



## INSTALLATION and MAINTENANCE MANUAL

### 3 and H-MC SERIES

#### ROTOGEAR™ SEALLESS PUMPS



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**ISO 9001**

## GENERAL INSTRUCTIONS

This Manual covers the “3” and “H” series Mag drive pumps.

Upon receipt of your Liquiflo pump verify:

- A) The equipment has not been damaged in transit.
- B) The pump model number and serial number are stamped on the pump's rear housing.

**RECORD**

**Model:**\_\_\_\_\_ **Serial No.**\_\_\_\_\_

**NOTE:** By adding a **K** prior to the pump's model number a repair kit can be obtained which consists of the following parts: drive and idler gears, drive and idler shafts, retaining rings, wear plates, keys, housing and bearing lock pins, o-rings and bearings.

## SYMBOL EXPLANATION

- A) Work Safety Symbol



This symbol indicates remarks applicable to operational safety, where risks for health and life of personnel may be posed. All cautions should be passed on to other users.

- B) Attention Symbol

**ATTENTION**

Special attention must be paid in order to maintain a correct operating procedure and to avoid damage to the pump and/or other plant equipment.

## INSTALLATION OF PUMP AND MOTOR ASSEMBLY

**ATTENTION**

All items included in this section.

The following should be observed for proper installation of the pump.

- A) Pump should be accessible for servicing and inspection.
- B) The foundation area should be rigid and level for maintaining pump alignment.
- C) The inlet should be as close to the liquid source as practical and preferably below it.
- D) Piping should be supported. **Do not use** the pump as a pipe hanger.
- E) Install valves and unions to isolate the pump during maintenance.

- F) Suction and discharge piping should be the same size or larger than the inlet and outlet ports.
- G) Clean piping as necessary to remove dirt, grit, weld slag, etc.
- H) If the Liquiflo pump was delivered as a complete assembly, it was properly aligned at the factory. Alignment should be checked by taking measurements at the coupling. Flexible couplings are not intended to compensate for misalignment. Therefore, both angularity and parallelism should be checked and corrected. If these are off, by more than 0.015 inches (0.4 mm), the assembly should be realigned.
- I) For further instructions on mounting or installing your pump, refer to the Hydraulics Institute Handbook.
- J) A positive displacement pump should have a pressure relief valve installed in the discharge line.
- K) Maximum particle size capable of being passed by the pump is 37 microns. A filter of at least 400 U.S. Mesh should be installed in the suction line. 312, H12 and 314 particle size is 60 microns with a filter mesh of 230 U.S.. Concentration of solids, exceeding 1% is not recommended as wear rates will increase to unacceptable levels.



## START UP

Insure motor is locked out, prior to rotating pump by hand.

- A) Turn the pump by hand to insure that it turns freely.
- B) Jog the motor to check the rotation. As viewed from the pump end a clockwise rotation of the motor will result in fluid discharge to the left. Counterclockwise rotation will result in fluid discharge to the right. The 312, H12 and 314 are opposite.
- C) The pump should be operated with at least a 20-psi (1.4 bar) differential pressure.
- D) The pump is capable of pulling a dry lift, but it is still recommended to prime the pump prior to start up.
- E) **Do not** operate the pump without fluid in it for more than 30 seconds.

**ATTENTION****REMOVAL FROM SYSTEM**

When the pump is handling flammable, toxic or hazardous fluid, flush the pump prior to removal from the piping system. Prior to flushing and disassembly consult the Material Safety Data Sheet (MSDS) for the pumped fluid to ensure procedures and precautions as specified are adhered to. Exercise extreme care to avoid contact with the fluid.

**ATTENTION**

Insure that the motor is locked out.

**MAINTENANCE AND REPAIR**

The pump has internal bearings and wear plates, which require replacement over time.

The selection of a seal-less pump may have been due to a concern for leakage of hazardous liquids. When performing maintenance on this pump, cautionary steps should be taken to ensure proper drainage or cleansing of the liquid inside the pump prior to disassembly.

**WORK SAFETY**

Magnetic drive pumps contain strong magnets, which pose health risks. Based on this the following must be observed.



- A) Individuals with cardiac pacemakers should avoid repairs on these units.
- B) Individuals with internal wound clips, metallic wiring, or other metallic prosthetic devices should avoid repairs on these units.
- C) Strong magnetic field can cause tools and parts to slam together; injuring hands and fingers.

Keep magnets away from credit cards, computers, computer discs and watches.

**MAINTENANCE**

Flush the pump and drain the containment can by removing the 1/8-inch NPT pipe plug from the front housing.

**ATTENTION**

Insure the pump's motor switch is in the "*off*" position and locked out.

## DISASSEMBLY

- 1) Remove the coupling guard and disconnect the flexible coupling if necessary.
- 2) Disconnect the piping from the pump's center housing (21).

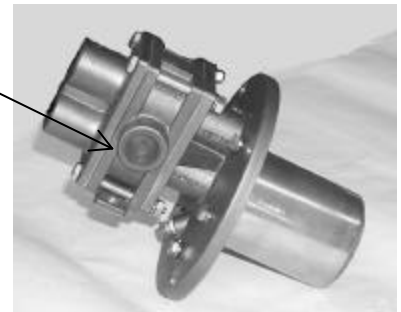
**NOTE:** For the 312, H12 and 314 go to step 17.

- 3) Remove the four front housing bolts (27), housing nuts (26) and the lock washers (31), which secure the front housing to the pedestal (16).



Cartridge

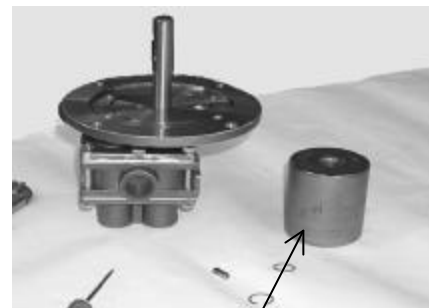
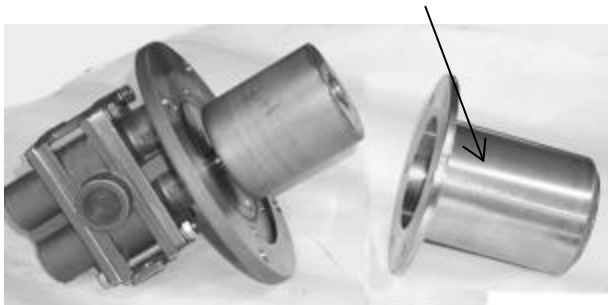
Pedestal



- 4) Remove the pump's cartridge from the pedestal by pulling the cartridge straight out.

**NOTE:** Force must be applied to overcome the magnetic field.

- 5) Remove the six containment can screws (18) and lock washers (32) which secure the front housing to the containment can (12).
- 6) Separate the containment can from the front housing.

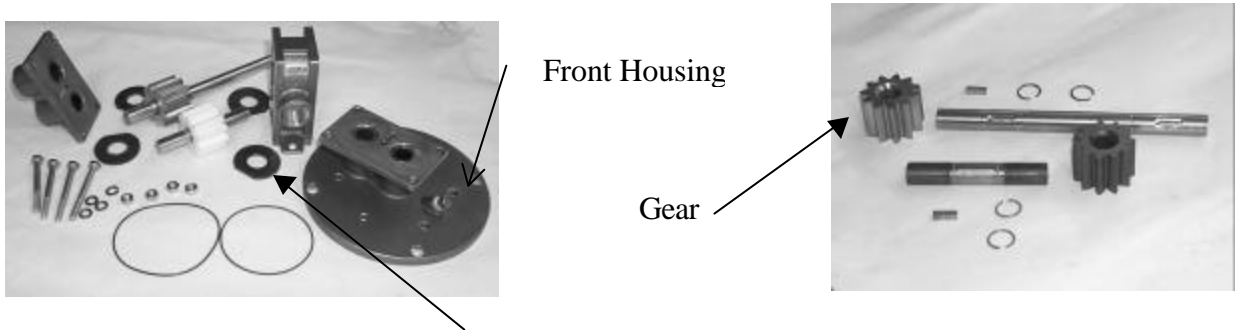


Inner Magnet

- 7) Discard the o-ring (19).
- 8) Remove the inner magnet assembly (11) from the drive shaft (20) by removing the retaining ring (28). Remove retaining rings by inserting a pointed tool in the split and prying off.

**NOTE:** Exercise care during removal as not to damage the grooves.

- 9) Remove the inner magnet and key (13).
- 10) Remove the four housing bolts (4), nuts (30) and lock washers (29) that secure the front and rear housing (2) to the center housing (21).



- 11) Remove the o-rings (5) and wear plates (7).
- 12) Remove the drive and idler shaft assemblies.
- 13) Remove the gears (22) and (6) from the shaft by removing the retaining rings (28).
- 14) Remove the keys (23A) and (23B).
- 15) Remove the bearings (3), (24) and the bearing lock pins (25) from the front and rear housings. Removal is generally accomplished by destroying the bearing.  
**NOTE:** When removing the bearings be careful not to damage the bearing bores.



- 16) Remove any burrs on shafts and bearing bores by polishing prior to reassembling pump.

**NOTE:** This is important to insure the proper fit of parts and the prevention of leaks.

**Caution:** Do not reuse O-rings, bearings and retaining rings. When tightening the housing bolts use a star pattern torque sequence on the fasteners to insure even compression on the O-ring's surface. Repeat this process several times waiting between re-tightening. This is necessary as the Teflon® will cold flow.

Bolt Size	Torque in-lbs (NM)
10-32 UNF	28 (3.2)
1/4-20 UNC	60 (6.7)
1/4-28 UNF*	70 (8)
5/16-18 UNC	90 (10)

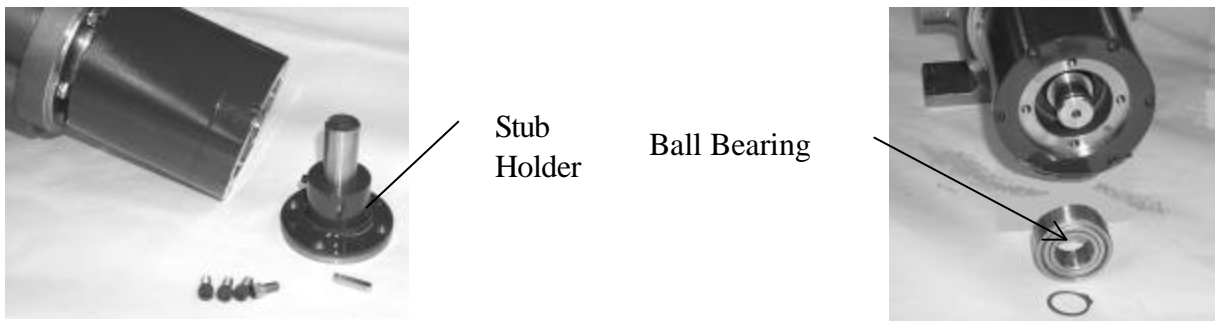
\*For containment can screws.

## 312, H12 and 314 Continued from Step 2

**Caution:** The 312, H12 and 314 pumps weigh approximately 70 and 90 lbs. (32 and 41 kg), respectively.

- 17) Remove the coupling hub, keys (31) and stub shaft (16) by loosening the setscrews (17).
- 18) Remove the stub holder (32) by removing the holder screws (15).

**Note:** If the stub holder is difficult to remove there are two, 1/4 -20 UNC tapped holes for jacking screws.



- 18) Remove the external snap ring (27) and ball bearing.

The magnetic couplings supplied with these units are extremely powerful. Never place your fingers so that a rapid pull from the magnets will place your fingers between two hard surfaces.

- 19) Using tool Pt.No. S314016 (available from Liquiflo), fasten hub to the outer magnet assembly using .25-20 UNC by 1.5 inch long screws and turn threaded rod clockwise to remove the outer magnet assembly.
- 20) Go to steps 6 through 9 listed above.
- 21) Remove the six housing screws (4) and lockwashers (30) that secure the front housing (8) to the center housing (21).



- 22) Go to step listed above 11 through 14 listed above.
- 23) Remove the six housing screws (4) and lockwashers (30) securing the rear housing (2) to the center housing (21).
- 24) Go to steps 15 and 16 listed above.

## OUTER MAGNET REMOVAL

- 1) Remove the pedestal (16) from the power frame, C-face adapter or motor by removing the four screws (15).



- 2) Remove the pedestal.
- 3) Loosen the two setscrews (17) which hold the hub (33) onto the motor shaft.
- 4) Remove the outer magnet assembly.
- 5) For re-assembly apply a small amount of anti-seize to the motor shaft.
- 6) Install outer magnet assembly onto motor shaft.
- 7) Position the outer magnet as follows:
  - a) For 56C-face motors, the end of the motor shaft must be flush with the inner surface of the hub. 143/145TC shafts should protrude 1/16 in. (1.6 mm)
  - b) For IEC motors (metric bore) the outer magnet's hub is positioned via a snap ring installed in the hub. Install hub until it bottoms out against the snap ring.

## Trouble Shooting Guide

<b>Problem</b>	<b>Possible Cause</b>	<b>Remedy</b>
No Discharge	Pump not primed	Verify suction pipe is submerged Increase suction pressure Open suction valve
	Wrong direction of rotation	Reverse motor leads Reverse suction and discharge piping
	Valves closed	Verify valves are open
	Bypass valve open	System pressure higher than relief setting Close bypass valve
	Air leak in suction	Tighten connections Apply sealant to all threads Verify suction pipe is submerged
	Clogged strainer	Clean strainer
	Pump worn	Rebuild pump
	Magnetic coupling broken free	Stop pump. Wait till there is no rotation restart pump
Insufficient Discharge	Inlet pressure to low	Increase suction pressure Verify suction piping is not to long. Fully open any suction valves
	Clogged strainer	Clean strainer
	Speed to low	Increase driver speed if possible A larger size pump may be needed.
	Bypass valve open	System pressure higher than relief setting Close bypass valve
	Pump worn	Rebuild pump
Loss of suction after satisfactory operation	Increase in fluid viscosity	Heat fluid to reduce viscosity Decrease pump speed
	Air leaks in suction line	Tighten connections Apply sealant to all threads Verify suction pipe is submerged

Excessive power consumption	Fluid viscosity higher than specified	Heat fluid to reduce viscosity Decrease pump speed Increase driver horsepower
	Gear clearances insufficient for viscosity	Purchase gears trimmed for the correct viscosity
	Differential pressure greater than specified	Increase pipe diameter
Rapid pump wear	Abrasives in fluid	Install suction strainer
	Corrosion wear	Materials of construction not acceptable for fluid being pumped
	Extended dry running	Install power sensor to stop pump
	Discharge pressure too high	Increase pipe diameter Decrease pipe run
	Misalignment	Align pump and motor