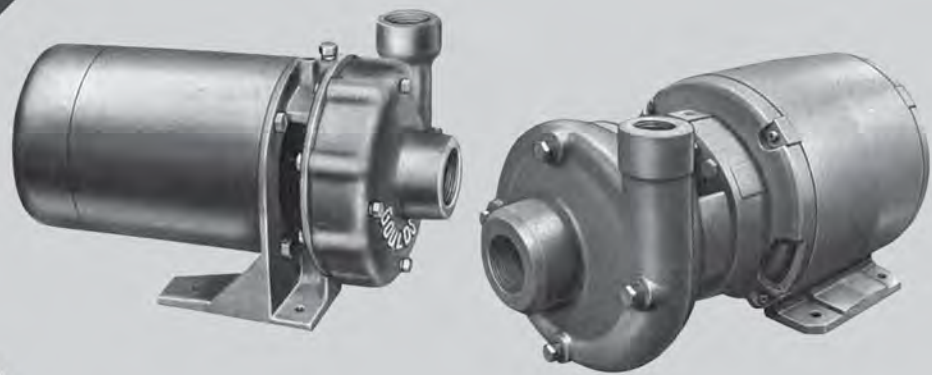


 **GOULDS PUMPS**

Installation, Operation, and Maintenance Instructions

3642-3656



ITT

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1 Introduction and Safety

1.1 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 <https://www.gouldspumps.com/en-US/Tools-and-Resources/Literature/> 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 <https://www.gouldspumps.com>

1.2 Safety Warnings

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



WARNING:

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.



WARNING:

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.



WARNING:

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:**

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 <http://www.gouldspumps.com/literature>.

1.3 Safety

Definitions

Throughout this manual the words Warning, Caution, Electrical are used to indicate where special operator attention is required.

Observe all Cautions and Warnings highlighted in the 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.

**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.

Electrical Hazard:

**WARNING:**

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.

Install the shaft guard - if provided

**WARNING:**

- Running a pump without safety devices exposes operators to risk of serious personal injury or death. Never operate a unit unless appropriate safety devices (guards, etc.) are properly installed.
- Failure to disconnect and lock out driver power may result in serious physical injury or death. Always disconnect and lock out power to the driver before performing any installation or maintenance tasks.
 - Electrical connections must be made by certified electricians in compliance with all international, national, state, and local rules.
 - Refer to driver/coupling/gear manufacturer's installation and operation manuals (IOM) for specific instructions and recommendations.

Exposed rotating shaft between pump seal and bearing frame. Avoid contact and/or install proper guarding. If guarding is not provided with the pump, contact Goulds for price and availability of proper guarding.


1.4 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.

Table 1: 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>Safety Apparel:</p> <ul style="list-style-type: none"> • Insulated work gloves when handling hot bearings or using bearing heater • Heavy work gloves when handling parts with sharp edges, especially impellers • Safety glasses (with side shields) for eye protection • Steel-toed shoes for foot protection when handling parts, heavy tools, etc. • Other personal protective equipment to protect against hazardous/toxic fluids
WARNING		<p>Receiving:</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 www.gouldspumps.com/literature_ioms.html 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>Alignment:</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.
WARNING		Before beginning any alignment procedure, make sure driver power is locked out. Failure to lock out driver power will result in serious physical injury.
CAUTION		Piping: 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.
WARNING		Flanged Connections: Use only fasteners of the proper size and material.
WARNING		Replace all corroded fasteners.
WARNING		Ensure all fasteners are properly tightened and there are no missing fasteners.
WARNING		Startup and Operation: When installing in a potentially explosive environment, please ensure that the motor is properly certified.
WARNING		Operating pump in reverse rotation may result in contact of metal parts, heat generation, and breach of containment.
WARNING		Lock out driver power to prevent accidental start-up and physical injury.
WARNING		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.
WARNING		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.
WARNING		Never operate a pump without coupling guard properly installed. Personal injury will occur if pump is run without coupling guard.
WARNING		Make sure to properly lubricate the bearings. Failure to do so may result in excess heat generation, sparks, and / or premature failure.
CAUTION		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.
WARNING		Never attempt to replace packing until the driver is properly locked out and the coupling spacer is removed.
WARNING		DO NOT operate pump below minimum rated flows or with suction and/or discharge valve closed. These conditions may create an explosive hazard due to vaporization of pumpage and can quickly lead to pump failure and physical injury.
WARNING		Ensure pump is isolated from system and pressure is relieved before disassembling pump, removing plugs, opening vent or drain valves, or disconnecting piping.
WARNING		Shutdown, Disassembly, and Reassembly: Pump components can be heavy. Proper methods of lifting must be employed to avoid physical injury and/or equipment damage. Steel toed shoes must be worn at all times.

WARNING		The pump may handle hazardous and/or toxic fluids. 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.
WARNING		Operator must be aware of pumpage and safety precautions to prevent physical injury.
WARNING		Lock out driver power to prevent accidental startup and physical injury.
CAUTION		Allow all system and pump components to cool before handling them to prevent physical injury.
CAUTION		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.
WARNING		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.
CAUTION		Wear heavy work gloves when handling impellers as sharp edges may cause physical injury.
CAUTION		Wear insulated gloves when using a bearing heater. Bearings will get hot and can cause physical injury.
WARNING		Noise: Sound pressure levels may exceed 80 dbA in operating process plants. Clear visual warnings or other indicators should be available to those entering an area with unsafe noise levels. Personnel should wear appropriate hearing protection when working on or around any equipment, including pumps. Consider limiting personnel's exposure time to noise or, where possible, enclosing equipment to reduce noise. Local law may provide specific guidance regarding exposure of personnel to noise and when noise exposure reduction is required.
WARNING		Temperature: Equipment and piping surfaces may exceed 130°F (54°C) in operating process plants. Clear visual warnings or other indicators should alert personnel to surfaces that may reach a potentially unsafe temperature. Do not touch hot surfaces. Allow pumps operating at a high temperature to cool sufficiently before performing maintenance. If touching a hot surface cannot be avoided, personnel should wear appropriate gloves, clothing, and other protective gear as necessary. Local law may provide specific guidance regarding exposure of personnel to unsafe temperatures.
WARNING		This product contains Carbon Black a chemical known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov

1.5 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 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:



II = Group 2

2 = Category 2

G/D = Gas and Dust present

T4 = Temperature class, can be T1 to T6 (see Table 1)

Table 2: Temperature class definitions

Code	Maximum permissible pumpage temperature in °C °F	Minimum permissible pumpage temperature in °C °F
T1	450 842	372 700
T2	300 572	277 530
T3	200 392	177 350
T4	135 275	113 235
T5	100 212	Option not available
T6	85 185	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.

1.6 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.

2 General Information

2.1 General Information

Models 3642 and 3656 both are single state end suction volute type general purpose centrifugal pumps with enclosed impellers applicable to clear liquids. Also appropriate for general machinery and industrial services up to 212°F particularly suited to air conditioning condensate booster service and water transfer.

Both models are close coupled to an electric motor having NEMA standard face mounting and shaft extension dimensions and designed for continuous service with prelubricated ball bearings. Model 3642 has a standard jet pump motor with stainless steel threaded shaft extension. Model 3656 steel shaft is protected by a stainless steel sleeve.

Both models are equipped with mechanical seals. Single unbalanced J. Crane seals are standard. The back pull-out design (the entire rotating elements and motor can be pulled from the pump casing) facilitates inspection and repair without disturbing the piping.

The pumps are shipped completely assembled.

3 Installation

3.1 Installation

Location – Locate pump as near the liquid source as practical (and below the level of liquid storage if automatic operation is contemplated). Protect the unit from weather and against water damage due to flooding. Low static lift and short direct suction and discharge pipes are desirable. At suction lift higher than 15 ft. consult the pump performance curve for NPSHr (Net positive Suction Head – Required). The suction pipe should be at least equal in size to the suction connection of the pump slope upward to the pump avoiding air pockets. If pipe larger than pump suction is used and eccentric pipe reducer should be used at the pump. Gate valve in the suction is necessary only on positive suction head installation and must not be used to throttle the pump.

Allow adequate room for servicing and ventilation.

Foundation – Bolt unit to foundation by removable hold-down bolts for easy dismantling. Foundation surface must be flat so there is no distortion and/or strain developed when tightening the bolts. The pumps are inherently quiet and smooth running, but rubber mounting is desirable on foundation susceptible to sound effect.

Alignment – No field alignment of these pumps is necessary, since they are close coupled.

Wiring – National Electric Code and local codes should be followed. Motor branch circuit should be protected by a suitable manual or magnetic starter and it is desirable to have low voltage protection. Proper fusing and sufficient time delay for starting must also be selected according to codes.

All single phase motors furnished with model 3642 pumps are dual voltage, 115/230V, 60 Hz. A.C. All pumps are tested at the factory. Upon installation in the field correct rotation (3 phase), phase frequency and voltage of power supply should be checked. The power lines should be of proper size to carry the required amperage.

Model 3656 single phase 3HP motors are dual voltage 115/230V , AC and single phase 5HP motors are 230V only, 60 Hz, AC. All other motors are three phase dual voltage 230/460V. 60Hz AC. Higher voltages are always recommended wherever available.

The rotation must be checked upon installation. Close then break the contacts quickly and observe rotation of the exposed portion of rotating parts. Rotation must agree with the arrow cast on the pump casing. For all pumps the standard rotation is counter clockwise viewed from the suction end. Motor wiring is easily changed in the field by following the wiring diagram on the inside of the terminal box cover, or on the motor name.

4 Operation

4.1 Operation

Fill the suction pipe and casing with the liquid to be pumped to ensure that the mechanical seal will not run dry. Four plugs are provided in the casing so that in any position one will be on the top for priming and/or venting and another at the bottom for draining. With the pump primed and motor properly wired, the unit may be started. Be sure that the pump is not started against a closed controlling valve in the discharge line.

For possible leaks, check flange bolting, piping connections and pipe plugs. Tighten if necessary. The maximum temperature - 212° F limitation – is imposed by the mechanical seal material. Optional, high temperature seals might be used.

5 Maintenance – Model 3642

5.1 Maintenance – Model 3642

Lubrication

Pumps should require no maintenance, other than the motor bearings, according to the following instructions:

Ball-sleeve bearing construction (G.E.).

Ball bearing-drive end.

Clean and remove grease plug. Add grease until housing is filled. Operate with plug removed until excess grease escaped. Replace plug.

Sleeve bearing-opposite drive end.

Oil bearing while motor is not running. Add SEA10 oil until wicking is saturated. Restart motor in hot environment lubrication may be necessary every 2-3 months, otherwise lubrication once a year is sufficient. Inspect periodically to determine the condition of the lubricant and how often it should be replaced.

Ball-bearing construction (A.O. Smith, Century)

Double shielded, prelubricated bearings are used. For the life of the bearings no additional lubrication is required.

6 Replacing Mechanical Seal

6.1 Dismantling

1. Turn off power.
2. Drain System.
3. Remove bolts holding motor adapter to foundation.
4. Remove casing bolts.
5. Withdraw motor and rotating element from casing, leaving casing and piping undisturbed.
6. Insert a screwdriver in one of the impeller nut with a socket wrench (5/8" across flats). As shown.

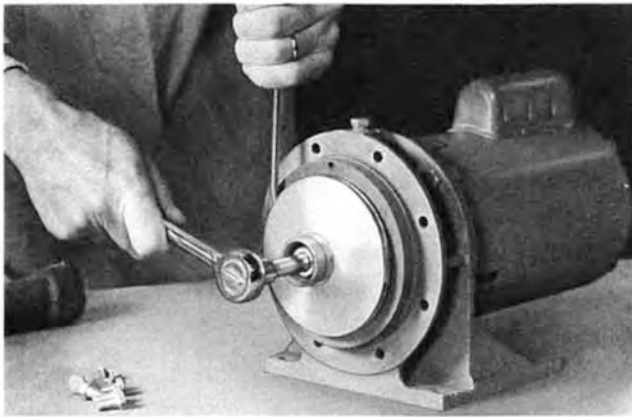


Figure 1:

7. Remove impeller from shaft as follows:

G.E. and Century motors:

Remove motor shaft end cap. Insert a screwdriver in slot of motor shaft and while holding shaft against rotation with screwdriver, unscrew impeller from shaft by turning counter clockwise when facing it. To loosen impeller, it might be required to apply heat to exposed shaft thread and impeller hub since Loctite was used to secure impeller in place.

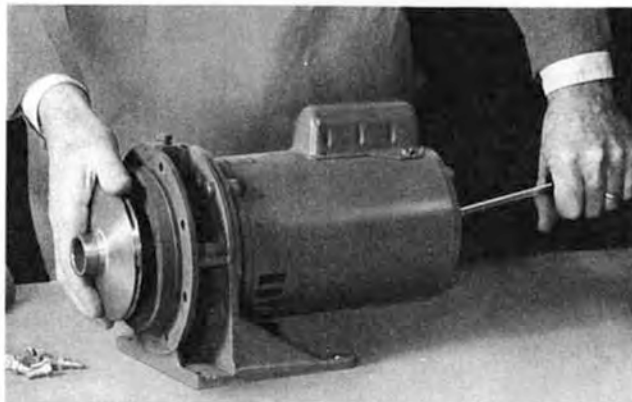


Figure 2:

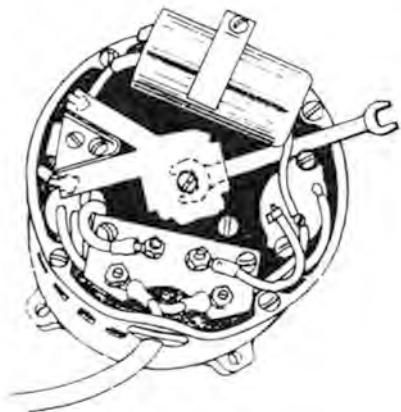


Figure 3:

A.O. Smith motors:

Remove motor end cover. Insert 7/16" open end wrench under switch mechanism onto flats on motor shaft and while holding shaft against rotation unscrew impeller from shaft (fig.3) Head might be applied as indicated in for G.E. and Century motors.

8. Pry off rotating member of mechanical seal from shaft by using two (2) screwdrivers.

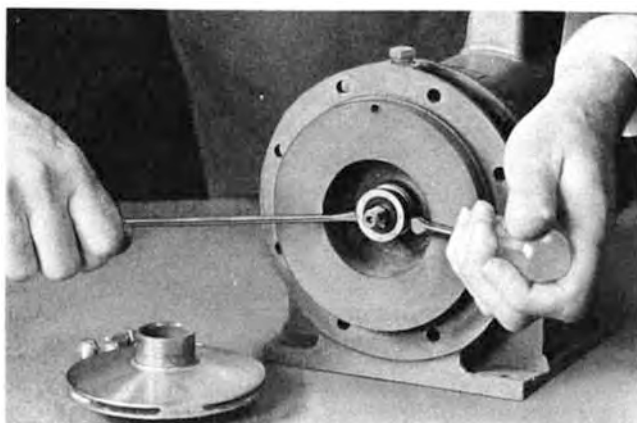


Figure 4:

9. Remove bolts holding adapter to motor and take off adapter.
10. Place adapter on a flat surface and push out stationary parts of mechanical seal.

6.2 Reassembly

1. Clean gasket and flange faces, male and female locks, seal seat counterbore and shaft, in particular shaft shoulder fitting against impeller.
2. Wet counterbore of adapter and rubber bushing of stationary seal with water or light oil, and press stationary seal in counterbore squarely and evenly with caution not to mar the lapped face of seat.
3. Remount adapter on motor, making sure the motor shaft does not dislocate the stationary seat of the seal.
4. Apply a thin coat of light oil or water to the motor shaft and the rubber seal member of seal and slide rotating member of mechanical seal on motor shaft. Be sure the rotating seal face stays in the holding collar during installation. Also take extra care not to damage the seal lapped faces.
5. Spray both shaft and impeller threads with LOCQUIC, Primer "T" –Loctite product item No. 74756 (Purchased at Automotive Parts or Hardware store). Let parts dry and then apply Loctite #271 on same parts.

6. Hold shaft against rotation as described in Step 7 of dismantling procedure, and thread impeller on shaft until it is tight against the shaft shoulder.
7. Replace impeller nut holding impeller against rotation as indicated in Step 6 of dismantling procedure.
8. Remove any burrs caused by screwdriver on the periphery of impeller in waterway passages.
9. Replace motor and rotating element in casing. Be sure that any damaged gasket is replaced.
10. Tighten casing bolts alternately and evenly.
11. Replace hold-down bolts.
12. Check for free rotation after assembly is completed.
13. Replace motor shaft end cap or end cover.
14. Close all drain openings using pipe joint compound on male threads.
15. Reprime before starting. Do not start unit until pump is completely filled with water.

7 Maintenance-Model 3656

7.1 Lubrication

Pumps should require no maintenance, other than the motor bearings, according to the following instruction:

Double shielded, pre-lubricated bearings are used and for the life of the bearings no additional lubrication is required. However, in hot environment, lubrication may be necessary every 2-3 months; otherwise once-a-year lubrication is sufficient. Inspect periodically to determine the condition of the lubricant and how often it should be replaced.

7.2 Replacing mechanical seal

Dismantling:

1. Turn off power.
2. Drain system.
3. Remove bolts holding down motor to foundation.
4. Remove casing bolts.
5. Remove motor and rotating element from casing, leaving casing and piping undisturbed.
6. Insert a screwdriver in one of the impeller water-way passages and back off the impeller bolt with a socket wrench, as shown.

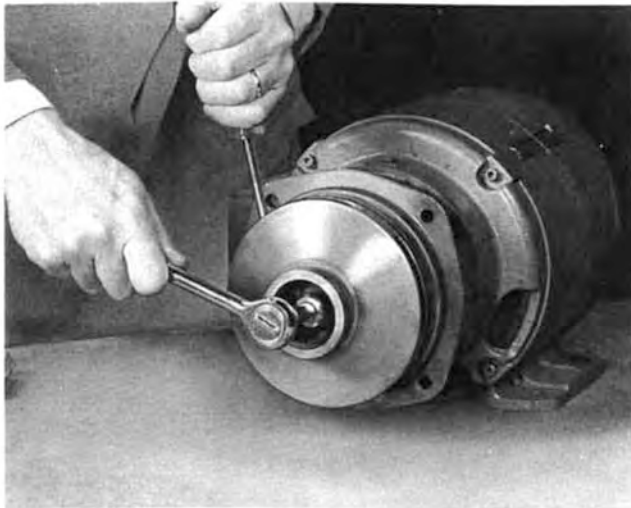


Figure 5:

7. Remove washer and impeller from shaft, being careful not to lose the impeller key. If impeller is difficult to remove, it may be necessary to insert two (2) screwdriver between impeller and adapter 180° apart to pry off impeller.
8. Remove bolts holding adapter to motor and take off adapter pulling with it the rotating seal part from sleeve.
9. Place adapter on flat surface and push out stationary parts of mechanical seal.
10. Inspect shaft sleeve if damaged, remove from shaft by heating with torch and using a bearing puller or other similar device.

Reassembly:

11. Clean parts and male and female locks seal seat counterbore and shaft in particular shaft where sleeve fits (if sleeve was removed).

12. Spray both shaft sleeve fit and sleeve inside with LOCQUIC Primer "T" – Loctite product item no 74756. (Purchased at Automotive Parts, or Hardware store). Let parts dry and then apply Loctite #271 on same parts. Slide sleeve over shaft twist sleeve back and forth a couple times. Wipe off excess Loctite and let it cure according to manufacturer's instruction.
13. Wet counterbore of adapter and rubber bushing of stationary seat with water or light oil and press stationary seat in counterbore squarely and evenly with caution not to mar the lapped face of seat.
14. With motor preferable in vertical position remount adapter on motor making sure the motor shaft does not dislocate the stationary seat of the seal.
15. Apply a thin coat of light oil or water to the sleeve and the rubber seal member of rotating seal and slide rotating member of mechanical seal on sleeve and attach spring. Be sure the rotating seal face stays in the holding collar during installation. Also take extra care not to damage the seal lapped faces.
16. Place key in keyway slot and slide impeller on shaft. Place impeller washer on impeller hub and start threading impeller bolt into motor shaft. This bolt has a PTFE thread coating and should be reused only two or three times.
17. Insert a screwdriver in a waterway passage of the impeller holding it against rotation and tighten bolt.
18. Remove any burrs caused by screwdriver on the periphery of impeller in waterway passages.
19. Slide motor and rotating element in casing. Be sure that any damaged O-ring was replaced.
20. Tighten casing bolts alternately and evenly.
21. Replace hold down bolts.
22. Check for free rotation after assembly is completed.
23. Close all drain openings using pipe joint compound on male threads.
24. Reprime before starting. Do not start unit until pump is completely filled with water.

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