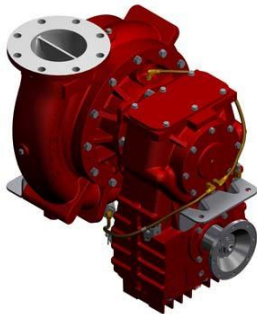
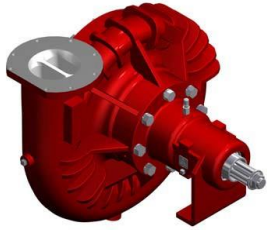




# CR/CRU-1/CRU-2 Series Operation and Maintenance Instructions



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**Read through the installation instructions carefully before using your Waterous CR/CRU-1/CRU-2 Series Pump**

NOTE: Instructions subject to change without notice

F-1031, Section 2112 (6/4/20)

Waterous Company, 125 Hardman Avenue South, South St. Paul, Minnesota 55075 USA (651) 450-5000

[www.waterousco.com](http://www.waterousco.com)

## Safety Information



Read through the safety information and operating instructions carefully before using your Waterous Fire Pump.

### **WARNING**

Death or serious personal injury might occur if proper operating procedures are not followed. The pump operator, as well as individuals connecting supply or discharge hoses to the apparatus must be familiar with these pump operating instructions as well as other operating instructions and manuals for the apparatus, water hydraulics and component limitation.

### **WARNING**

#### **Pressure Hazard. May result in personal injury.**

Prior to connection or removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains or bleeder valves. Bleeder valves should also be used while filling a hose connected to an intake with water.

### **WARNING**

#### **Scalding Water Hazard. May result in serious burns.**

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs for a few minutes completely close, it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a bypass system or other provision designed to prevent overheating, opening a discharge valve may be unnecessary.

## Safety Information



Read through the safety information and operating instructions carefully before using your Waterous Fire Pump.



### WARNING

**Hose Testing Hazard. May result in serious personal injury.**

Due to a potential for catastrophic hose failure during service testing of fire hose, it is vital that safety precautions be taken to prevent exposure of anyone to this danger. Fire pumps on fire department apparatus are not designed for and should not be used for service testing of fire hoses. Hose testing machines should be used for service testing of fire hoses.



### WARNING

**Pressure Hazard. May result in serious personal injury.**

If a fire pump on a fire department apparatus is used for service testing of fire hoses, the procedures in NFPA 1962 **MUST be followed** including the use of a fire department gate valve with a ¼-inch (6 mm) hole drilled through the gate installed between the fire apparatus discharge outlet and the hose test layout to prevent a volume surge from the pump in the event a hose bursts during testing.



### WARNING

**Scalding Water Hazard. May result in serious burns.**

If a fire pump on a fire department apparatus is used for service testing of fire hoses, pump discharge water must be circulated through a by-pass system or discharged through a slightly open discharge valve, or some other provision must be used to prevent overheating. If the pump runs for a few minutes without adequate flow through the pump, water may be heated enough to scald someone when a valve is opened.

## Introduction

This instruction contains information needed for the operation and maintenance of CR/CRU/CRU-2 Series centrifugal pumps.

---

## General Description

---

The CR/CRU-1/CRU-2 Series fire pumps are single stage, vertically-split and designed to operate from a water tank, hydrant or from draft. They are designed for direct-drive (Model CR/CRU-1/CRU-2) or can be driven via a chain driven QA transmission (CRQA), a chain-driven QB Transmission (CRQB), a chain-driven QC Transmission (CRU-QC2/CRQC/CRUQC-2 with Bell Housing Adapter) or a chain-driven C21 Transmission (CRUC21-2).

**OPERATION LIMITS: Do not operate pump beyond max. pressure or max. speed as follow:**

**CR: Max. pressure (300 psi) or max. speed (3500 rpm)**

**CRU-1: Max. pressure (350 psi) or max. speed (2800 rpm)**

**CRU-2: Max. pressure (350 psi) or max. speed (3400 rpm)**

**Fail to do that may result in personal injury or premature pump failure.**

## Components

### ***Body Assembly***

The body assembly includes the volute body, intake and discharge adapters and related parts. These parts are available in either cast iron or bronze (except CRU-2).

### ***Impeller Shaft Assembly***

The impeller shaft assembly consists of a bronze impeller mounted on a stainless steel shaft, bronze wear rings, mechanical seal and related parts. The impeller is mechanically and hydraulically balanced and the impeller shaft is supported by ball bearings.

### ***Mechanical Seals***

Mechanical seals are standard on CR series pumps.

A mechanical seal consists of a flat, highly polished (lapped), spring-fed carbon ring that is sealed to and rotates with the impeller shaft. It presses against a highly polished (lapped), silicone carbide, stationary ring that is sealed in the pump body. This seals the shaft and prevents air from entering and water from leaving.

A mechanical seal does not leak or drip water, even when pumping.

## Options

### ***Anodes***

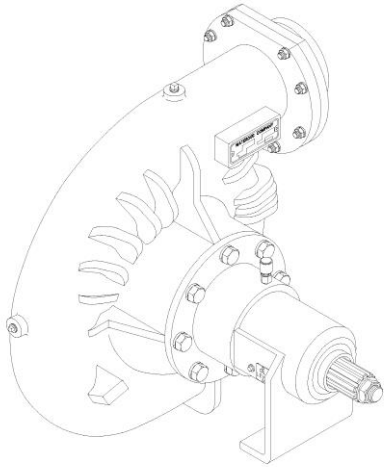
As additional corrosion protection for iron body pumps, Waterous has anodes available to fit any unused opening in the intake fitting. Anodes provide an additional sacrificial surface to the water to supplement the intake screens.

### ***Overheat Protection Manager (OPM)***

The Overheat Protection Manager (OPM) acts as a safety device by releasing hot water to the ground or back to the water tank from the discharge area of the pump.

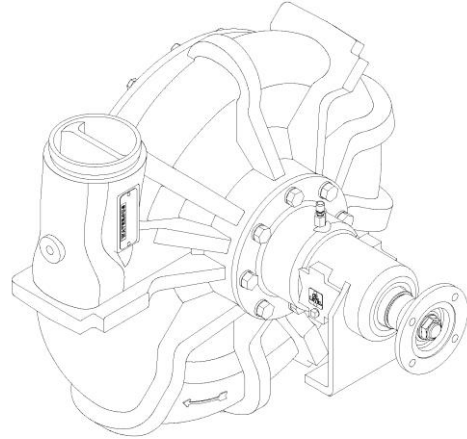
## Available Models

**Model CR Direct Drive**



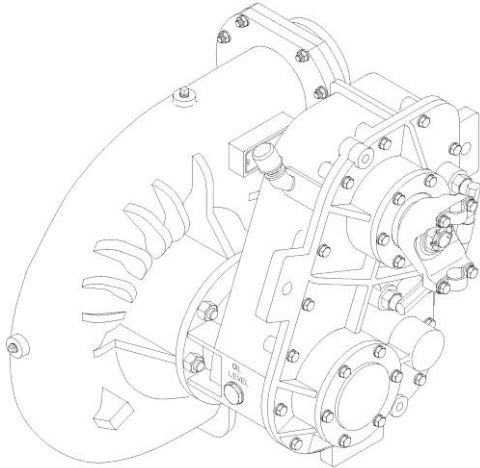
IL1805

**Model CRU-1 Direct Drive**



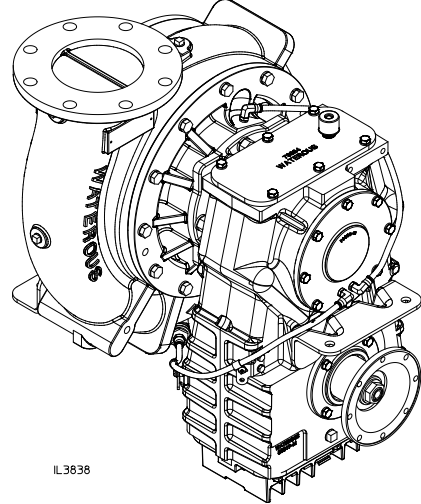
IL3762

**Model CRQA**



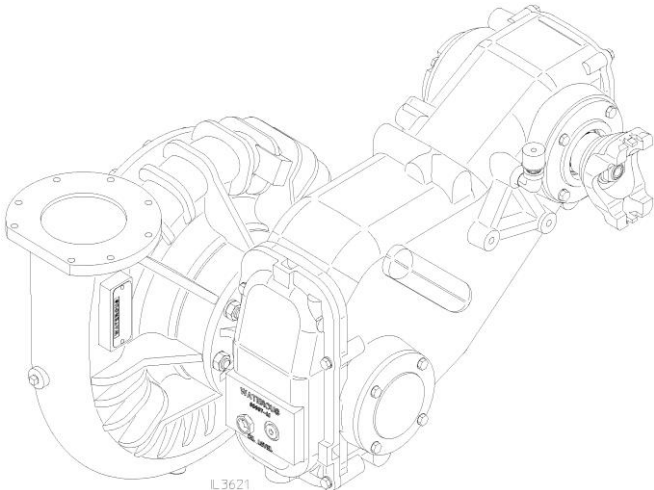
IL1806

**Model CRUQC-2**



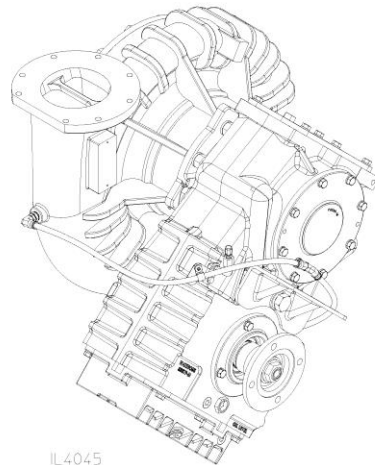
IL3838

**Model CRQB**



IL3621

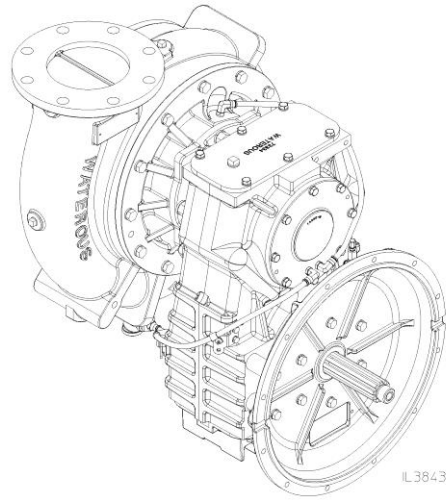
**Model CRQC**



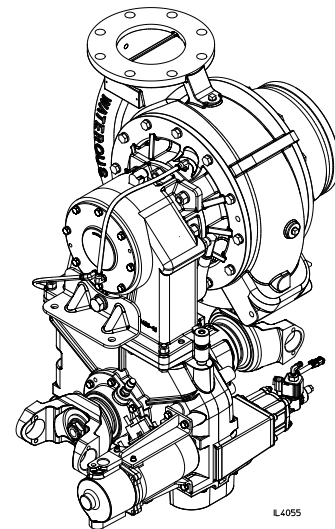
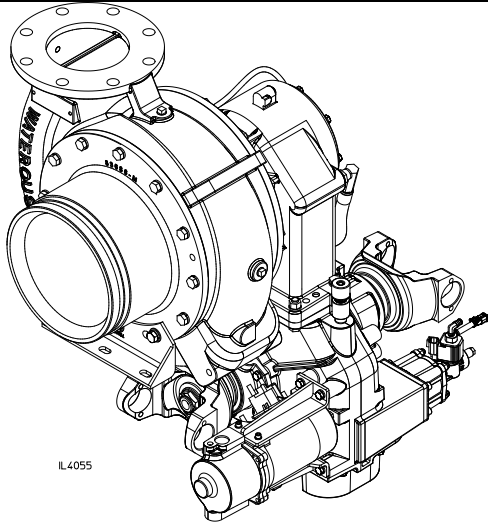
IL4045

## Available Models (con't)

### Model CRUQC-2 with Bell Housing Adapter



### Model CRUC21-2



Pump mounted on front (input shaft side) of transmission.

Pump mounted on rear (output shaft side) of transmission.

# Operating Instructions

## Pumping from Water Tank

### WARNING

#### **Pressure Hazard. May result in personal injury or death.**

Prior to connection of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains.

### WARNING

#### **Scalding Water Hazard. May result in serious burns.**

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs for a few minutes completely closed, it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a by-pass system or other provision designed to prevent overheating, opening a discharge valve may be unnecessary.

### WARNING

#### **Unexpected Truck Movement. May result in personal injury or death.**

Failure to properly shift transmission in accordance with the transmission operating instructions may result in unexpected truck movement which may result in serious personal injury or death.

1. Open valves in piping between water tank and pump intake and at least one discharge valve.
2. Allow about 30 seconds for water to flow into pump.

**NOTE: Priming the pump may be necessary under some conditions because of air trapped in the pump and piping.**

3. Engage pump drive and accelerate engine to obtain desired discharge pressure and capacity.

### NOTICE

Do not attempt to pump more water than is available from the water tank. Always make sure the intake compound gage reading stays above zero.

## After Pumping

### WARNING

#### **Pressure Hazard. May result in personal injury or death.**

Prior to removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains.

1. Disengage pump drive.
2. If pumping anything but clean water, remove all intake and discharge caps, open all valves and open all drains. Flush entire system with clean, fresh water for several minutes to remove all traces of impurities.
3. If pump is kept full of water when not in use, make sure water is clean and non-corrosive. Make sure the pump is completely full or completely drained - never partially full.

### NOTICE

#### **Freezing water hazard. May cause damage to the pump.**

If the pump is exposed to freezing temperatures, drain all water from pump, lines and accessories.

4. Close all drains and install intake and discharge caps.
5. If truck is equipped with a priming pump, operate it until fluid is discharged from priming pump discharge pipe. Also check fluid level in priming tank, and refill if necessary.

For pump and roll operation, engage the PTO as directed by the apparatus builder.

## Pumping from Hydrant or in Relay

### WARNING

#### **Pressure Hazard. May result in personal injury or death.**

Prior to connection of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains or bleeder valves.

### WARNING

#### **Scalding Water Hazard. May result in serious burns.**

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs even for a few minutes completely closed it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a by-pass system or other provision designed to prevent over-heating, opening a discharge valve may be unnecessary.

### WARNING

#### **Unexpected Truck Movement. May result in personal injury or death.**

Failure to properly shift transmission in accordance with the transmission operating instructions may result in unexpected truck movement which may result in serious personal injury or death.

**NOTE: Limit inlet pressure to 150 psi (10.3 bar) if possible. The pump will operate properly with higher in- take pressure but will accelerate mechanical seal wear.**

1. Engage pump drive.
2. Open intake, hydrant and other valves as necessary to allow water to enter the pump.

**NOTE: Bleeder valves should be used while filling a hose connected to an intake with water.**

3. Open discharge valves and accelerate engine to obtain desired discharge pressure and capacity.
4. Set relief valves or other pressure governing device to desired pressure.

### **NOTICE**

Do not attempt to pump more water than is available from the hydrant or relaying pumper. Always make sure the intake pressure compound gage reading stays above zero.

**NOTE: Some fire departments operate at a minimum intake pressure of 10 psi (.7 bar) when pumping from hydrant or in relay to prevent a "soft" intake hose from collapsing.**

## *After Pumping*

### WARNING

#### **Pressure Hazard. May result in personal injury or death.**

Prior to removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains or bleeder valves.

1. Disengage pump drive.
2. If pumping anything but clean water, remove all intake and discharge caps, open all valves and open all drains. Flush entire system with clean, fresh water for several minutes to remove all traces of impurities.
3. If pump is kept full of water when not in use, make sure water is clean and non-corrosive. Make sure the pump is completely full or completely drained - never partially full.

### **NOTICE**

#### **Freezing water hazard. May cause damage to the pump.**

If the pump is exposed to freezing temperatures, drain all water from pump, lines and accessories.

4. Close all drains and install intake and discharge caps.
5. If truck is equipped with a priming pump, operate it until fluid is discharged from priming pump discharge pipe. Also check fluid level in priming tank, and refill if necessary.



## Pumping from Draft

### **WARNING**

#### **Pressure Hazard. May result in personal injury or death.**

Prior to connection of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains.

### **WARNING**

#### **Scalding Water Hazard. May result in serious burns.**

When operating the pump, be sure to open at least one discharge valve slightly to prevent the pump from overheating. If the pump runs even for a few minutes completely closed it may heat the water enough to scald someone when the valve is opened. Overheating can damage the packing, seals and other pump parts. If the apparatus builder has installed a by-pass system or other provision designed to prevent over-heating, opening a discharge valve may be unnecessary.

### **WARNING**

#### **Unexpected Truck Movement. May result in personal injury or death.**

Failure to properly shift transmission in accordance with the transmission operating instructions may result in unexpected truck movement which may result in serious personal injury or death.

#### **NOTE: To get full capacity, quick prime and maintain pump efficiency:**

- a) Position vehicle as near as possible to water supply.
  - b) Avoid humps and sharp bends in intake hose. Make sure no part of hose is higher than pump inlet. (Air pockets in intake hose may cause loss of prime or erratic pump action, and may reduce pump capacity.)
  - c) Make sure all intake connections are tight and discharge valves are closed.
  - d) Immerse intake strainer at least two feet below water surface to prevent pump from drawing air. (Whirlpools forming above intake strainer indicate that strainer is too close to surface of water.)
  - e) Make sure intake strainer is far enough from bottom to prevent sand, gravel and other foreign matter from being drawn into the pump.
1. Prime the pump (see separate instructions supplied with primer).
  2. Engage pump drive.
  3. Open discharge valves, and accelerate engine to obtain desired discharge pressure and capacity.
  4. Set relief valves or other pressure governing device to desired pressure.

## *After Pumping*

### **WARNING**

#### **Pressure Hazard. May result in personal injury or death.**

Prior to removal of hoses, caps or other closures with pump intake or pump discharge connections, relieve pressure by opening drains.

1. Disengage pump drive.
2. If pumping anything but clean water, remove all intake and discharge caps, open all valves and open all drains. Flush entire system with clean, fresh water for several minutes to remove all traces of impurities.
3. If pump is kept full of water when not in use, make sure water is clean and non-corrosive. Make sure the pump is completely full or completely drained - never partially full.

### **NOTICE**

#### **Freezing water hazard. May cause damage to the pump.**

If the pump is exposed to freezing temperatures, drain all water from pump, lines and accessories.

4. Close all drains and install intake and discharge caps.
5. If truck is equipped with a priming pump, operate it until fluid is discharged from priming pump discharge pipe. Also check fluid level in priming tank, and refill if necessary.

# Fire Hose Testing



## WARNING

### **Hose Testing Hazard. May result in serious personal injury.**

Due to a potential for catastrophic hose failure during service testing of fire hose, it is vital that safety precautions be taken to prevent exposure of anyone to this danger. Fire pumps on fire department apparatus are not designed for and should not be used for service testing of fire hoses. Hose testing machines should be used for service testing of fire hoses.

NFPA 1962 *Standard for the Inspection, Care, and use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose* provides requirements and testing procedures for service-testing fire hose at least annually. NFPA 1962 includes procedures for service testing with either a hose testing machine or with a pump on a fire department fire apparatus.



## WARNING

### **Pressure Hazard. May result in serious personal injury.**

If a fire pump on a fire department apparatus is used for service testing of fire hoses, the procedures in NFPA 1962 **MUST be followed** including the use of a fire department gate valve with a ¼-inch (6 mm) hole drilled through the gate installed between the fire apparatus discharge outlet and the hose test layout to prevent a volume surge from the pump in the event a hose bursts during testing.

During fire hose testing with a fire pump on a fire department fire apparatus, the fire pump is required to be operated at high discharge pressure with little or no flow out of the apparatus.



## WARNING

### **Scalding Water Hazard. May result in serious burns.**

If a fire pump on a fire department apparatus is used for service testing of fire hoses, pump discharge water must be circulated through a by-pass system or discharged through a slightly open discharge valve, or some other provision must be used to prevent overheating. If the pump runs for a few minutes without adequate flow through the pump, water may be heated enough to scald someone when a valve is opened.

## NOTICE

If a fire pump on a fire department apparatus is used for service testing of fire hoses, operating the pump at high discharge pressure with little or no flow may result in severe damage to the pump.

## Lubrication

1. Check the lubrication level once a month and change annually or after each 100 hours of operation, whichever comes first. Under severe conditions where pump has been used continuously at high output, change more frequently.
2. Always fill to the bottom of the plug hole labeled "Oil Level". Do not Overfill.
3. Note that the breather may be removed and the hole used as the lubricant fill.
4. Capacities shown are approximate, quantities listed vary based on ratio and/or mounting orientation.
5. Be sure to clean the drain plug and breather.
6. Synthetic oil substitutes are acceptable.

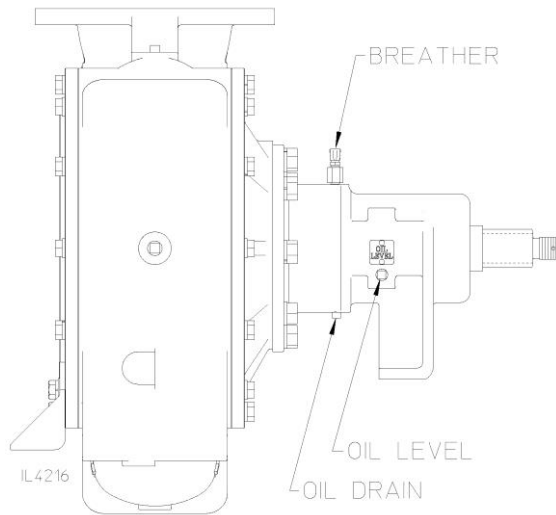
### NOTICE

If fluid level is low, locate the source of the leak and repair. If the fluid level is high, loosen the drain plug until the fluid drops to the proper level. If excessive water drains out, change the fluid and determine the source of the water leakage and repair.

### NOTICE

**Fluid temperature hazard.**  
**May cause premature seal wear and damage.**  
 Fluid temperature should not exceed 250°F (121°C) for an extended period of time in order to prevent seal wear and damage.

## Model CRU-2 Direct Drive

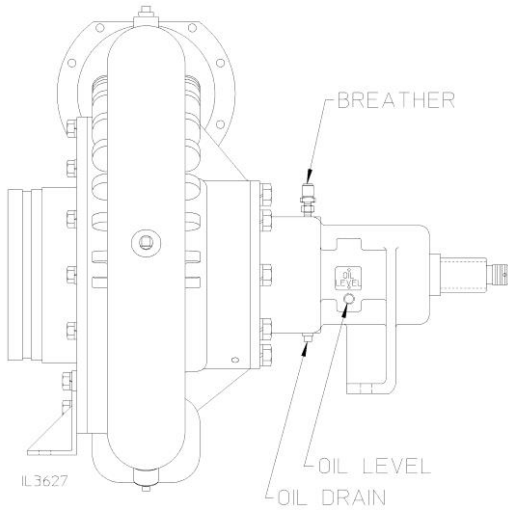


| Lubricant | Capacity                   |
|-----------|----------------------------|
| ATF       | 1.50 Quarts<br>1.42 Liters |

**For Ambient Temperature Over 90°F:**  
 SAE 20 Oil 300 SSU @ 100°F with service classification SA, SB, SC should be used.

## Lubrication (con't)

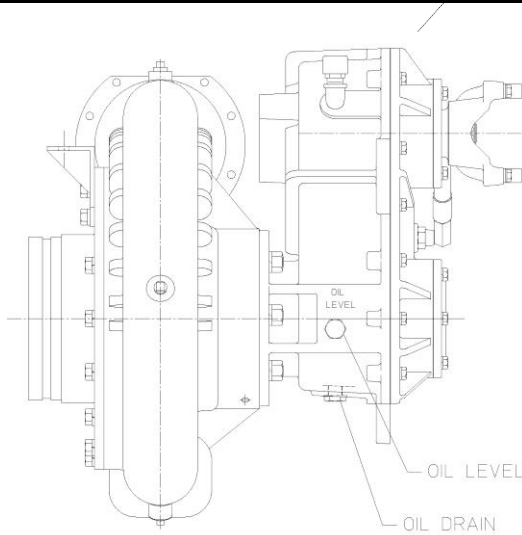
### Model CR (Direct Drive)



| Lubricant                  | Capacity                 |
|----------------------------|--------------------------|
| ATF or<br>SAE 30 Motor Oil | .25 Quarts<br>.24 Liters |

**For Ambient Temperature Over 90°F:**  
SAE 20 Oil 300 SSU @ 100°F with service classification SA, SB, SC should be used.

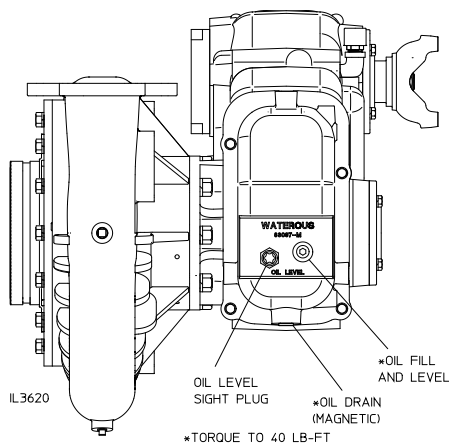
### Model CRQA



| Lubricant | Capacity                   |
|-----------|----------------------------|
| ATF       | 1.50 Quarts<br>1.42 Liters |

**For Ambient Temperature Over 90°F:**  
SAE 20 Oil 300 SSU @ 100°F with service classification SA, SB, SC should be used.

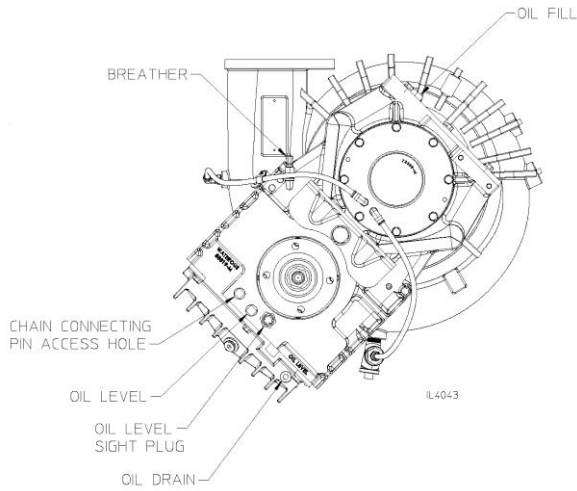
### Model CRQB



| Lubricant | Capacity                   |
|-----------|----------------------------|
| ATF       | 4.50 Quarts<br>4.27 Liters |

**For Ambient Temperature Over 90°F:**  
SAE 20 Oil 300 SSU @ 100°F with service classification SA, SB, SC should be used.

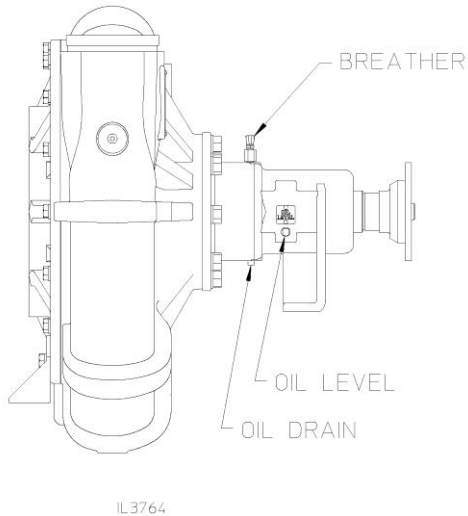
## Model CRQC



| Lubricant | Capacity                  |
|-----------|---------------------------|
| ATF       | 4.0 Quarts<br>3.80 Liters |

**For Ambient Temperature Over 90°F:**  
SAE 20 Oil 300 SSU @ 100°F with service classification SA, SB, SC should be used.

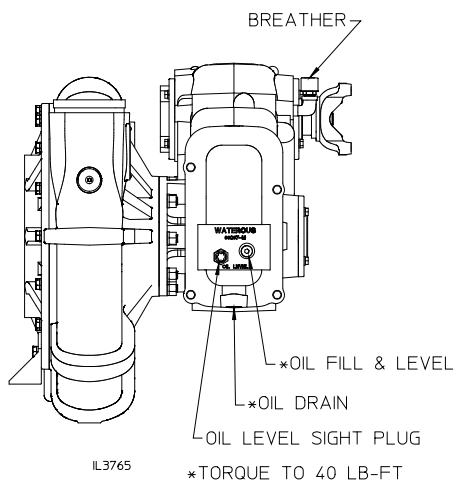
## Model CRU-1 (Direct Drive)



| Lubricant                                     | Capacity                 |
|---|--------------------------|
| ATF or<br>SAE 30 Motor Oil<br>(Non-Detergent) | .25 Quarts<br>.24 Liters |

**For Ambient Temperature Over 90° F:**  
SAE 20 Oil 300 SSU @ 100° F with service classification SA, SB or SC should be used.

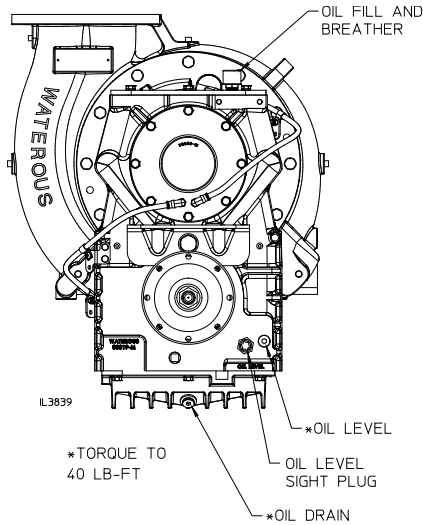
## Model CRUQB-1



| Lubricant | Capacity                   |
|-----------|----------------------------|
| ATF       | 4.50 Quarts<br>4.27 Liters |

**For Ambient Temperature Over 90° F:**  
SAE 20 Oil 300 SSU @ 100° F with service classification SA, SB or SC should be used.

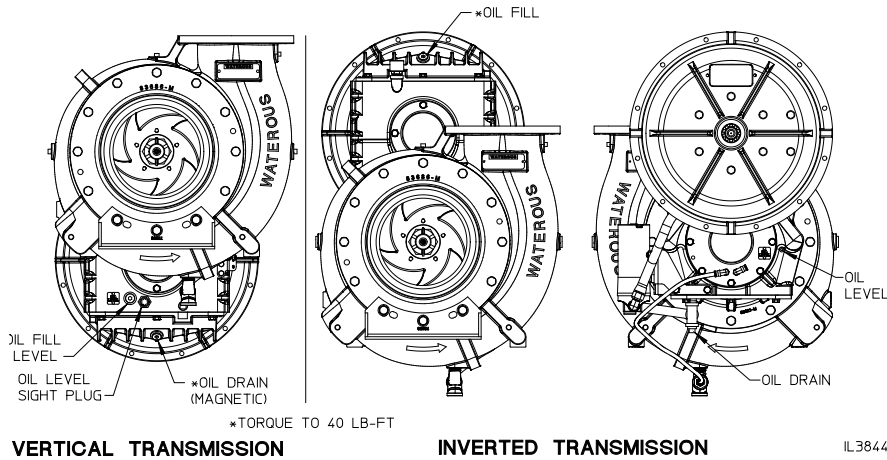
## Model CRUQC-2



| Lubricant | Capacity                 |
|-----------|--------------------------|
| ATF       | 4.0 Quarts<br>3.8 Liters |

**For Ambient Temperature Over 90°F:**  
SAE 20 Oil 300 SSU @ 100°F with service classification SA, SB or SC should be used.

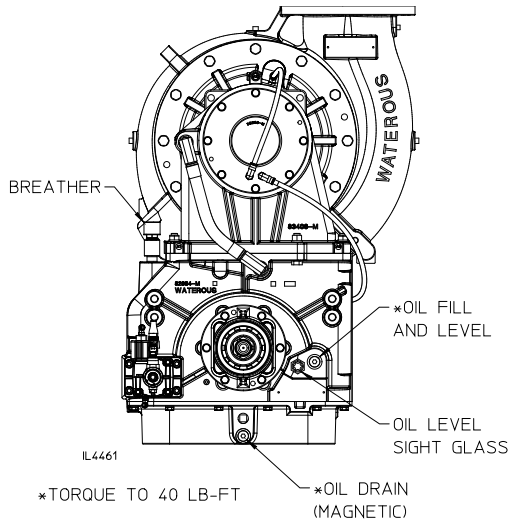
## Model CRUQC-2 with Bell Housing Adapter



| Lubricant | Capacity                 |                          |
|-----------|--------------------------|--------------------------|
|           | Vertical                 | Inverted                 |
| ATF       | 4.0 Quarts<br>3.8 Liters | 3.0 Quarts<br>2.8 Liters |

**For Ambient Temperature Over 90° F:**  
SAE 20 Oil 300 SSU @ 100° F with service classification SA, SB or SC should be used.

## Model CRUC21-2



| Lubricant | Capacity                 |
|-----------|--------------------------|
| ATF       | 4.0 Quarts<br>3.8 Liters |

**For Ambient Temperature Over 90° F,**  
SAE 20 Oil 300 SSU @ 100° F with service classification SA, SB or SC should be used.

## Mechanical Seal

A mechanical shaft seal is used and no adjustment is required. When the pump operates, the water being pumped cools and lubricates the shaft seal to prevent it from overheating.

### **NOTICE**

Prolonged dry pump operation or operating a dry pump at high speeds will reduce the life of the mechanical seal.

If the mechanical seal leaks, replace the entire seal.

The same drain (weep hole) is used to vent the mechanical seal on the pump shaft and the oil seal for the bearing housing. Inspect for water (mechanical seal) or oil (oil seal) leaks.

## Overheat Protection Manager

Check the electrical circuit by pressing the test button located on the panel plate every 100 hours of pump operation or every six months, whichever comes first.

If the light does not flash, the light bulb or flasher may need replacement (provided all wire connections are solid).