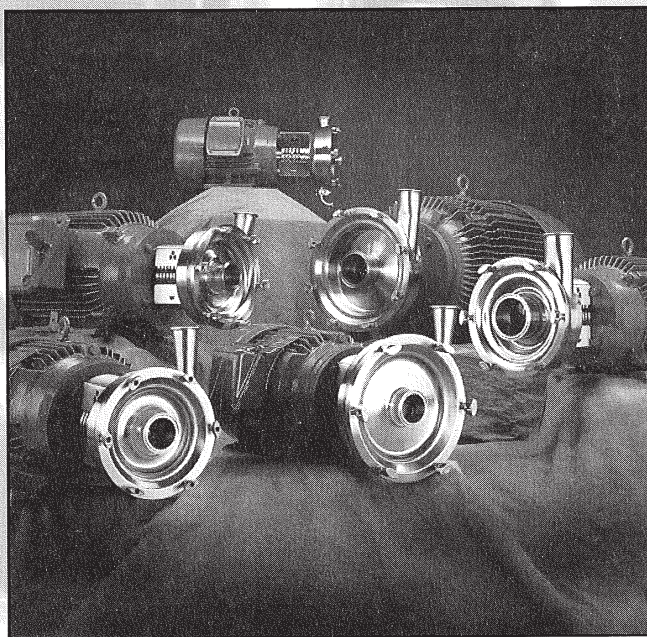


CLSM



# Tri-Clover CL Series Centrifugal Pumps

Service & Installation Manual





**CSI**

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# CONTENTS

Thank you for purchasing a Tri-Clover Product!

This manual contains disassembly and assembly instructions, maintenance procedures, troubleshooting, and a complete parts list for all CL Series Centrifugal Pumps designed and manufactured by Tri-Clover Inc., Kenosha, Wisconsin.

**READ THIS MANUAL** carefully to learn how to service these pumps. Failure to do so could result in personal injury or equipment damage.

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# SAFETY

## DO'S AND DON'TS

- DO** read and understand these instructions before installing or using the pump.
- DO NOT** modify the pump. Modifying the pump creates unsafe conditions and voids all warranties.
- DO** use Tri-Clover spare parts when replacing a component of the pump.
- DO NOT** place the pump in an application where the service ratings are exceeded.
- DO NOT** service the pump while it is running.

### SAFETY PRECAUTIONS WHEN INSTALLING PUMP

- DO** use an authorized electrician when connecting the pump.
  - DO** observe the mechanical limits of the pump (refer to the pump performance sheet).
  - DO NOT** lift the Motor and Pump by the pump casing or wingnuts.
- If it is necessary to regulate flow out of the pump, **DO** install a throttling valve in the discharge outlet line. **DO NOT** install a throttling valve in the suction inlet line.

### SAFETY PRECAUTIONS WHEN OPERATING PUMP

- DO NOT** touch the pump or the lines when pumping hot fluids or when performing Clean In Place (CIP) procedures.
- DO NOT** run the pump with BOTH the suction inlet and discharge outlet blocked. Running the pump with the inlet blocked will cause serious damage to the pump.
- DO NOT** check pump rotation with liquid in the pump.
- DO NOT** run the pump with the impeller rotating in the wrong direction. Rotating the impeller in the wrong direction may cause damage to the pump.
- DO NOT** operate the pump without the seal guard in place.

### SAFETY PRECAUTIONS WHEN SERVICING PUMP

- DO** ensure the pump is cool to touch before performing service.
  - DO** relieve all pressure and drain all fluids from pump and connected piping before performing service.
  - DO ENSURE POWER TO THE UNIT HAS BEEN UNPLUGGED PRIOR TO PERFORMING ANY PUMP MAINTENANCE OR CLEANING.**
  - DO** exercise caution and wear protective clothing when using lye or acid for cleaning.
- These instructions contain operating and service information for the pump only. Motor information is provided separately by the motor manufacturer.



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# SAFETY

## IMPORTANT SAFETY INFORMATION

The following DANGER, WARNING, AND CAUTION signs and their meanings are used within these instructions.

	 <b>DANGER</b>
	Indicates an imminently hazardous situation which, if not avoided, <b>will</b> result in death or serious injury. The word Danger is used in the most extreme cases.

	 <b>WARNING</b>
	Indicates a potentially hazardous situation which, if not avoided, <b>may</b> result in minor or moderate injury. May also be used to alert against an unsafe operating or maintenance practice.

	 <b>CAUTION</b>
	Indicates a potentially hazardous situation which, if not avoided, <b>could</b> result in death or serious injury.



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# TECHNICAL INFORMATION

## TECHNICAL DATA

### SPECIFICATIONS

Maximum Inlet Pressure ..... 145 PSI (1000 kPa) (10 bar)  
Temperature Range ..... 14°F - 284°F (-10°C to 140°C)  
Typical Motor Noise Level ..... 60 - 80 dB(A)

### MATERIALS

Product Wetted Steel Parts ..... AISI 316L  
Product Wetted Seals ..... EPDM (standard)  
Alternative Seals ..... BUNA-N, SFY (Fluoroelastomer), PTFE Encapsulated Fluoroelastomer  
Finish ..... Polished Standard

### SHAFT SEALS

Seals Type ..... Single External or Single/Double Flushed  
Maximum Water Pressure (single flushed seal) ..... Maximum 14 PSI (1 bar) of water  
Water Consumption (flushed seal) ..... 2 - 4 GPM (0.13 to 0.25 liter/second)  
Stationary Seal Ring Material ..... AISI 316L with Silicon Carbide sealing surface  
Rotating Seal Ring Material ..... Carbon (standard) or Silicon Carbide  
O-ring Material ..... EPDM (standard)  
O-ring Alternate Material ..... BUNA-N, Fluoroelastomer, PTFE Encapsulated Fluoroelastomer

### MOTOR INFORMATION

Uses standard NEMA C-flange lock bearing close coupled motors. Options include drip proof, explosion proof, energy efficient, chemical casings, and IEC B5 flange motors.

CL4311 pumps with frame size 320 and larger use motors with special Duplex thrust bearings, which ensure longer bearing life.

### Voltage and Frequency

3 phase, 50Hz, 220/380 VAC ..... 1500/3000 RPM  
3 phase, 60Hz, 208-230/460 VAC ..... 1800/3600 RPM  
3 phase, 60Hz, 575 VAC ..... 1800/3600 RPM

### Available Motor Sizes

60 Hz: 1, 1.5, 2, 3, 5, 7.5, 10, 15, 20, 25, 30, 40, 50, 60, 75, 100 (Horsepower)  
50 Hz: .75, 1.1, 2.2, 3, 4, 5.5, 7.5, 11, 15, 18.5, 22, 30, 37, 45, 55, 75 9 (Kilowatts)



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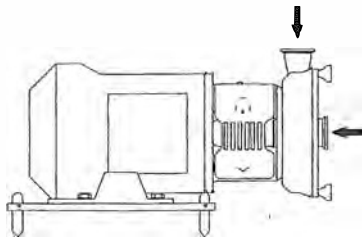
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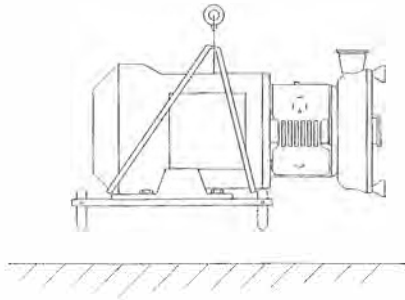
# INSTALLATION

## UNPACKING EQUIPMENT

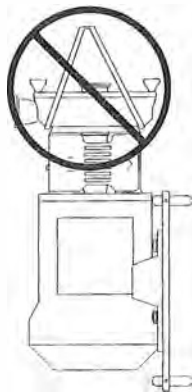
- ✓ The following items are included with the pump:
  - Delivery Notes
  - Pump Service/Instruction Manual
  - Motor Service/Instruction Manual
  - Test Certificate certifying the performance of the pump. (if pump is supplied with a motor from Tri-Clover)
- ✓ Remove all packing materials from the pump and motor.



- ✓ Check the suction inlet and discharge outlet for any pieces of packing.
- ✓ Inspect the pump, motor and motor mounting frame for signs of damage.
- ✓ Check all nuts, bolts, and set screws, and retighten as necessary.
- ✓ Report any damage to the carrier.
- ✓ Carefully lift the motor and pump.



- Use a hoist or other lifting means if necessary.



- **DO NOT** lift motor and pump by the pump.

# INSTALLATION

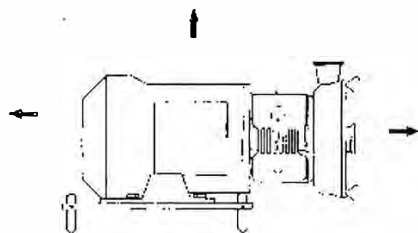
## INSTALLATION



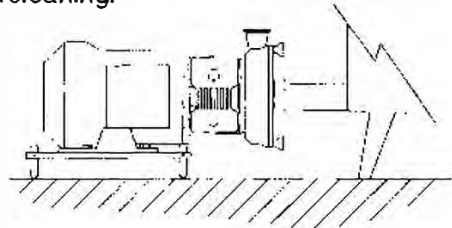
### ⚠ WARNING

Only authorized electricians should connect the pump.

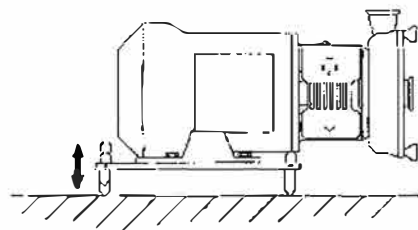
Ensure sufficient clearance around the motor and pump.



Allow sufficient access for inspection and cleaning.

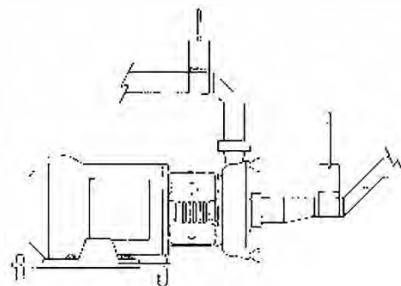


Pump should be located as near as possible to the source being pumped.

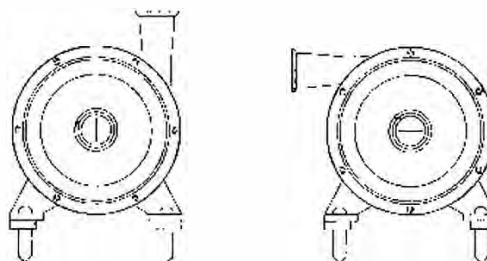


Mounting surface should be flat and level.

Legs are adjustable. Legs are not available on NEMA 300/IEC200 frames and above.



Piping should be supported to avoid strain on pump casing and front cover. Pump is designed for either vertical or horizontal discharge.



If pump is horizontal, mounting the discharge outlet on top is preferred.



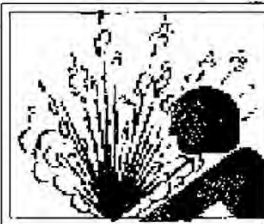
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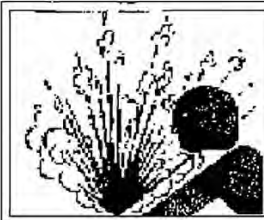
# INSTALLATION

## OPERATIONAL CHECK



### WARNING

**Never** run the pump with both the suction side and the pressure side blocked. This will cause serious damage to the pump.



### WARNING

**Always** check rotation without liquid in the pump.



### WARNING

**Do not** operate the pump without the seal guard in place.

Before starting, bump the motor to check if the motor fan is rotating clockwise when seen from the motor back. If the motor fan cannot be seen, look through the seal guard to view the stub shaft. (Bump means to momentarily apply power to the motor and then immediately remove power.)

Check the following:

- Flow direction is correct.
- Suction inlet and discharge outlet lines are hooked up correctly.
- All connections are tightened.

When practical, an eccentric tapered reducer should be used to prevent air pockets from forming in the lines or in the pump.

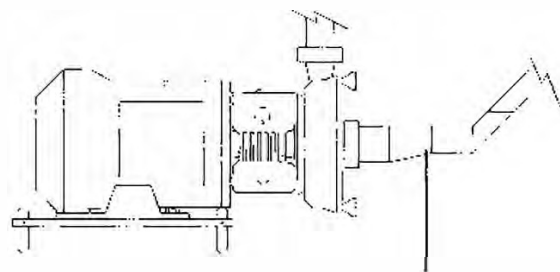
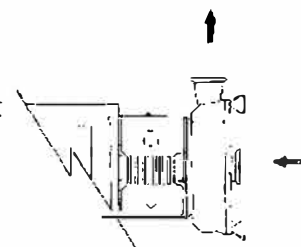
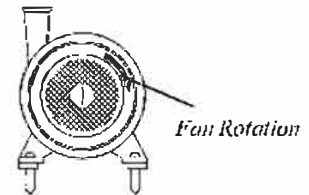
Pay attention to circumstances that could lead to pump cavitation:

- Low pressure in the suction line due to line restrictions.
- Air in the suction inlet line.
- Temperature of the fluid being pumped is too high.
- Pump is oversized for the fluid being pumped.

Ensure that there is a sufficient supply of fluid to be pumped.

Check the motor for vibration, unusual noises, or any other abnormalities.

**Motor Back**



**Eccentric Tapered Reducer**



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# MAINTENANCE

## CLEANING AND REPAIR



### WARNING

**Do Not** touch the pump when running the Clean-In-Place procedure.

If the pump is installed in a processing piping system designed for Clean-In-Place (CIP), pump disassembly is not required. A recommended CIP procedure is included in these instructions.

If CIP is not available, disassemble the pump according to the disassembly instructions provided.

Once disassembled, clean pump parts in an approved cleaning solution(s).

During disassembly and cleaning, inspect all parts for serviceability. Replace all parts which show signs of wear to prevent pump failure. Discard all replaced parts in accordance with local, state, or federal regulations.

The following instructions are for complete pump disassembly and assembly. Use these instructions as a guide when partial disassembly or assembly is required.

Disassembly/assembly of the pump for repair is identical to disassembly/assembly of the pump for cleaning. Removal of the pump adapter may not be required.

### RECOMMENDED CLEAN-IN-PLACE PROCEDURE



### WARNING

Lye and nitric acid are poisonous and can cause burns to skin.

#### Mixing Cleaning Solution

Only use clean, fresh water to mix nitric acid ( $\text{HNO}_3$ ) or caustic soda ( $\text{NaOH}$ ).

*Examples:*

1% caustic soda (by weight) at 150°F (70°C).

2.5 lbs (1 kg) caustic soda + 30 gal (100 l) water = cleaning solution

1 gal (3.81 l) 33% caustic soda and water + 45 gal (170 l) water = cleaning solution

0.5% nitric acid (by weight) at 150°F (70°C).

0.2 gal (0.751 l) 53% nitric acid and water + 28 gal (105 l) water = cleaning solution

Avoid excessive amounts of cleaning solution.

Adjust the solution flow to the pumping process.

For example, when pumping viscous fluids, increase the flow of cleaning solution.

Always rinse the pump as well as the suction inlet and discharge outlet lines well with clean fresh water after performing CIP.



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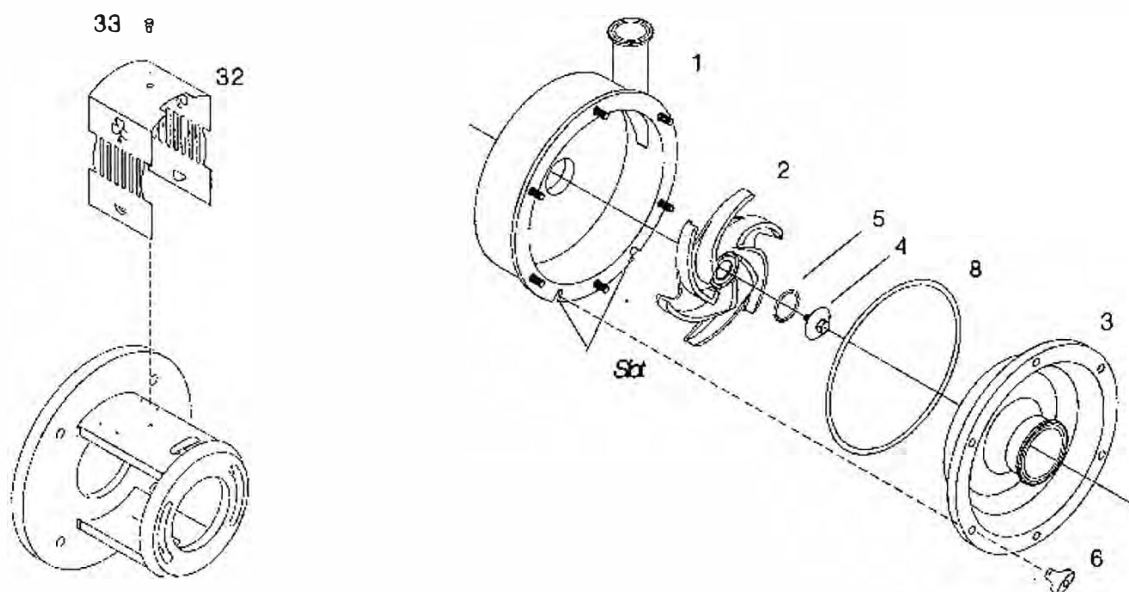
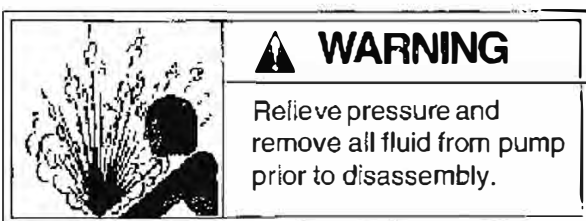
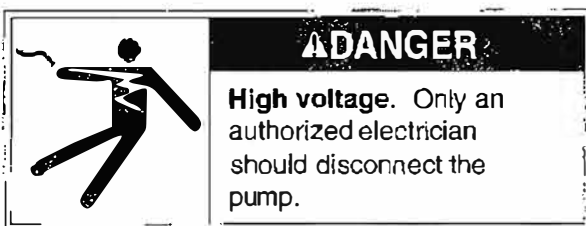
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# MAINTENANCE

## DISASSEMBLY

### REMOVING PUMP PARTS



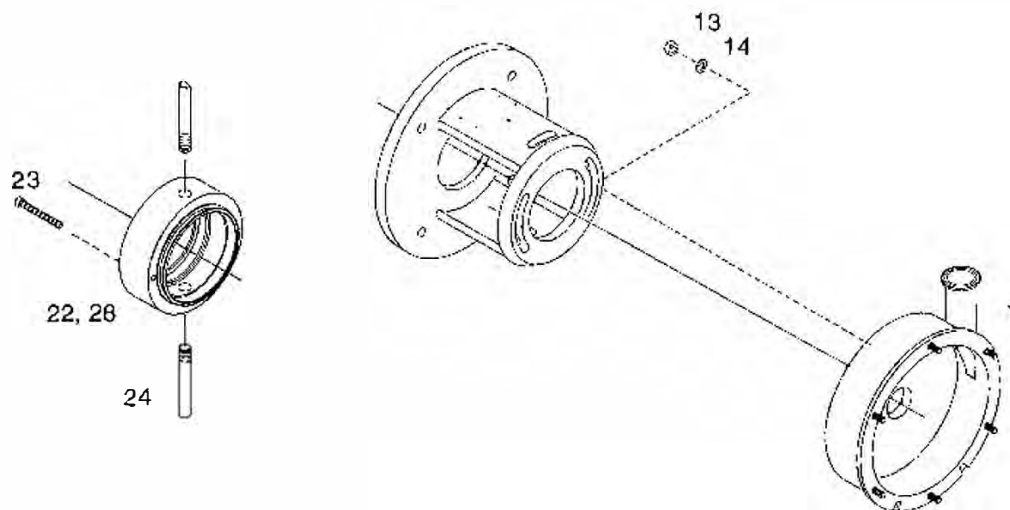
1. Remove seal guard (32) by removing screw (33).
2. Remove wingnuts (6) securing cover (3) to casing (1).
3. Remove front cover (3). Use the two slots in casing (1) and a screwdriver to pry cover off.
4. Remove impeller screw (4) from stub shaft.
5. Unscrew impeller (2) from stub shaft.
6. Remove o-ring (5) on impeller (2) and o-ring (8) on cover as required.



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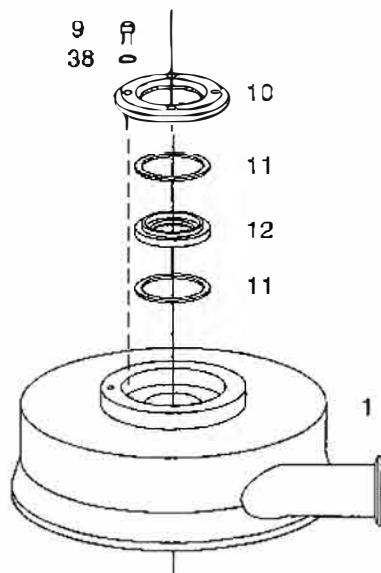


**If disassembling pump with stuffing box and flushing pipes, remove as follows:**

1. Remove flushing pipes (24) from stuffing box (22 or 28).
2. Remove casing (1) by removing nuts (13) and washers (14).
3. Remove stuffing box (22 or 28) from casing by removing two screws (23) securing stuffing box to casing.

## STATIONARY SEAL DISASSEMBLY

Disassemble casing as follows:



1. Remove seal gland (10) on back of casing by removing allen screws (9) and washers (38).
2. Remove rear gasket (11), stationary seal (12), and front gasket (11) as required. NOTE: A rear elastomer gasket is required when using a front PTFE gasket.



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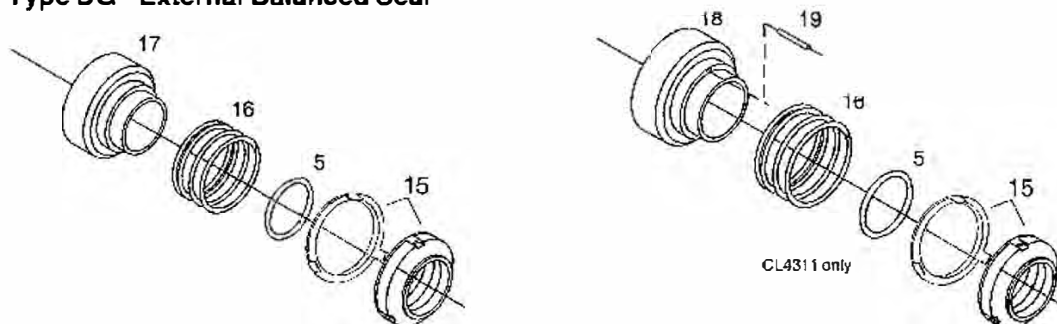


# MAINTENANCE

## ROTATING SEALS DISASSEMBLY

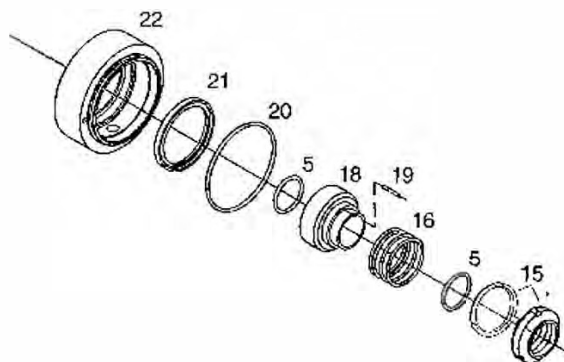
1. Remove and disassemble seals according to the appropriate configuration shown and described.

### Type DG - External Balanced Seal



2. Remove the rotating seal (15), o-ring (5), spring (16) and drive collar (17) from stub shaft.  
CL4311 and CL6410: Remove 15, 5, 16, and 18 from the stub shaft. Remove pin (19) as needed.

### Type FG - Water Cooled Single Seal



3. Remove rotating seal (15), o-ring (5), spring (16), and stainless steel drive collar (18) from stub shaft.
4. Remove pin (19) from stainless steel drive collar as required.
5. Remove o-ring (5) from stainless steel drive collar.
6. Remove o-ring (20) from stuffing box (22).
7. Remove single flush lip seal (21) from stuffing box (22).

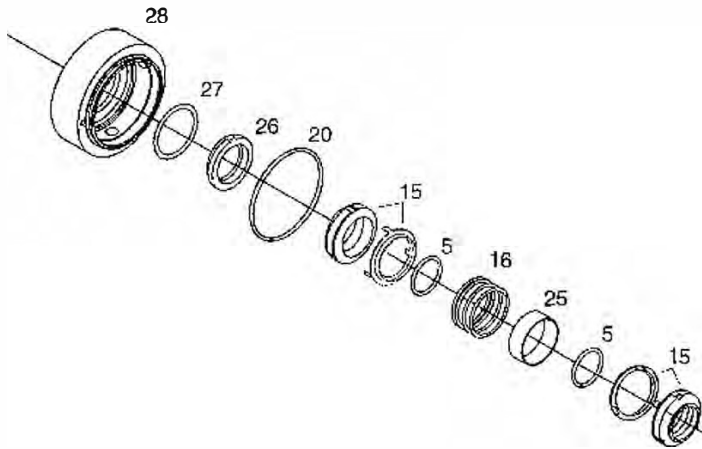


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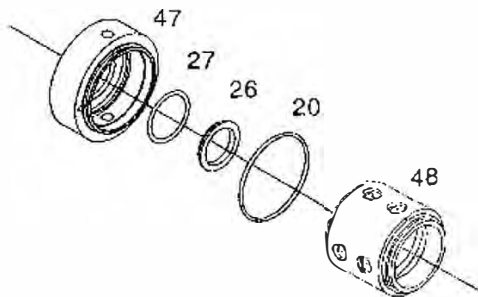
# MAINTENANCE

## Type EG - Water Cooled Balanced Double Seal



1. Remove front rotating seal (15), o-ring (5), spacing ring (25) spring (16), o-ring (5), and rear rotating seal (15) from stub shaft.
2. Remove rear stationary seal (26) o-ring (27), and o-ring (20) from stuffing box (28).

## John Crane Double 8 seal

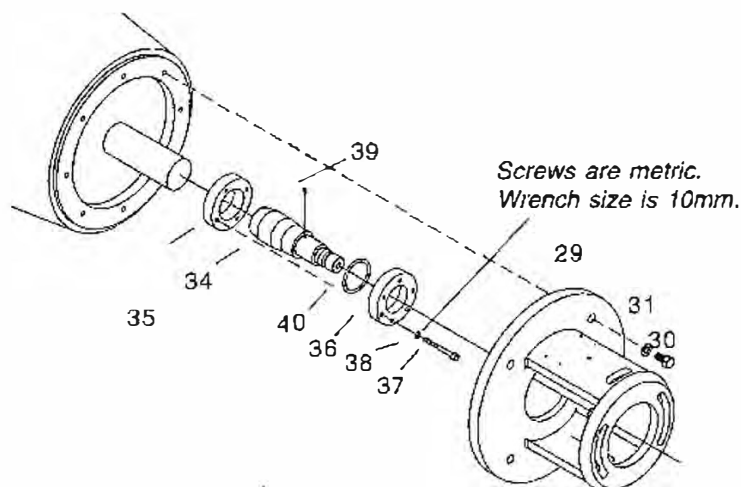


1. Remove John Crane seal (48) from the stub shaft.
2. Remove rear stationary seal (26) o-ring (27), and o-ring (20) from stuffing box (47).

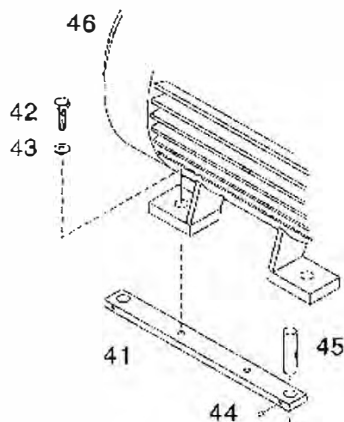
# MAINTENANCE

## PUMP PARTS DISASSEMBLY

After the seals are removed and disassembled, remove the following:



1. Remove pump adapter (29) from motor by removing hex head cap screws (30) and washers (31).
2. Remove compression ring (36), threaded compression ring (35) and retaining ring (40) (used on 1.5 HP and 2 HP motors only) by removing screws (37) and washers (38). Note that hex head screws are metric (wrench size is 10mm).
3. Remove pin (39) from stub shaft (34) as required.
4. Remove stub shaft from motor shaft as required.



1. Remove leg brackets (41) from motor (46) by removing hex head cap screws (42) and washers (43).
2. Remove adjustable legs (45) from leg brackets (41) by removing set screws (44).



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# MAINTENANCE

## INSPECTION

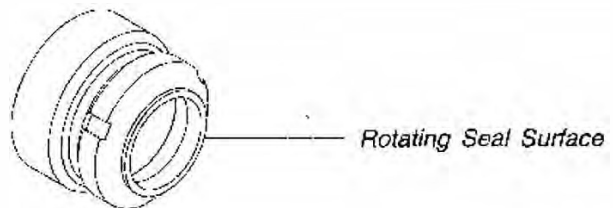
- Inspect o-rings, seals and gaskets for reuse. Worn o-rings, seals and gaskets should be replaced.
- Inspect seal faces for scoring or cracks. Replace any seal faces that are damaged.
- Inspect stub shaft and other metal parts for wear or damage.
- Inspect impeller for damage from cavitation. Cavitation damage appears as pitting on the impeller surfaces.

## ASSEMBLY

### ⚠ CAUTION

Use only Tri-Clover spare parts when replacing any component of the CL pump. Use of non-Tri-Clover parts could result in pump damage or malfunction.

1. Before assembly, lubricate o-rings and gaskets with a food grade silicone spray (Tri-Clover part number L-1011B) or equivalent.
2. It is important that the surface of the rotating seal be wiped clean of any foreign matter (dirt, dust, oil from fingers, etc.) prior to assembly. Clean surface in accordance with good shop practice.

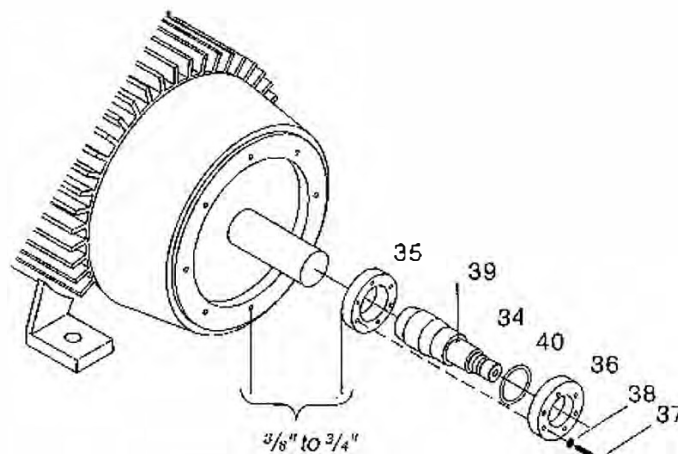


### LEG AND BRACKET ASSEMBLY

Assemble frame parts in reverse order of disassembly. (See page 14).

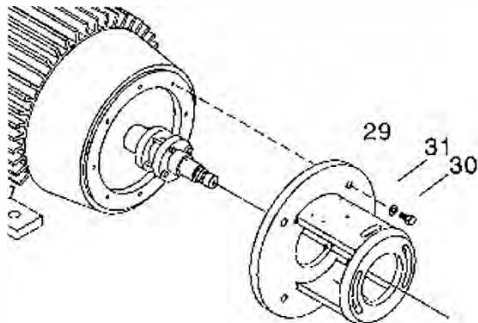
### PUMP PARTS ASSEMBLY

1. Assemble compression ring (36), retaining ring (40) (used on 1.5 and 2 HP motors only), and threaded compression ring (35) onto stub shaft (34).
2. Place hex head screws (37) and washers (38) in compression ring. Start, but do not tighten screws.
3. Place pin (39) in stub shaft as required. (Pin is not used with the Type EG and John Crane Double 8 Seal).

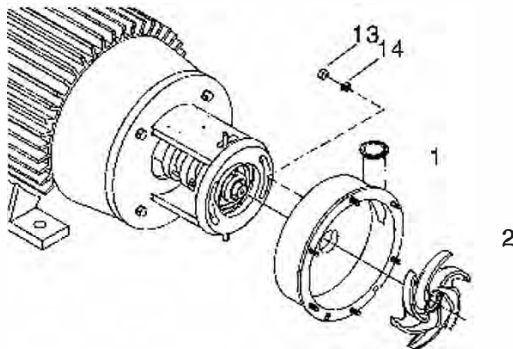


# MAINTENANCE

4. Place stub shaft with parts assembled on motor shaft.
5. Stub shaft should be placed so after the pump adapter is installed, the distance between the end of the stub shaft and the motor flange on the pump adapter is between  $\frac{3}{8}$ " and  $\frac{3}{4}$ ".
6. Tighten hex head cap screws evenly but not more than to allow the stub shaft to be moved by gently tapping with a rubber or plastic tipped mallet. This will allow for possible adjustment during setting of impeller clearance.



7. Assemble pump adapter (29) to motor with hex head cap screws (30) and washers (31). Tighten hex head cap screws until tight.



8. Assemble casing (1) to pump adapter with nuts (13) and washers (14). **Do not assemble stationary seal components into casing. These parts should be assembled into casing after the impeller clearance has been adjusted. Perform impeller clearance adjustment without seals to prevent any damage to the seals.**
9. Screw impeller (2) to stub shaft.

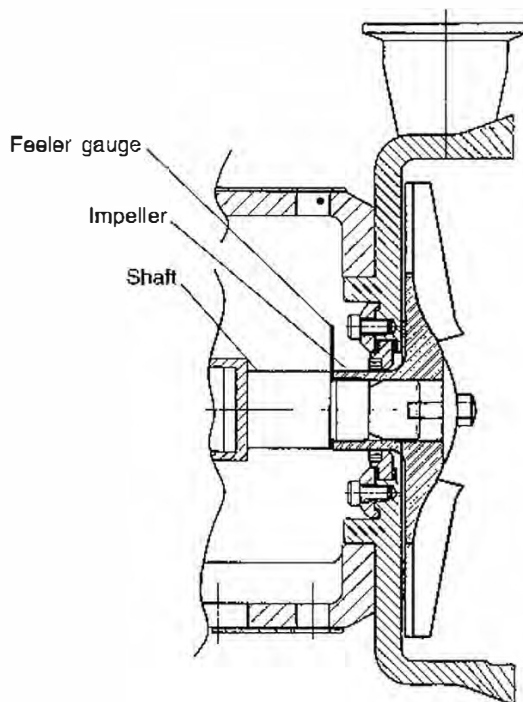


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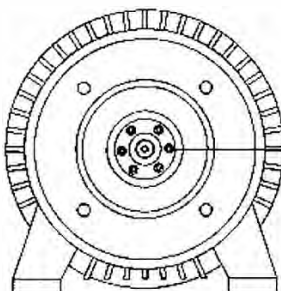
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# MAINTENANCE

## SETTING IMPELLER CLEARANCES WITHOUT SEALS



1. Remove the front cover, impeller screw and impeller. Remove the casing, rotating seals, drive collar and spring. If applicable, remove the flush housing.
2. Loosen stubshaft hex head screws. Assemble pump as shown above.
3. Loosen impeller a few turns.
4. Place a .018" thick feeler gauge between impeller hub and shaft shoulder as shown.
5. Tighten impeller against the feeler gauge and shaft shoulder.
6. Assemble front cover, slide shaft/impeller forward until contact is made with the front cover.
7. Tighten stubshaft bolts (37) to 132 lb-in or 11 lb-ft (15Nm). Screws are metric. Wrench size is 10mm.
8. Remove feeler gauge and tighten impeller. Impeller will now be .018" from front cover.



*Torque 6 compression ring screws to 132 lb-in or 11 lb-ft (15Nm). Screws are metric. Wrench size is 10mm.*



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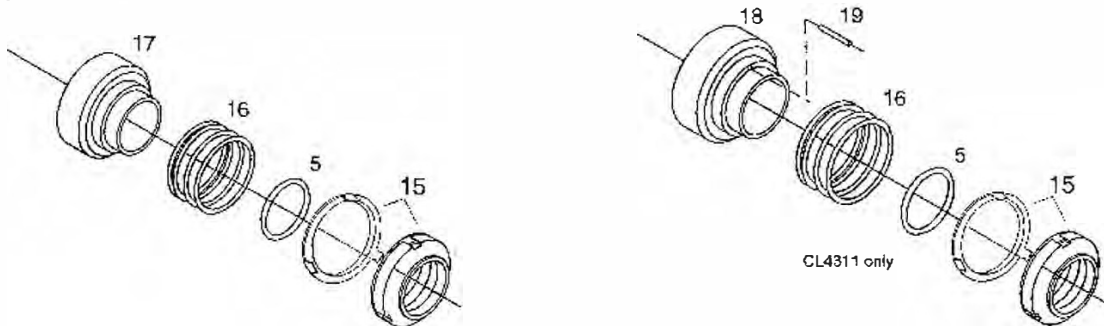
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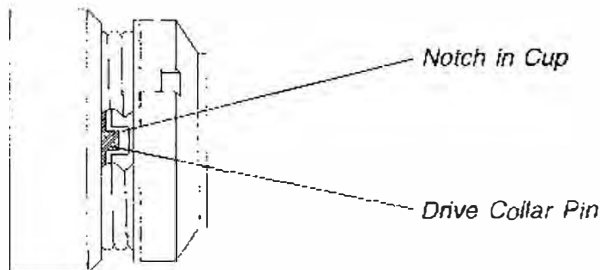
# MAINTENANCE

## ROTATING SEALS AND PUMP CASING ASSEMBLY

### Type DG - External Balanced Seal

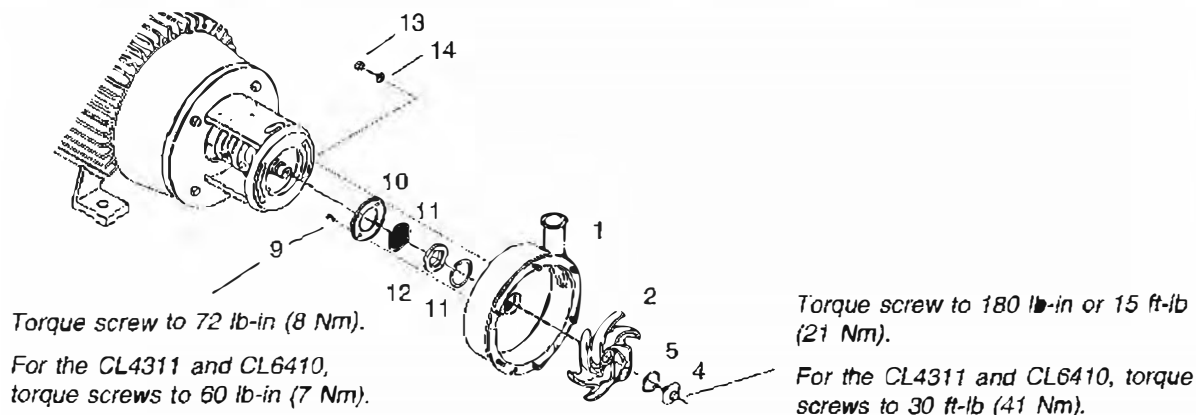


1. If assembling DG type seals, install o-ring (5) into rotating seal (15). Then assemble the rotating seal (15) and spring (16) onto the drive collar (17).  
For the CL4311 pump, insert the pin (19) into the drive collar, and install the o-ring (5) into the rotating seal (15). Then assemble the rotating seal (15) and spring (16) onto the drive collar (18).
2. Place the assembled seal on the stub shaft. The drive collar notch must align with the pin on the stub shaft.



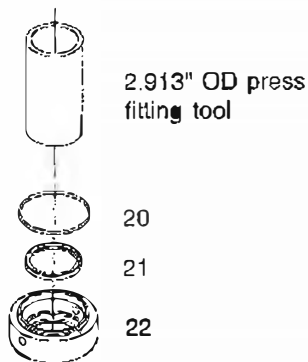
**Ensure the drive collar pin enters the notch on the rotating seal cup when the spring is compressed.**

# MAINTENANCE



3. Install front gasket (11), stationary seal (12), rear gasket (11) and seal gland (10) into casing (1) using allen screws (9). Torque the screw to 72 lb-in (8 Nm). For the CL4311 and the CL6410, torque the screw to 60 lb-in (7 Nm). NOTE: A rear elastomer gasket is required when using a front PTFE gasket.
4. Install casing (1) to pump adapter with nuts (13) and washers (14). Tighten nuts and washers.
5. Screw impeller (2) to stub shaft.
6. Install o-ring (5) in impeller.
7. Install impeller screw (4) on stub shaft. Torque impeller screw to 180 lb-in or 15 lb-ft (21Nm). For the CL4311 and CL6410, torque the impeller screw to 30 ft-lb (41Nm).

## Type FG - Water Cooled Single Seal



1. Using a proper press fitting tool, (OD should be 2.913"), install single flush lip seal (21) into stuffing box (22) with beaded edge up. **Make certain the lip seal is completely seated in the gland in the stuffing box.**

Note: It is not necessary to use a press fitting tool to install the lip seal on the 4311 and 6410 pumps. Install the lip seal beaded edge up, making certain the seal is completely seated in the gland in the stuffing box.

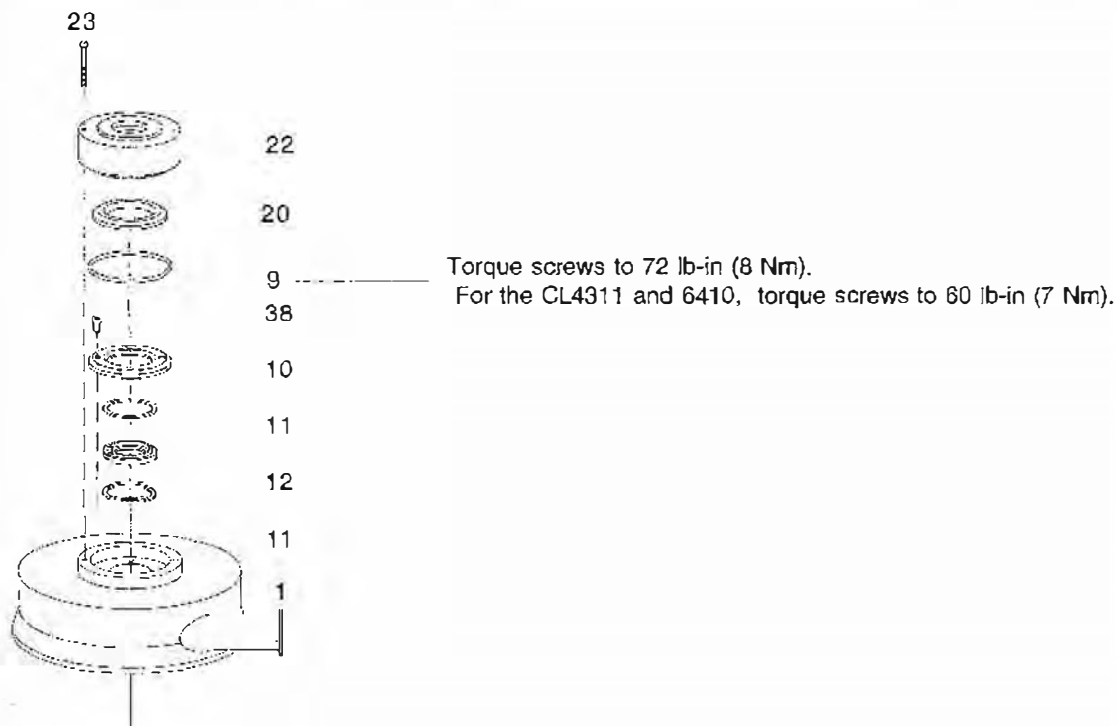
2. Install o-ring (20) into stuffing box (22).



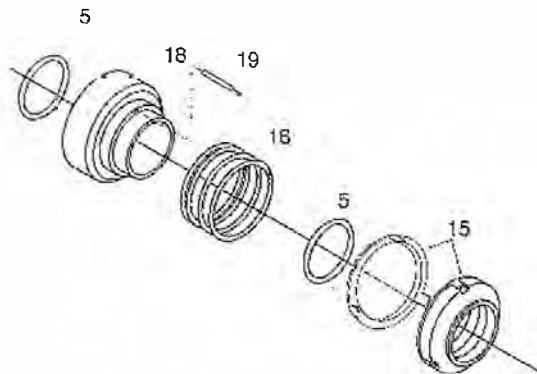
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# MAINTENANCE



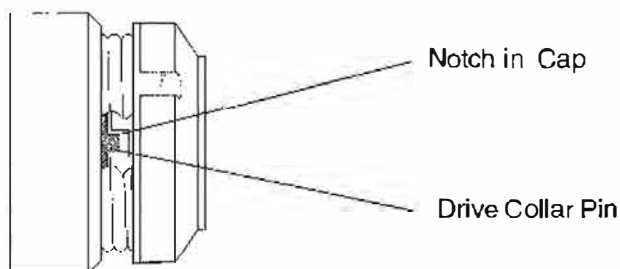
3. Install front gasket (11), stationary seal (12), rear gasket (11) and seal gland (10) into casing (1) using Allen screws (9) and washers (38). Torque the screws to 72 lb-in (8 Nm). For the CL4311 and the CL6410, torque the screws to 60 lb-in (7 Nm). NOTE: A rear elastomer gasket is required when using a front PTFE gasket.
4. Install two screws (23) securing stuffing box (22) to casing.
5. Install pin (19) into stainless steel drive collar (18) as required.



6. Install o-ring (5) into stainless steel drive collar (18).
7. Install o-ring (5) into rotating seal (15).
8. Install spring (16) onto rotating seal (15) and onto stainless steel drive collar (18).

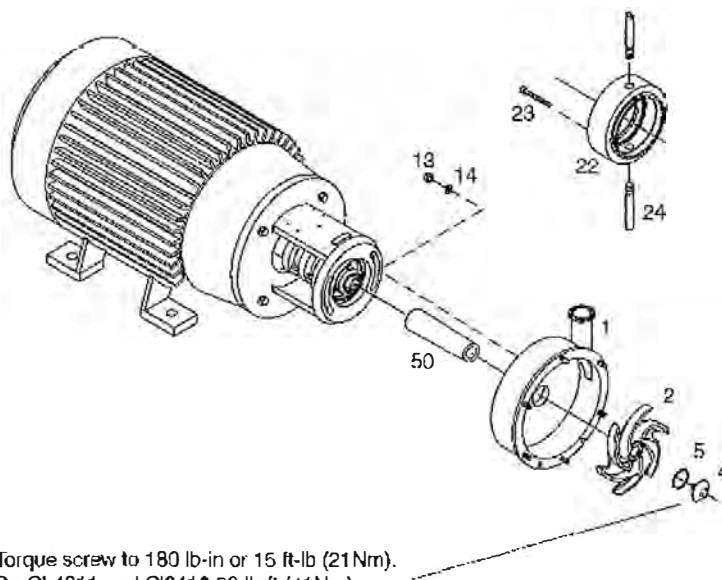


# MAINTENANCE



9. Install the stainless steel drive collar (18) with the spring (16) and rotating seal (15) onto the stub shaft.

**Ensure the drive collar pin enters the notch on the rotating seal cup when the spring is compressed.**



Torque screw to 180 lb-in or 15 ft-lb (21Nm).  
On CL4311 and CL6410 30 lb-ft (41Nm).

10. Slide the seal installation tool (50) over the stub shaft, tapered end out, until it abuts with the shoulder of the stub shaft. (This tool can also be used for disassembly to protect the seals.)
11. Check to make certain lip seal is still seated correctly. Slide casing (1) with the assembled seals over installation tool and onto the stub shaft.
12. Remove seal installation tool (50).
13. Install casing (1) to pump adapter with nuts (13) and washers (14). Tighten nuts and washers.
14. Screw impeller (2) to stub shaft.
15. Install o-ring (5) in impeller.
16. Install impeller screw (4) on stub shaft. Torque impeller screw to 180 lb-in or 15 lb-ft (21 Nm). For the CL4311 and the CL6410, torque the impeller screw to 30 lb-ft (41 Nm).
17. Install flushing pipes (24) to stuffing box.

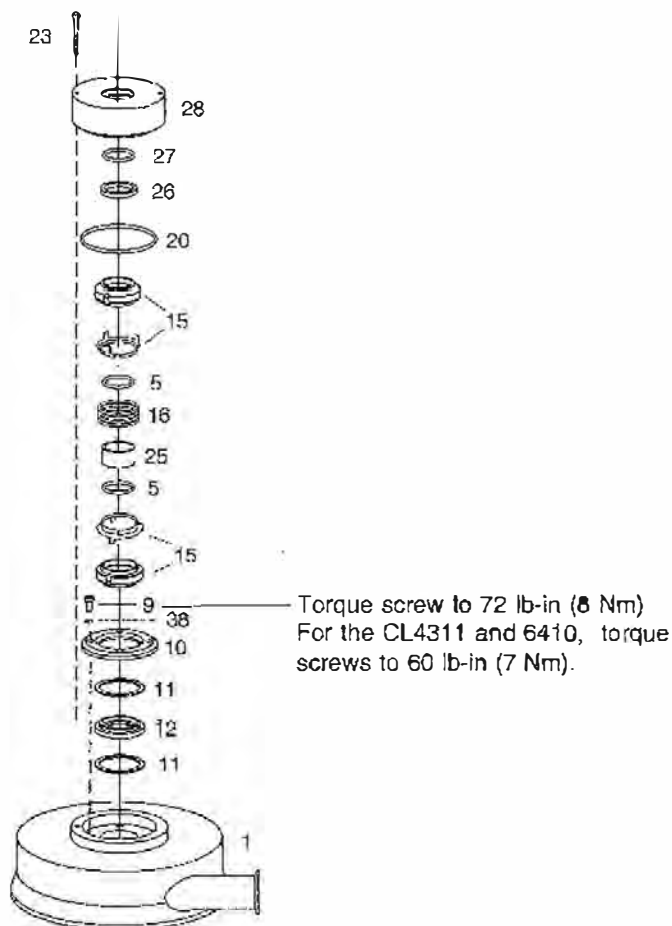


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# MAINTENANCE

## Type EG - Water Cooled Balanced Double Seal



1. Install front gasket (11), stationary seal (12), rear gasket (11) and seal gland (10) into casing (1) using Allen screws (9) and washers (38). Torque screw (9) to 72 lb-in (8 Nm). For CL4311 and CL6410, torque screw to 60 lb-in (7 Nm). (A rear elastomer gasket is required when using a front PTFE gasket.)
2. Install o-ring (27) onto rear stationary seal (26) and place stationary seal (o-ring first) into bottom of the stuffing box (28). Ensure that the rear stationary seal is seated properly in the stuffing box by pressing down evenly on the seal until it is flush with the inside of the stuffing box.
3. Lubricate the stuffing box o-ring (20), and place it around the outside edge of the stuffing box (28).
4. Install the o-rings (5) into the two rotating seals (15).

**Note:** Do not lubricate these o-rings with silicone spray. This will cause the seal to slip and rotate independently on the shaft. Instead, use soapy water or some other temporary lubricant suitable to your application. This will allow the o-rings to slide easily over the shaft, without permanently lubricating them.

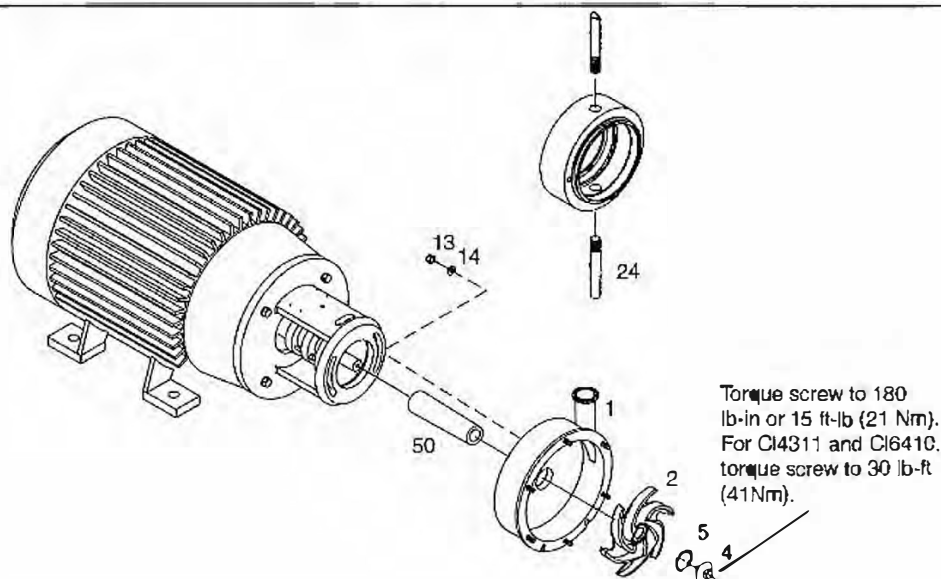
5. Install spring (16) onto the seal cup (with seal attached) (15). Then place seal, face down and spring up, onto the stationary seal (12).
6. Insert the spacing ring (25) inside the spring (16). Make certain spacing ring is seated flat against o-ring.



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# MAINTENANCE



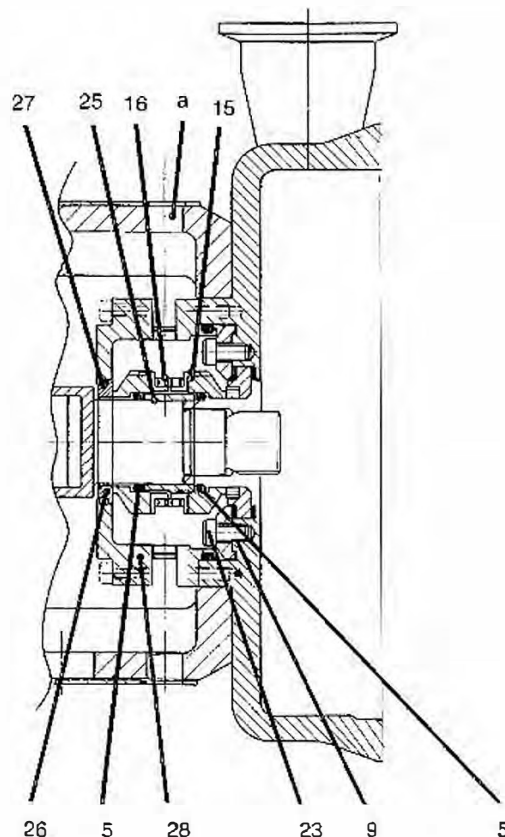
7. Install the other seal cup, with seal attached (15) on the spring.
8. Place the stuffing box (28) over rotating seal assembly, and secure it to the casing using the two screws (23).

**Note:** With the stuffing box secured, reach inside the opening and ensure that the rotating seal assembly is centered in the stuffing box. If not, move the seal until it is centered with the stuffing box opening.

9. Slide the Seal Installation Tool (50) over the stub shaft, tapered end out, until it abuts with the shoulder of the stub shaft. This tool prevents the rear stationary seal face from jarring against the stub shaft during installation and removal.
10. Slide casing (1) with assembled seals over the installation tool (50) and onto the stub shaft and secure it with nuts (13) and washers (14).
11. Remove the Seal Installation Tool (50).
12. Before installing the impeller, inspect the o-ring (5) on the forward stationary seal to see that it did not slide out of place during installation. Rotate the rotating seal assembly to ensure that it rotates with the stub shaft.

**Note:** You can see the rotating seal assembly rotate by looking down the slot in the adapter into the holes for the flush pipes.

13. Lubricate the hub of the impeller (2) with soapy water or some other temporary lubricant, and screw it onto the stub shaft. Prevent the stub shaft from turning by wedging a screwdriver between the stub shaft and the screws on the compression rings. When screwing the impeller in, you'll feel some resistance from the o-ring, but keep turning until you can feel the hub contact the shoulder of the stub shaft.



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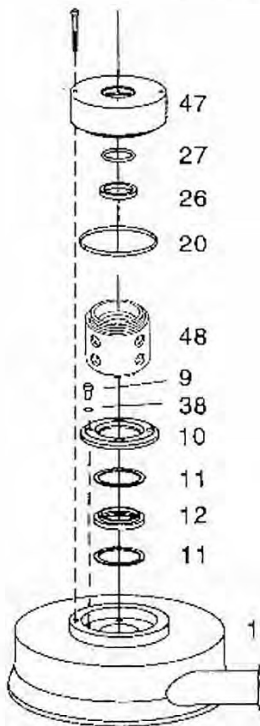


# MAINTENANCE

14. Install o-ring (5) in impeller.
15. Install impeller screw (4) on stub shaft. Torque impeller screw to 180 lb-in or 15 lb-ft (21 Nm). For the CL4311 and CL6410, torque the impeller screw to 30 lb-ft (41 Nm).
16. Install flushing pipes (24) to stuffing box.

At this point, you may want to run water through the flushing pipes at normal pressure to ensure that the seals don't leak. Leakage may indicate damage to the stationary seal or incorrect rotating seal installation.

## John Crane Double 8 Seal



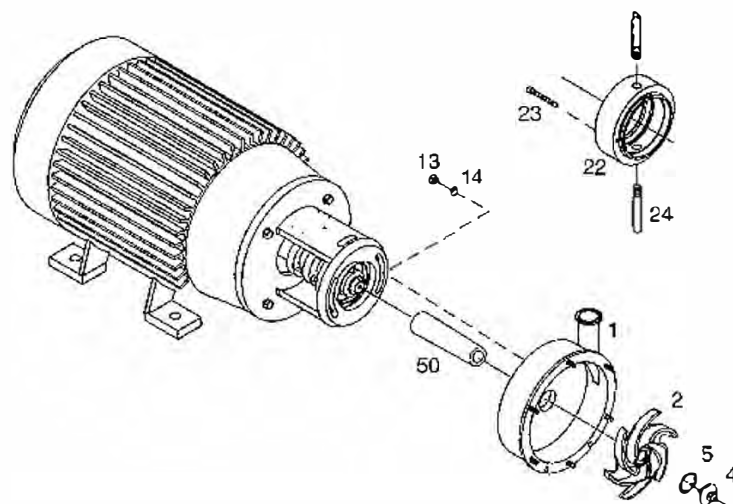
1. Install front gasket (11), stationary seal (12), rear gasket (11) and seal gland (10) into casing (1) using Allen screws (9) and washers (38). NOTE: A rear elastomer gasket is required when using a front PTFE gasket.
2. Install o-ring (27), rear stationary seal (26) and o-ring (20) into stuffing box (47).
3. Install John Crane Double 8 Seal (48) onto casing stationary seal.
4. Install two screws (23) to secure stuffing box to casing.



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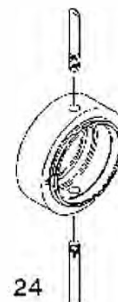
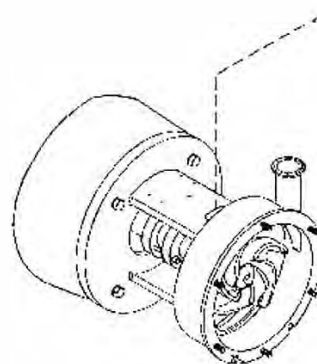
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# MAINTENANCE



Torque screw to 180 lb-in or 15 ft-lb (21Nm).  
On CL4311 and CL6410 30 lb-ft (41Nm).

5. Slide casing (1) with the assembled seals onto the stub shaft. Use caution when sliding assembled seals and stuffing box onto stub shaft.
6. Install casing (1) to pump adapter with nuts (13) and washers (14). Tighten nuts and washers.
7. Screw impeller (2) to stub shaft.
8. Tighten the set screws on the John Crane seal to keep it from rotating independently on the shaft. To do this:
  - a. Rotate the seal until you can see a set screw when you are looking through the top flushing pipe hole.
  - b. Using a  $\frac{5}{16}$ " Allen wrench, tighten the set screw through the flushing pipe hole.
  - c. Repeat this procedure until all four screws have been tightened.
9. Install o-ring (5) in impeller.
10. Install impeller screw (4) on stub shaft. Note that impeller screw is metric (wrench size is 13mm). Torque impeller screw to 180 lb-in or 15 lb-ft (21 Nm).
11. Install flushing pipes (24) to stuffing box.

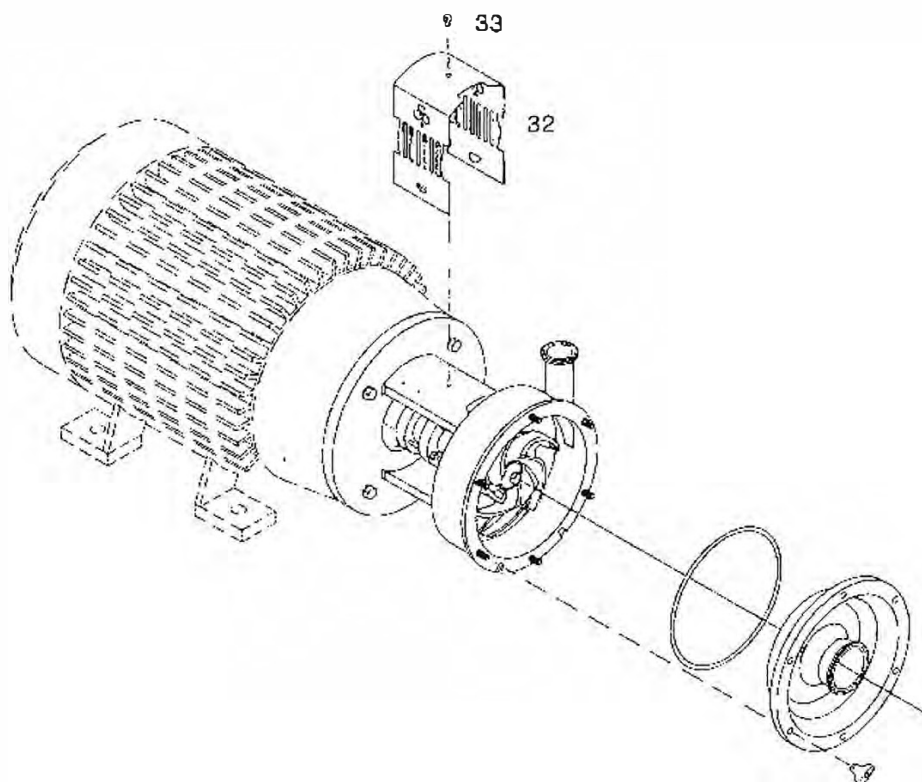


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# MAINTENANCE

## FINAL ASSEMBLY



1. Install O-ring (8) onto cover (3).
2. Install cover (3) onto casing (1) with wingnuts (6).
3. Install seal guard (32) using screw (33).



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# TROUBLESHOOTING

## TROUBLESHOOTING

The troubleshooting chart applies to problems which may arise during pump operation. The chart assumes that the pump is correctly installed and is the correct size for the application.

Contact Tri-Clover if assistance is required.

Refer to the motor manufacturer's operating and maintenance manual for motor troubleshooting information.

PROBLEM	PROBABLE CAUSE	REMEDY
1. Motor and pump do not run.	a. No power at power panel.	a. Ensure power is available at power source.
2. Pump not discharging.	a. Motor connections incorrect/loose. b. Obstruction in discharge piping. c. Closed throttle or check valve.	a. Check power leads to motor. b. Remove obstruction. c. Ensure all valves are open.
3. Pump is rotating in the wrong direction.	a. Motor wired backwards.	a. Verify motor is wired according to manufacturer's instructions.
4. Pump is not discharging at rated capacity.	a. Motor wired incorrectly. b. Bent impeller. c. Throttle or check valve partially closed. d. Obstruction in discharge piping. e. Pump cavitation. f. Impeller clearance incorrect. g. Solid particles in pump.	a. Verify motor is wired according to manufacturer's instructions. b. Remove cover and check impeller against a known straightedge. c. Ensure all valves are fully open. d. Ensure no obstruction in discharge piping exists. e. See cavitation causes in the INSTALLATION section of these instructions. f. Check impeller clearance. g. Remove cover and check for particles in the pump.



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# TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	REMEDY
5. Pump is noisy.	<ul style="list-style-type: none"> <li>a. Bent impeller.</li> <li>b. Motor is rotating in the wrong direction.</li> <li>c. Impeller clearance is not within tolerance.</li> <li>d. Pump cavitation.</li> <li>e. Solid particles in pump.</li> </ul>	<ul style="list-style-type: none"> <li>a. Remove cover and check impeller against a known straightedge.</li> <li>b. Verify motor is wired according to manufacturer's instructions.</li> <li>c. Remove casing and verify clearance between impeller rear and casing is correct.</li> <li>d. See cavitation causes in the INSTALLATION section of these instructions.</li> <li>e. Remove cover and check for particles in the pump.</li> </ul>
6. Fluid leaks at sealing surfaces.	<ul style="list-style-type: none"> <li>a. Worn seals or damaged o-rings.</li> <li>b. Not enough compression on rotating seal.</li> </ul>	<ul style="list-style-type: none"> <li>a. Disassemble pump according to the DISASSEMBLY sequence in these instructions. Replace all worn seals or damaged o-rings.</li> <li>b. Disassemble pump according to the DISASSEMBLY sequence in these instructions. Replace spring.</li> </ul>



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# PARTS LIST

## ORDERING INFORMATION

All orders for repair parts must contain the following:

1. Complete model number (located on nameplate).
2. Pump serial number (located on nameplate).
3. Description and part key number from the parts list.

The exploded view and parts key facilitate ordering repair parts from Tri-Clover. All parts for the CL pump are keyed to the parts list.

KEY #	DESCRIPTION	QTY	KEY #	DESCRIPTION	QTY
1	Casing	1	25	Spacing Ring	1
2	Impeller	1	26	Stationary Seal, Rear	1
3	Cover	1	27	O-ring, Stationary Seal	1
4	Impeller Screw	1	28	Stuffing Box (Type EG)	1
5	O-ring	1, 2 or 3	29	Adapter	1
6	Wingnut	6 or 8	30	Screw, Motor	4
7	Stud, Casing / Cover	6 or 8	31	Washer, Motor	4
8	Cover O-ring	1	32	Seal Guard	1
9	Screw, Seal Gland	4	33	Screw, Seal Guard	1
10	Seal Gland	1	34	Stub Shaft	1
11	Gasket	2	35	Compression Ring, Threaded	1
12	Stationary Seal	1	36	Compression Ring	1
13	Nut, Casing / Adapter	2 or 4	37	Screw, Compression Ring	6
14	Washer, Casing / Adapter	2 or 4	38	Washer, Compression Ring, Seal Gland	6 4
15	Rotating Seal	1 or 2	39	Pin, Stub Shaft	1
16	Spring	1	40	Retaining Ring, Stub Shaft	1
17	Drive Collar	1	41	Leg Bracket	2
18	Drive Collar, Stainless Steel	1	42	Screw, Leg Bracket	4
19	Pin, Drive Collar	1	43	Washer, Leg Bracket	4
20	O-ring, Stuffing Box	1	44	Set Screw, Adjustable Leg	4
21	Single Flush Lip Seal	1	45	Adjustable Leg	4
22	Stuffing Box (Type FG)	1	46	Motor	1
23	Screw, Stuffing Box	2	47	Stuffing Box (John Crane)	1
24	Flush Pipe	2	48	John Crane Double 8 Seal	1

**O-ring requirements:**

- Impeller - 1 o-ring (CL4311, 6410 - use key #49, 1 o-ring)
- Type DG Seal - 1 o-ring
- Type FG Seal - 2 o-rings
- Type EG Seal - 2 o-rings

EG Seal requires two Rotating Seals.

CL4311 and CL6410 require 8 wing nuts and studs.

CL4311 and CL6410 require 4 nuts and 4 washers.

CL4311 and CL6410 do not require a washer for the seal gland.

CL4311 pumps with frame size 320 and larger use motors with special Duplex thrust bearings. Contact your local Tri-Clover distributor or Tri-Clover for more information.

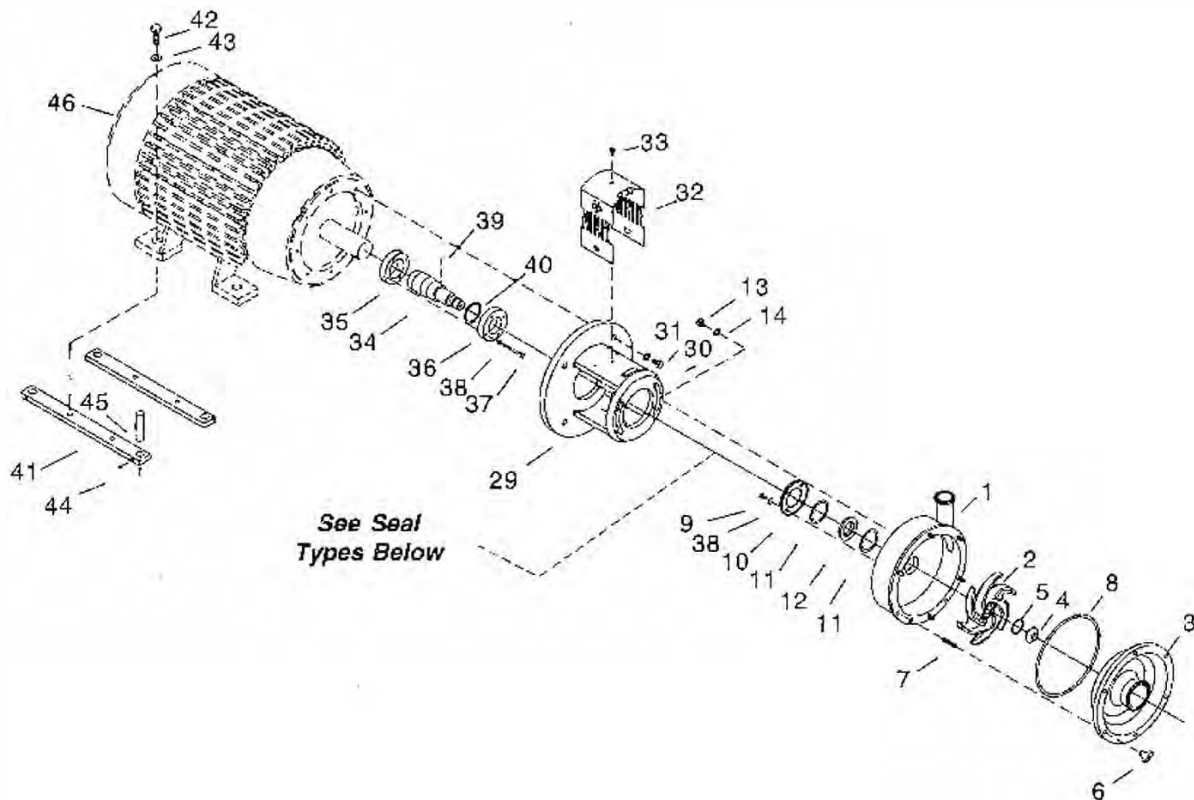
Required on 1½ and 2 horsepower motors only.



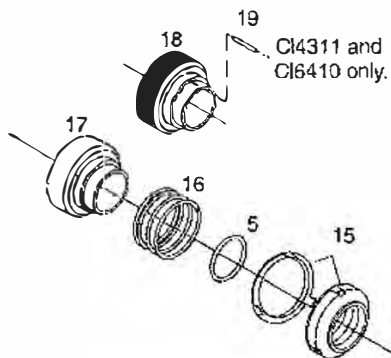
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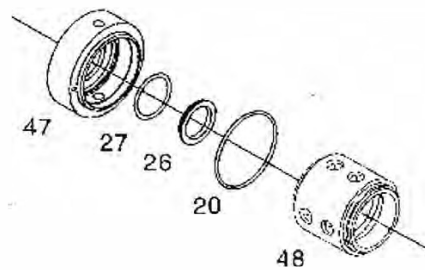
# EXPLODED VIEW FOR ALL CL SERIES PUMPS



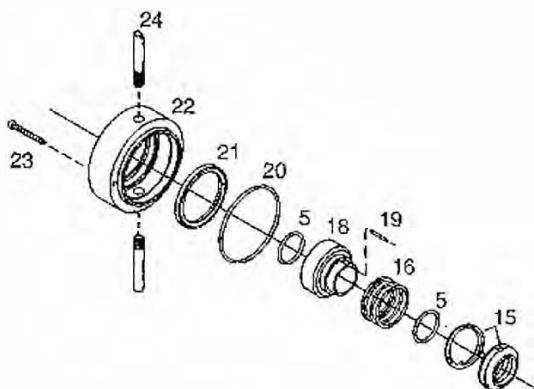
## TYPE DG - EXTERNAL BALANCED SEAL



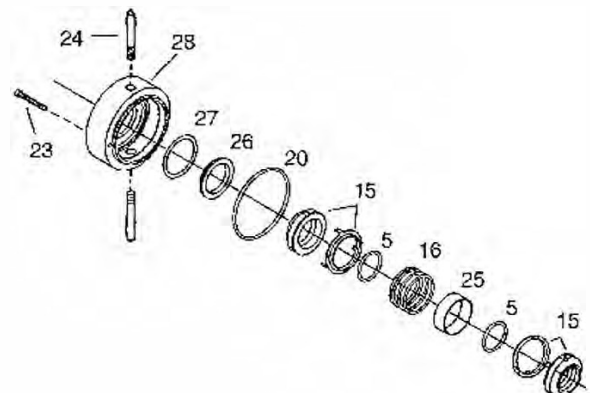
## JOHN CRANE DOUBLE 8 SEAL



## TYPE FG - WATER COOLED SINGLE SEAL



## TYPE EG - WATER COOLED BALANCED DOUBLE SEAL



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# PARTS LIST

## CROSS SECTIONAL VIEW

KEY #	DESCRIPTION	QTY	KEY #	DESCRIPTION	QTY
1	Casing	1	25	Spacing Ring	1
2	Impeller	1	26	Stationary Seal, Rear	1
3	Cover	1	27	O-ring, Stationary Seal	1
4	Impeller Screw	1	28	Stuffing Box (Type EG)	1
5	O-ring	1, 2 or 3	29	Adapter	1
6	Wingnut	6 or 8	30	Screw, Motor	4
7	Stud, Casing / Cover	6 or 8	31	Washer, Motor	4
8	Cover O-ring	1	32	Seal Guard	1
9	Screw, Seal Gland	4	33	Screw, Seal Guard	1
10	Seal Gland	1	34	Stub Shaft	1
11	Gasket	2	35	Compression Ring, Threaded	1
12	Stationary Seal	1	36	Compression Ring	1
13	Nut, Casing / Adapter	2 or 4	37	Screw, Compression Ring	6
14	Washer, Casing / Adapter	2 or 4	38	Washer, Compression Ring, Seal Gland	6
15	Rotating Seal	1 or 2			4
16	Spring	1	39	Pin, Stub Shaft	1
17	Drive Collar	1	40	Retaining Ring, Stub Shaft	1
18	Drive Collar, Stainless Steel	1	41	Leg Bracket	2
19	Pin, Drive Collar	1	42	Screw, Leg Bracket	4
20	O-ring, Stuffing Box	1	43	Washer, Leg Bracket	4
21	Single Flush Lip Seal	1	44	Set Screw, Adjustable Leg	4
22	Stuffing Box (Type FG)	1	45	Adjustable Leg	4
23	Screw, Stuffing Box	2	46	Motor	1
24	Flush Pipe	2	47	Stuffing Box (John Crane)	1
			48	John Crane Double 8 Seal	1

1. O-ring requirements:  
 Impeller - 1 o-ring (CL4311, 6410 - use key #49, 1 o-ring)  
 Type DG Seal - 1 o-ring  
 Type FG Seal - 2 o-rings  
 Type EG Seal - 2 o-rings
2. EG Seal requires two Rotating Seals.
3. CL4311 and CL6410 require 8 wing nuts and studs.
4. CL4311 and CL6410 require 4 nuts and 4 washers.
5. CL4311 and CL6410 do not require a washer for the seal gland.

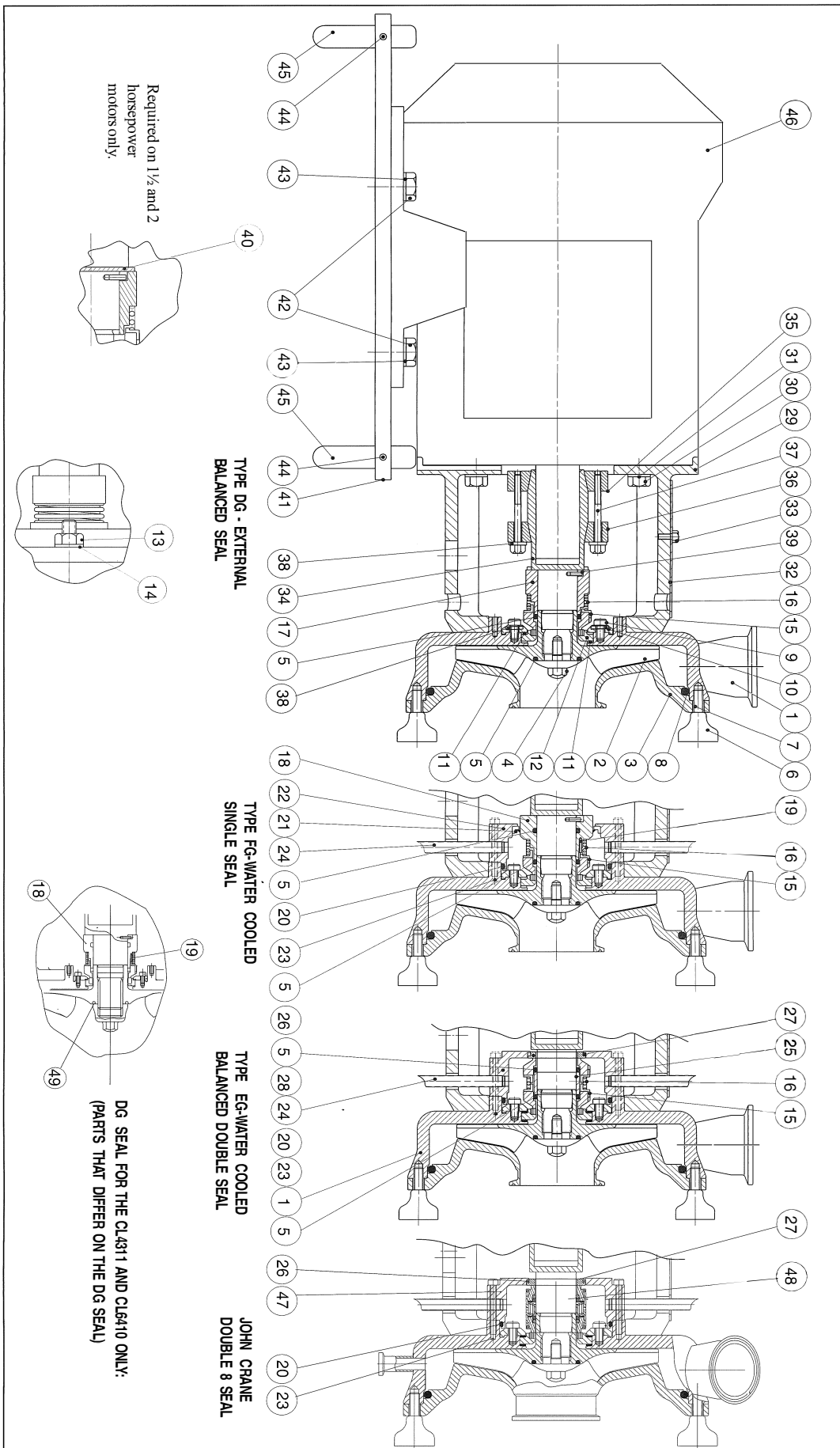
6. CL4311 pumps with frame size 320 and larger use motors with special Duplex thrust bearings. Contact your local Tri-Clover distributor or Tri-Clover for more information.
7. Required on 1½ and 2 horsepower motors only.



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# PARTS LIST

## CL PUMP REPLACEMENT PARTS

Key No.	Description	CL2264	CL2265	CL2284	CL3285	CL3295
		Part Number	Part Number	Part Number	Part Number	Part Number
1*	Casing - Tri-Clamp, Industrial	9612-7091-15	9612-7093-15	9612-7095-15	9612-7094-15	9612-7096-15
1*	Casing - Tri-Clamp, Sanitary	9612-7091-04	9612-7093-04	9612-7095-04	9612-7094-04	9612-7096-04
1*	Casing - Tri-Clamp, Sanitary Plus	9612-7091-01	9612-7093-01	9612-7095-01	9612-7094-01	9612-7096-01
2**	Impeller - Full Size, Industrial	9612-7038-50	9612-7039-50	9612-7045-50	9612-7044-50	9612-7040-50
2**	Impeller - Full Size, Sanitary, San Plus	9612-7038-02	9612-7039-02	9612-7045-02	9612-7044-02	9612-7040-02
3*	Cover - Tri-Clamp, Industrial	9612-7101-15	9612-7103-15	9612-7105-15	9612-7104-15	9612-7106-15
3*	Cover - Tri-Clamp, Sanitary	9612-7101-04	9612-7101-04	9612-7101-04	9612-7101-04	9612-7101-04
3*	Cover - Tri-Clamp, Sanitary Plus	9612-7101-01	9612-7101-01	9612-7101-01	9612-7101-01	9612-7101-01
4	Impeller Screw	9612-7070-02	9612-7070-02	9612-7070-02	9612-7070-02	9612-7070-02
5	O-ring - Buna N	9612-7301-01	9612-7301-01	9612-7301-01	9612-7301-01	9612-7301-01
5	O-ring - EPDM	9612-7301-02	9612-7301-02	9612-7301-02	9612-7301-02	9612-7301-02
5	O-ring - SFY (Fluoroelastomer)	9612-7301-03	9612-7301-03	9612-7301-03	9612-7301-03	9612-7301-03
6	Wingnut	9612-7308-01	9612-7308-01	9612-7309-01	9612-7309-01	9612-7309-01
7	Stud, Casing / Cover	9612-7304-01	9612-7304-01	9612-7305-01	9612-7305-01	9612-7305-01
8	Cover O-ring - Buna N	751560	751561	751563	751563	751578
8	Cover O-ring - EPDM	751543	751556	751558	751558	751559
8	Cover O-ring - SFY (Fluoroelastomer)	751519	751529	751536	751536	751542
9 - 12 (Seal Parts)		Refer to Seal Replacement Parts later in this manual.				
13	Nut, Casing / Adapter	9612-7306-01	9612-7306-01	9612-7306-01	9612-7306-01	9612-7306-01
14	Washer, Casing/Adapter	9612-7307-01	9612-7307-01	9612-7307-01	9612-7307-01	9612-7307-01
15 - 28 (Seal Parts)		Refer to Seal Replacement Parts later in this manual.				

\* Other port connections available upon request. Contact Tri-Clover for details.

\*\* Cut down impeller sizes available upon request. Contact Tri-Clover for details.



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# PARTS LIST

## CL PUMP REPLACEMENT PARTS

Key No.	Description	CL4311	CL4359	CL4378	CL4387	CL4488
		Part Number	Part Number	Part Number	Part Number	Part Number
1*	Casing - Tri-Clamp, Industrial	9612-7100-15	9612-7092-15	9612-7097-15	9612-7098-15	9612-7099-15
1*	Casing - Tri-Clamp, Sanitary	9612-7100-04	9612-7092-04	9612-7097-04	9612-7098-04	9612-7099-04
1*	Casing - Tri-Clamp, Sanitary Plus	9612-7100-01	9612-7092-01	9612-7097-01	9612-7098-01	9612-7099-01
2**	Impeller - Full Size, Industrial	9612-7169-50	9612-7043-50	9612-7046-50	9612-7041-50	9612-7042-50
2**	Impeller - Full Size, Sanitary, San. Plus	9612-7169-02	9612-7043-02	9612-7046-02	9612-7041-02	9612-7042-02
3*	Cover - Tri-Clamp, Industrial	9612-7110-15	9612-7102-15	9612-7107-15	9612-7108-15	9612-7109-15
3*	Cover - Tri-Clamp, Sanitary	9612-7110-04	9612-7102-04	9612-7107-04	9612-7108-04	9612-7109-04
3*	Cover - Tri-Clamp, Sanitary Plus	9612-7110-01	9612-7102-01	9612-7107-01	9612-7108-01	9612-7109-01
4	Impeller Screw	9612-7170-01	9612-7070-02	9612-7070-02	9612-7070-02	9612-7070-02
5	O-ring - Buna N	9612-7325-01	9612-7301-01	9612-7301-01	9612-7301-01	9612-7301-01
5	O-ring - EPDM	9612-7325-02	9612-7301-02	9612-7301-02	9612-7301-02	9612-7301-02
5	O-ring - SFY (Fluoroclastomer)	9612-7325-03	9612-7301-03	9612-7301-03	9612-7301-03	9612-7301-03
6*	Wingnut	9612-7309-01	9612-7308-01	9612-7309-01	9612-7309-01	9612-7309-01
7	Stud, Casing / Cover	9612-7326-01	9612-7304-01	9612-7305-01	9612-7305-01	9612-7305-01
8	Cover O-ring - Buna N	9612-7323-02	751560	751563	751578	751578
8	Cover O-ring - EPDM	9612-7323-01	751543	751558	751559	751559
8	Cover O-ring - SFY (Fluoroclastomer)	9612-7323-03	751519	751536	751542	751542
9 - 12	(Seal Parts)	Refer to Seal Replacement Parts later in this manual.				
13	Nut, Casing / Adapter	9612-7306-01	9612-7306-01	9612-7306-01	9612-7306-01	9612-7306-01
14	Washer, Casing / Adapter	9612-7301-01	9612-7307-01	9612-7307-01	9612-7307-01	9612-7307-01
15 - 28	(Seal Parts)	Refer to Seal Replacement Parts later in this manual.				

\* Other port connections available upon request. Contact Tri-Clover for details.

\*\* Smaller impeller sizes available upon request. Contact Tri-Clover for details.



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# PARTS LIST

## CL PUMP REPLACEMENT PARTS

Key No.	Description	140TC NEMA Frames	180TC NEMA Frames	210TC NEMA Frames	250TC NEMA Frames	280TSC NEMA Frames	320TSC NEMA Frames
		Part Number	Part Number	Part Number	Part Number	Part Number	Part Number
29	Adapter	9612-7065-01	9612-7066-01	9612-7067-01	9612-7068-01	9612-7068-02	9612-7069-01
30	Screw, Motor	189888	189888	189888	189888	189888	189888
31	Washer, Motor	189952	189952	189952	189952	189952	189952
32	Seal Guard	9612-7114-01	9612-7075-01	9612-7075-02	9612-7075-03	9612-7075-03	9612-7075-03
33	Screw, Seal Guard	9612-7315-01	9612-7315-01	9612-7315-01	9612-7315-01	9612-7315-01	9612-7315-01
34	Stub Shaft	9612-7032-01	9612-7031-01	9612-7033-01	9612-7034-01	9612-7034-01	9612-7035-01
35	Compression Ring, Threaded	9612-7037-01	9612-7037-02	9612-7037-03	9612-7037-03	9612-7037-03	9612-7037-06
36	Compression Ring	9612-7036-01	9612-7036-02	9612-7036-03	9612-7036-03	9612-7036-03	9612-7036-06
37	Screw, Compression Ring	9612-7314-01	9612-7314-01	9612-7314-02	9612-7314-03	9612-7314-03	9612-7314-03
38	Washer, Compression Ring	9612-7317-01	9612-7317-01	9612-7317-01	9612-7317-01	9612-7317-01	9612-7317-01
39	Pin, Stub Shaft	9612-7311-01	9612-7311-01	9612-7311-01	9612-7311-01	9612-7311-01	9612-7311-01
40	Retaining Ring, Stub Shaft	9612-7313-01	N/A	N/A	N/A	N/A	N/A
41	Leg Bracket	483052	483025	483028	483038	483055	N/A
42	Screw, Leg Bracket	180701	189741	189741	180148	180148	N/A
43	Washer, Leg Bracket	180037	180070	180070	189952	189952	N/A
44	Set Screw, Adjustable Leg	180260	180259	180259	180259	180259	N/A
45	Adjustable Leg	483075	483075	483075	483626	483626	N/A
46	Motor	Refer to Motor price booklet					
47	Stuffing Box (John Crane)	Refer to Seal Replacement Parts later in this manual.					
48	John Crane Double 8 Seal	Refer to Seal Replacement Parts later in this manual.					



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# PARTS LIST

## CL PUMP REPLACEMENT PARTS

Key No.	Description	213-215 TC	254-256 TC	284-286 TC	324-365 TSC	405 TSC
		Part Number	Part Number	Part Number	Part Number	Part Number
29	Adapter	9612-7205-03	9612-7205-03	9612-7205-01	9612-7205-02	9612-7205-02
30	Screw, Motor	189888	189888	189888	189797	189797
31	Washer, Motor	189971	189971	189971	189569	189569
32	Seal Guard	9612-7171-01	9612-7171-01	9612-7171-01	9612-7171-01	9612-7171-01
33	Screw, Seal Guard	9612-7315-01	9612-7315-01	9612-7315-01	9612-7315-01	9612-7315-01
34	Stub Shaft	9612-7198-02	9612-7188-02	9612-7186-02	9612-7086-02	9612-7089-02
35	Compression Ring, Unthreaded	9612-7037-05	9612-7037-03	9612-7037-04	9612-7037-04	9612-7037-06
36	Compression Ring	9612-7036-05	9612-7036-03	9612-7036-04	9612-7036-04	9612-7036-06
37	Screw, Compression Ring	9612-7314-02	9612-7314-03	9612-7314-03	9612-7314-03	9612-7314-03
38	Washer, Compression Ring	9612-7317-01	9612-7317-01	9612-7317-01	9612-7317-01	9612-7317-01
39	Pin, Stub Shaft	9612-7311-01	9612-7311-01	9612-7311-01	9612-7311-01	9612-7311-01
40	Retaining Ring, Stub Shaft	480328	480338	480355	-	-
41	Leg Bracket	189741	180148	180148	-	-
42	Screw, Leg Bracket	180070	189952	189952	-	-
43	Washer, Leg Bracket	180259	180259	180259	-	-
44	Set Screw, Adjustable Leg	483075	483626	483626	-	-
45	Adjustable Leg	483075	483626	483626	-	-
46	Motor	Refer to Motor price booklet				
47	Stuffing Box (John Crane)	Refer to Seal Replacement Parts later in this manual.				
48	John Crane Double 8 Seal	Refer to Seal Replacement Parts later in this manual.				

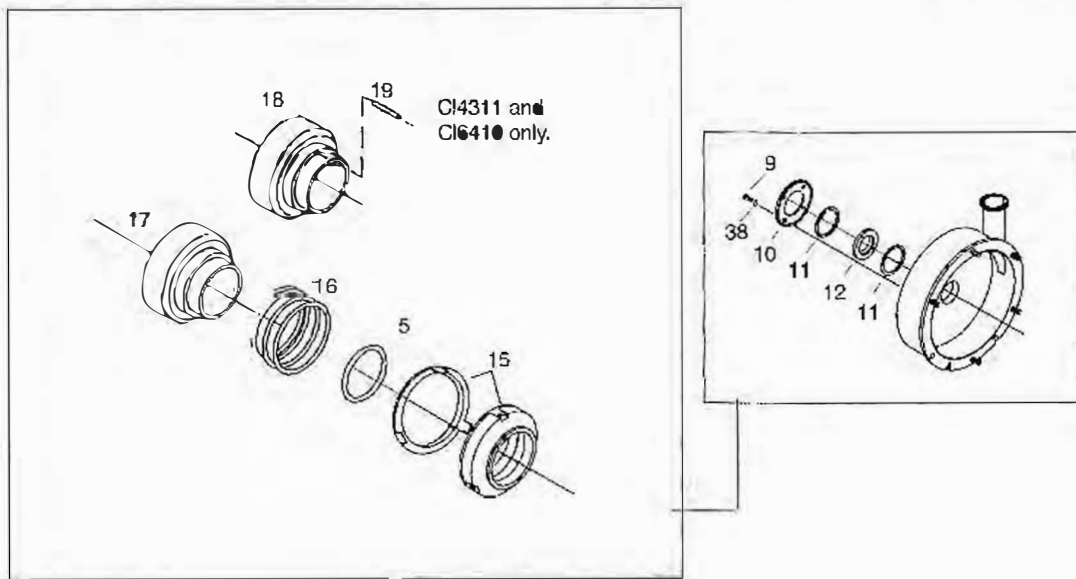


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# PARTS LIST

## SEAL REPLACEMENT PARTS - Type DG (External Balanced Seal)



Key No.	Description	CL2264 CL2265 CL2284 CL3285 CL3295	CL4359 CL4378 CL4387 CL4488	CL4311
		Part Number	Part Number	Part Number
5*	O-Ring - Buna N	9612-7301-01	9612-7301-01	9612-7325-02
5*	O-Ring - EPDM	9612-7301-02	9612-7301-02	9612-7325-01
5*	O-Ring - SFY (Fluorocastomer)	9612-7301-03	9612-7301-03	9612-7325-03
9	Screw, Seal Gland	9612-7303-01	9612-7303-01	189643
10	Seal Gland	9612-7008-01	9612-7008-01	9612-7184-01
11*	Front & Rear Stationary Seal Gaskets, Buna N	9612-7130-02	9612-7130-02	9612-7321-02
11*	Front & Rear Stationary Seal Gaskets, EPDM	9612-7130-01	9612-7130-01	9612-7321-01
11*	Front & Rear Stationary Seal Gaskets, SFY	9612-7130-03	9612-7130-03	9612-7321-03
11*	Front Gasket, Stationary Seal, PTFE	9612-7130-04	9612-7130-04	9612-7321-04
12*	Silicon Carbide Stationary Seal	9612-7000-01	9612-7000-01	9612-7178-01
15*	Rotating Seal - Carbon (includes cup)	9612-7115-01	9612-7115-01	9612-7181-01
15*	Rotating Seal - SiC (includes cup)	9612-7115-02	9612-7115-02	9612-7181-02
16	Spring	9612-7116-01	9612-7116-01	9612-7182-01
17	Drive Collar	9612-7004-01	9612-7004-01	—
18	Drive Collar - Stainless Steel	—	9612-7009-02	9612-7173-01
19	Pin, Drive Collar	—	—	9612-7319-01
38	Washer, Compression Ring	9612-7317-01	9612-7317-01	9612-7317-01

\* Included in seal kits:

Buna N - kit number 9612-7118-02. For models CL4311 or CL6410, order 9612-7177-02

Buna N, SiC - kit number 9612-7119-02. For models CL4311 or CL6410, order 9612-7177-05

EPDM - kit number 9612-7118-01. For models CL4311 or CL6410, order 9612-7177-01

EPDM, SiC - kit number 9612-7119-01. For models CL4311 or CL6410, order 9612-7177-04

SFY - kit number 9612-7118-03. For models CL4311 or CL6410, order 9612-7177-03

SFY, SiC - kit number 9612-7119-03. For models CL4311 or CL6410, order 9612-7177-06



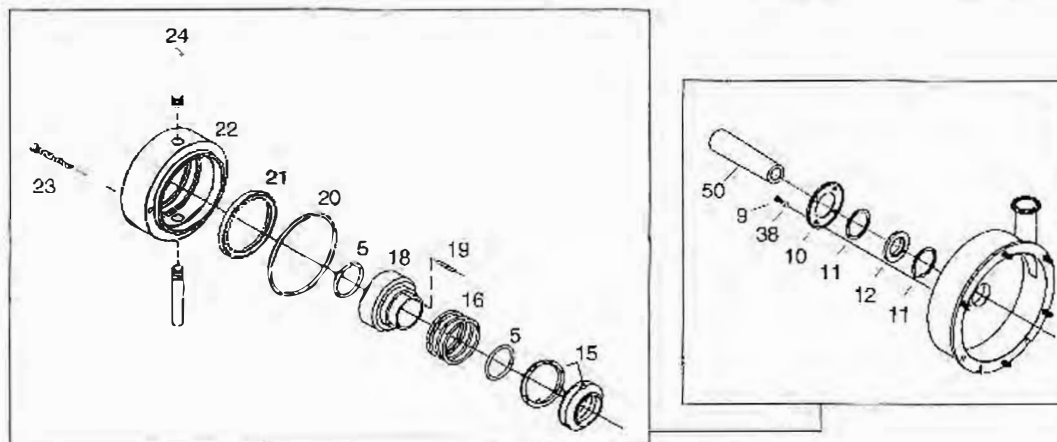
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# PARTS LIST

## SEAL REPLACEMENT PARTS - Type FG (Water cooled Single Seal)



Key No.	Description	All Models except CL4311	CL4311
		Part Number	Part Number
5*	O-Ring - Buna N	9612-7301-01	9612-7325-02
5*	O-Ring - EPDM	9612-7301-02	9612-7325-01
5*	O-Ring - SFY (Fluoroelastomer)	9612-7301-03	9612-7325-03
9	Screw, Seal Gland	9612-7303-01	189643
10	Seal Gland	9612-7008-01	9612-7184-01
11*	Front & Rear Stationary Seal Gaskets, Buna N	9612-7130-02	9612-7321-02
11*	Front & Rear Stationary Seal Gaskets, EPDM	9612-7130-01	9612-7321-01
11*	Front & Rear Stationary Seal Gaskets, SFY	9612-7130-03	9612-7321-03
11*	Front Gasket, Stationary Seal, PTFE	9612-7130-04	9612-7321-04
12*	Silicone Carbide Seal	9612-7000-01	9612-7000-01
15*	Rotating Seal - Carbon (includes cup)	9612-7115-01	9612-7181-01
15*	Rotating Seal - SiC (includes cup)	9612-7115-02	9612-7181-02
16*	Spring	9612-7116-01	9612-7182-01
18	Drive Collar, Stainless Steel	9612-7009-02	9612-7173-01
19	Pin, Drive Collar	9612-7312-01	9612-7319-01
20*	O-ring, Stuffing Box - Buna	9612-7300-01	9612-7300-01
20*	O-ring, Stuffing Box - EPDM	9612-7300-02	9612-7300-02
20*	O-ring, Stuffing Box - SFY	9612-7300-03	9612-7300-03
21*	Single Flush Lip Seal	9612-7117-01	9612-7324-01
22	Stuffing Box	9612-7007-01	9612-7007-01
23	Screw, Stuffing Box	9612-7302-01	9612-7302-01
24	Flush Pipe	9612-7129-01	9612-7129-01
38	Washer, Compression Ring	9612-7317-01	9612-7317-01
50*	Seal Installation Tool	9612-7320-02	9612-7320-03

\* Included in seal kits:

Buna N - kit number 9612-7118-08. For models CL4311 or CL6410, order 9612-7177-08

Buna N, SiC - kit number 9612-7119-08. For models CL4311 or CL6410, order 9612-7177-11

EPDM - kit number 9612-7118-07. For models CL4311 or CL6410, order 9612-7177-07

EPDM, SiC - kit number 9612-7119-07. For models CL4311 or CL6410, order 9612-7177-10

SFY - kit number 9612-7118-09. For models CL4311 or CL6410, order 9612-7177-09

SFY, SiC - kit number 9612-7119-09. For models CL4311 or CL6410, order 9612-7177-12

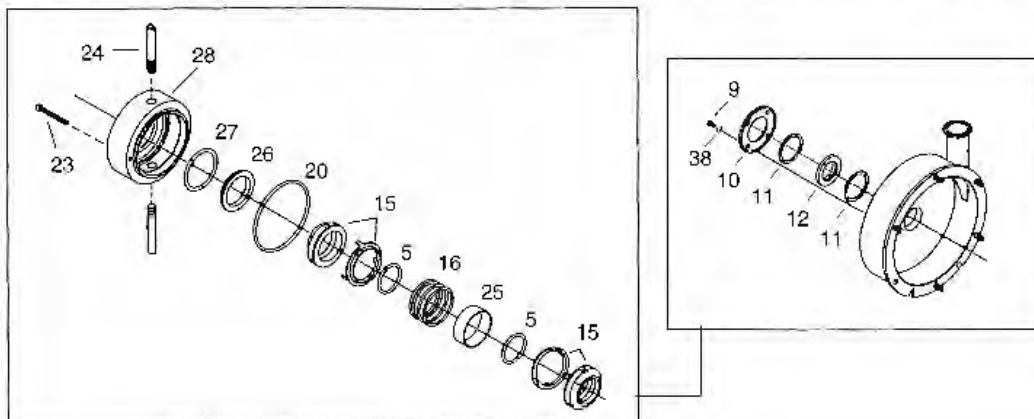


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# PARTS LIST

## SEAL REPLACEMENT PARTS - Type EG (Water cooled, Balanced Double Seal)



Key No.	Description	All Models except CL4311 or CL6410**
		Part Number
5*	O-Ring - Buna N	9612-7301-01
5*	O-Ring - EPDM	9612-7301-02
5*	O-Ring - SFY (Fluoroelastomer)	9612-7301-03
9	Screw, Seal Gland	9612-7303-01
10	Seal Gland	9612-7008-01
11*	Front & Rear Stationary Seal Gaskets, Buna N	9612-7130-02
11*	Front & Rear Stationary Seal Gaskets, EPDM	9612-7130-01
11*	Front & Rear Stationary Seal Gaskets, SFY	9612-7130-03
11*	Front Gasket, Stationary Seal, PTFE	9612-7130-04
12*	Silicone Carbide Stationary Seal	9612-7000-01
15*	Carbon Rotating Seal (includes cup), Buna N and EPDM	9612-7115-01
15*	Silicone Carbide Rotating Seal (includes cup), Buna N, SiC and EPDM, SiC	9612-7115-02
16*	Spring	9612-7116-01
20*	O-ring, Stuffing Box - Buna	9612-7300-01
20*	O-ring, Stuffing Box - EPDM	9612-7300-02
20*	O-ring, Stuffing Box - SFY	9612-7300-03
23	Screw, Stuffing Box	9612-7302-01
24	Flush Pipe	9612-7129-01
25	Spacing Ring	9612-7006-01
26*	Stationary Seal, Rear, SiC	9612-7113-01
26*	Stationary Seal, Rear, Stainless Steel	9612-7113-02
27*	O-Ring, Stationary Seal, Buna	9612-7316-02
27*	O-Ring, Stationary Seal, EPDM	9612-7316-01
27*	O-Ring, Stationary Seal, SFY (fluoroelastomer)	9612-7316-03
28	Stuffing Box	9612-7111-01
38	Washer, Compression Ring	9612-7317-01
50*	Seal Installation Tool	9612-7320-02

\* Included in seal kits:

Buna N - kit number 9612-7118-05, Buna N, SiC - kit number 9612-7119-05

EPDM - kit number 9612-7118-04, EPDM, SiC - kit number 9612-7119-04.

SFY (Fluoroelastomer) - kit number 9612-7118-06, SFY (Fluoroelastomer), SiC - kit number 9612-7119-06

\*\* Consult Tri-Clover for a model CL4311 or CL6410 with a type EG seal.



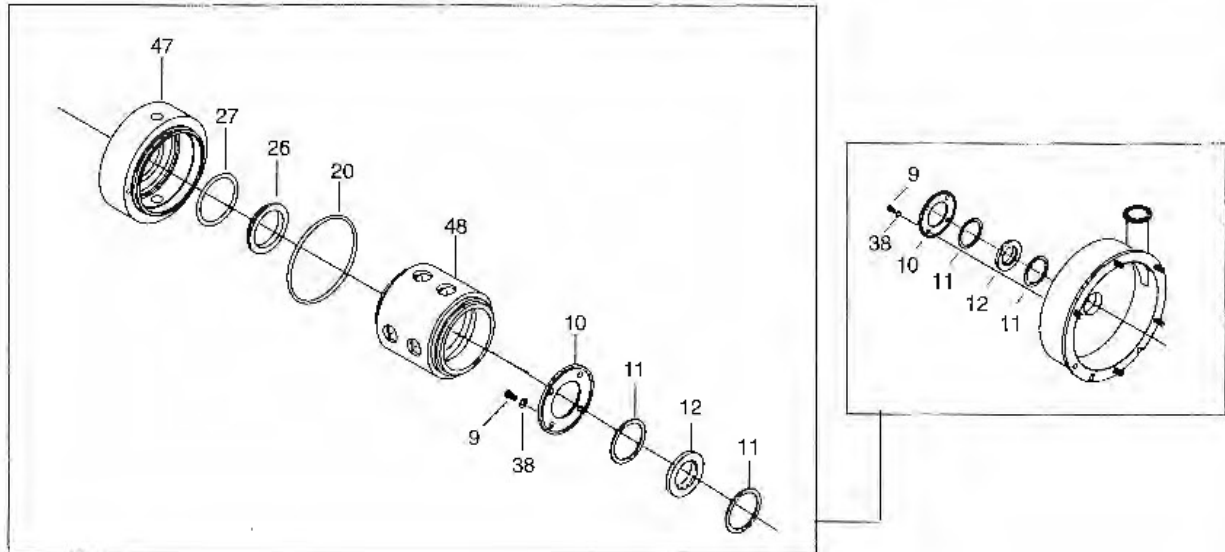
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# PARTS LIST

## SEAL REPLACEMENT PARTS - JOHN CRANE DOUBLE 8 SEAL



Key No.	Description	All Models except CL4311 or CL6410
		Part Number
9	Screw, Seal Gland	9612-7303-01
10	Seal Gland	9612-7008-01
11*	Front & Rear Stationary Seal Gaskets, Buna N	9612-7130-02
11*	Front & Rear Stationary Seal Gaskets, EPDM	9612-7130-01
12*	Silicone Carbide Stationary Seal	9612-7000-01
20*	O-ring, Stuffing Box - Buna	9612-7300-01
20*	O-ring, Stuffing Box - EPDM	9612-7300-02
20*	O-ring, Stuffing Box - SFY	9612-7300-03
26*	Stationary Seal, Rear, SiC	9612-7113-01
26*	Stationary Seal, Rear, Stainless Steel	9612-7113-02
27*	O-Ring, Stationary Seal, Buna	9612-7316-02
27*	O-Ring, Stationary Seal, EPDM	9612-7316-01
27*	O-Ring, Stationary Seal, SFY (fluoroelastomer)	9612-7316-03
47	Stuffing Box	9612-7111-02
48	John Crane Double Seal Type 8B2 - Viton	9612-7318-01
48	John Crane Double Seal Type 8B2 - EPDM	9612-7318-02

\* Included in seal kits:

Buna N - kit number 9612-7118-05, Buna N, SiC - kit number 9612-7119-05

EPDM - kit number 9612-7118-04, EPDM, SiC - kit number 9612-7119-04.

SFY (Fluoroelastomer) - kit number 9612-7118-06, SFY (Fluoroelastomer), SiC - kit number 9612-7119-06



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