



Read through the safety information and overhaul instructions carefully before repairing your Waterous CPK-5 Series Fire Pump.

NOTE: Instructions subject to change without notice

Table of Contents

Safety Information	2
Introduction	3
General Description	3
General Overhaul Information	3
Tools and Equipment	3
Preliminary Testing	3
Cleaning	3
Pump Bodies and Impellers.....	3
Bearings, Gaskets, Seals and O-rings.....	4
Impeller Shafts.....	4
Installing Ball Bearings	4
Installing Body Gaskets	4
Disassembly	4 - 5
Reassembly	6
Testing	7
Hydrostatic Testing.....	7
Operational Testing	7

Safety Information

Please 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 closed, it may heat the water enough to scald someone when the valve is opened. Overheating can damage the 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 serious personal injury or death.

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

Introduction

This section contains overhaul instructions for Waterous CPK-5 Series centrifugal fire pumps.

Also refer to the Service Parts List (SPL documents), available at waterousco.com. to aid in further part identification and repair parts ordering.

General Description

The CP-5 series pumps are designed to provide ultra high pressure and driven by a K-Series Transmission allowing for pump and roll operation.

General Overhaul Information

Tools and Equipment

The following tools and equipment are needed to overhaul a pump:

1. Usual automotive mechanic's hand tools.
2. An arbor press for assembling or disassembling components.
3. An engine lathe for turning impeller hubs.
4. A suitable hoist and slings.
5. Torque capability up to 325 lb-ft.

While no special tools and equipment are required, a few special items are illustrated or described so the mechanic can make them or they are available from the apparatus manufacturer or the Waterous Company. These special items are not absolutely necessary, but they will make the mechanic's work much easier.

Preliminary Testing

Before disassembling a pump, test it thoroughly, if possible, and record the results. A comparison of this test with periodic tests recommended in form F-1031, Section 1000 can often reveal specific pump troubles. Excessive speed, for instance, indicates that impellers and/or wear rings are probably worn.

Cleaning

The continued satisfactory operation of a pump depends to a great extent upon the cleanliness of its internal parts. Sand, dirt or other abrasive material will wear bearings, gears and related parts. Before disassembling a pump for repairs, be sure to clean its exterior. Make sure the working space, benches and tools are clean. Use only clean, lint-free cloths to wipe off components. Before reassembling a pump or its components, be sure to clean them thoroughly.

Pump Bodies and Impellers

Flush out these components and related parts with clean water. Use a stiff brush to remove loose scale, caked sediment, etc. Be sure to remove all traces of old gaskets. Examine pump bodies, covers, adapters and fittings for cracks, severe corrosion or other damage. Almost all damage to these parts results from improper use or maintenance, or from freezing. Replace defective parts.

Bearings, Gaskets, Seals and O-rings

Parts of this nature are frequently damaged during removal or disassembly. In addition, they sometimes deteriorate or lose their effectiveness because of age or misuse. Replacing these parts whenever overhauling a pump is a good policy.

Impeller Shafts

Examine shaft for severe scratches, grooves or corrosion - especially under mechanical seals. If scratches are not severe, clean them with a fine-cut file.

Installing Ball Bearings

Most Waterous pumps are designed so that ball bearings fit tightly on their shafts and have relatively loose fits in the bearing housings. When mounting these bearings on shafts, always apply force to the inner races. When bearings have a tight fit in the housings, and a heavy force is necessary to install them, be sure to apply force only to the outer bearing races. For either type of fit, applying force to the wrong bearing race may damage the balls and race.

Installing Body Gaskets

To provide added sealing for gaskets between body halves, or between bodies and intake adapters, coat both sides of these gaskets with a suitable sealant. A compound such as Permatex Super 300 is recommended for this application. Be sure all traces of previous gaskets and sealant are removed before installing new gaskets.

Disassembly

A CP-5 Series pump may be disassembled by removing the pump and transmission together, and then disassembling the pump is usually the easiest method. Refer to service parts list (SPL), available at waterousco.com, for component identification.

- SPL83421, CP-5 Series Pump Body
- SPL83422, CP-5 Series Pump Impeller Shaft
- SPL83423, Extra Heavy Duty K Transmission

Disassembly (con't)

► **To disassemble the pump, perform the following:**

1. Remove two (2) hex head screws (B12) and lock washers (B14) that attach to the intake adapter (B3)
2. Remove mounting bracket (B5) from the volute body (B1).
3. Remove cooling line (B21) from the intake adapter (B3).
4. Remove ten (10) hex head screws (B11) and lock washers (B14) that attach the intake adapter to the volute body (B1).
5. Remove intake adapter (B3) using two (2) jacking screw holes.
6. Remove O-rings B6 & B7 and discard.
7. Remove lock nut (S9) and nord lock washer (S10) from first stage impeller (S1).
8. Remove impeller using puller.
9. Remove square key (S8) from impeller shaft (S3).
10. Remove ten (10) hex head screws (B10) and lockwashers (B14) that attach the pump head (B2) to the volute body (B1).
11. Remove volute body (B1) from pump head (B2) and transmission.
12. Remove retaining ring (S7).
13. Remove second stage impeller (S2) using puller.
14. Remove mechanical seal silicon carbide ring from the back of the second stage impeller (S2).
15. Remove and discard O-rings (B6 & B7).
16. Remove four (4) lock nut (T121) and lock washers (T27) from studs (T121) on transmission (T13).
17. Remove pump head (B2) from transmission (T13).
18. Remove mechanical seal primary ring from the pump head (B2).

Reassembly

► **To reassemble the pump, perform the following:**

1. Apply light coating of grease to the O-ring of the mechanical primary ring (S6) and install it into the groove of the pump head (B2).
2. Protect sealing surface, line up pin with the slot of the primary ring, and press squarely into bore of pump head until it is seated.
3. Wipe seal surface with denatured alcohol and a clean cloth.
4. Carefully install pump head (B2) onto the transmission.
5. Place square key (S8) into impeller shaft (S3).
6. Apply light coating of grease on ID of second stage impeller (S2) bore groove, install silicon carbide O-ring.
7. Line up impeller pin (S13) with the groove on the silicon carbide ring.
8. Press silicon carbide ring onto the second stage impeller (S2).
9. Apply high pressure grease onto second stage impeller (S2).
10. Line up keyway of second stage impeller (S2) into the key (S8) of the shaft (S3).
11. Push the second stage impeller until it seats against the shoulder of the shaft (S3). An installation tool can be used to prevent breakage of mechanical seal.
12. Slide retaining ring (S7) until seated into groove.
13. Install volute body (B1) onto pump head (B2).
14. Insert hex head screws into volute body. Torque hex head screws to 210 lb-ft.
15. Install first stage impeller (S1) using press.
16. Install lock nut (S9) and nord lock washer (S10) onto first stage impeller (S1). Apply Loctite 542 & torque lock nut (S9) to 75 ft-lb.
17. Install the two (2) O-rings, one (1) on the face and one (1) on the turn (B6 & B7).
18. Install the ten (10) hex head screws that attach the intake adapter (B3) to the volute body (B1).
19. Install mounting bracket (B5) onto intake adapter (B3).
20. Install cooling line (B21) onto intake adapter (B3).

Testing

Before a pump can be returned to service, it is advisable to give the pump a hydrostatic and operational tests to check it for leaks and to make sure the pump operates properly.

Hydrostatic Testing

1. Connect the pump to a hydrant or other pressurized water supply.
2. Close all drain lines and open the discharge and priming valves.
3. Open hydrant until the water runs out through the discharge valves and discharge pipe in priming pump (if used).
4. Close all valves. Be sure to evacuate all air from the pump.
5. Check for leaks with a portable light. If leaks are discovered, tighten connections or attaching parts as necessary. Repeat until all leaks are eliminated.

NOTE: If a mechanical seal is used, the seal may leak under hydrostatic pressure; however, it should stop leaking after the seal faces are run in during operational testing.

6. Shut hydrant valve after all leaks are eliminated.
7. Drain pump completely and disconnect intake hose.

Operational Testing

1. Operate the pump at its maximum intended service pressure. Do not exceed 1350 psi.
2. Check for leaks with a portable light. If leaks are discovered, stop the pump and tighten connections or tighten attaching parts as necessary. Repeat until all leaks are eliminated.
3. Check for unusual noises, oil leaks, overheated bearings, etc. while the pump is running. If anything unusual is discovered, stop the pump immediately and determine the cause of the problem.

NOTE: After reassembling pump, perform vacuum test per NFPA 1911, before the truck is placed back in service.

Vacuum Test

1. Remove all caps except openings without valves. Close all discharge, intake and drain valves and other similar openings. Operate priming device to create a vacuum of about 22 in. Hg/.735 atmosphere in pump, then stop primer and engine.
2. Watch the pressure gauge; if vacuum drops more than 10 in. Hg/.334 atmospheres in five (5) minutes, listen for air leaks around O-rings, gaskets, valves, etc.
3. Replace gaskets, O-rings or otherwise repair source of trouble.
4. Repeat test.