any sub-vendee's responsibility to make known to the "Ultimate Consumer" the terms and conditions of this warranty.

The Company shall in no event be held liable for damages or delays caused by defective material and no allowance will be made for repairs or alterations unless made by its written consent or approval. In the event the products are altered or repaired by others without written approval by the Company all warranties are void.

Under no circumstances shall the Company be held liable for any consequential or other damages, losses, or expenses arising from installation, use, or any other causes, regardless of advice or recommendations that may have been rendered concerning such installations or use of its product, nor shall the Company be liable for penalties of any description.

This warranty is void if the Company's inspections reveal that the product was used in a manner inconsistent with normal industry practices and/or our specific recommendations. The purchaser and/or "Ultimate Consumer" is responsible for communication of all necessary information regarding the application and use of the product.

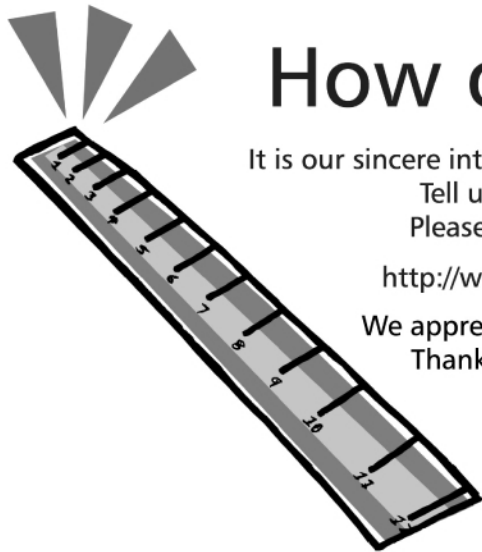
If the pump, motor and mechanical seal are supplied by Goulds Pumps, Inc., the scope of the above warranty will be applicable to the pump, motor and mechanical seal subject to the following conditions:

- A. The operating conditions (flow, head, temperature, specific gravity, suction pressure, viscosity, operating environment) are consistent to those which were clearly communicated to the Company at the time of Order Placement.
- B. The mechanical seal provided, if not selected by the Company, is in accordance with the guidelines provided by the Company.
- C. All motors provided by the Company are to be sized for full curve performance in a non-overloading state without utilization of the Motor Manufacturers "Service Factor".
- D. All equipment provided is operated and maintained in accordance with the recommendations provided by the Company and/or the recommendations of the Original Equipment Manufacturers of the supplied equipment.

If the pump, motor and mechanical seal are not purchased from the Company, then the scope of the above warranty shall only be applicable to the pump components.







# How did we measure up?

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

Tell us whether we achieved our goal on your order.

Please take our customer satisfaction survey online at:

<http://www.ittindustrialproducts.com/feedbacksurvey.html>

We appreciate you taking the time to provide your feedback.

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

Visit our Web site at [www.gouldspumps.com](http://www.gouldspumps.com)

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**ITT**