



## Series 2100 Trash- and Solids-Handling Centrifugal Pumps

# IMPORTANT Safety Precautions

In order to minimize the risk of accidents in connection with the service and installation work, the following rules should be followed:

1. Never work alone. Use a lifting harness, safety line and a respirator as required. Do not ignore the risk of drowning!
2. Make sure that there is sufficient oxygen and that there are no poisonous gases present.
3. Check the explosion risk before welding or using electric hand tools.
4. Do not ignore health hazards. Observe strict cleanliness.
5. Bear in mind the risk of electrical accidents.
6. Make sure that the lifting equipment is in good condition.
7. Provide a suitable barrier around the work area, for example, a guard rail.
8. Make sure you have a clear path of retreat!
9. Use a safety helmet, safety goggles and protective shoes.
10. All personnel who work with sewage systems shall be vaccinated against diseases that can occur.

### Follow all other health and safety rules and local codes and ordinances.

1. All electrical wiring of the pump installation must be done by a licensed electrician.
2. The **VERTIFLO FACTORY** must approve, in writing, any modifications, additions or deletions made to the pump.
3. The pump is designed primarily for water pumping. Before pumping other liquids, read the information below.
4. Avoid system pressures that may exceed one and one half times the operating point selected from the pump performance curve.
5. Should the liquid temperature rise more than 50 degrees F. above ambient, expansion joints must be installed on both the suction and the discharge ports to relieve and stress on the pump case.
6. In systems where shock wave may be generated, protective devices such as check valves/gate valves, must be installed in the discharge line to prevent shock pressures from entering the pump case.
7. In systems containing discharge check valves, gate valves, the pump will not prime against a closed valve. Check the discharge valves, making sure they are open before attempting to prime the pump. If there is a possibility of air being entrapped in the pump casing, install an automatic venting device, pet cock or ball valve, to bleed off the air.
8. Overheated pumps are extremely dangerous! Do not operate the pump with the suction or the discharge closed, as this will cause overheating. If overheating of the pump occurs, stop pump immediately, allow pump to cool, and then carefully and slowly vent the pump.
9. Regular checks for tightness of piping connections and gaskets should be made.
10. Always reinstall belts and guards before operating the pump.

## INSTALLING PUMP

Your **VERTIFLO** pump should be placed on a solid, level foundation, suitably grouted and/or bolted to the foundation. For best pump operation, locate the pump as close to the liquid level as possible. The priming ability of the pump depends on the size and installation of the piping, liquid temperature, suction lift and the type of liquid. Priming information is provided in the **VERTIFLO** sales catalog.

## PIPING

Piping to the suction and discharge ports of the pump may be made with pipe or very strongly reinforced suction hose. All pipe or hose should be supported independently to eliminate any possibility of piping strain to the pump. When operating the pump to the right of best efficiency point on the pump curve, the next larger size suction pipe is required

## ROTATION

Correct rotation of your **VERTIFLO** pump is **CLOCKWISE** when viewing the pump from the motor end. Always check for proper rotation with the coupling disconnected from the pump.

## SUCTION PIPING

1. Suction pipe should be the same size as the pump suction port, and should be as short as possible, with the least number of elbows and fittings. When design conditions are to the right of best efficiency point on the pump curve, one size larger suction pipe should be used.
2. The horizontal part of the suction pipe must be no higher than true horizontal; preferably on a gradual rise. Reducers should be eccentric with the flat portion in the top position to avoid air pockets. Long radius elbows are recommended.
3. If a suction strainer is used, the opening size should be no larger than that of the largest solid which the pump may pass. The open area of the strainer should be eight times the area of the suction pipe size.
4. Be sure all piping connections are tightly sealed. Any gasket sealant used must be compatible with the liquid being pumped.
5. The suction pipe should be installed no closer than 1½ times the pipe diameter from the bottom or side wall of the sump.
6. Any discharge from an open pipe into the sump must be positioned away from the suction pipe. A baffle must be installed between the inflow and the suction pipe at a distance at least six times the suction pipe diameter, away from the suction pipe. A bell type increaser is normally recommended on the suction side.

## VALVES

A throttling valve and a check valve is always recommended in the discharge line to protect the pump from shock, water hammer and reversed flow rotation when the pump is stopped. An air release line petcock or small ball valve must be installed between the discharge check valve and the pump, to assure priming.

## DISCHARGE PIPING

Always terminate the discharge piping at a level higher than the liquid level being pumped.

## EXTERNAL SEAL FLUSH

**VERTIFLO Series 2100** pumps have been designed with an external seal flush feature. To use, remove ¼" NPT pipe plug (26) located at 12 o'clock on the outboard face of the stuffing box cover (10). Attach external seal flush piping or tubing.

## AIR RELEASE LINE

Install the air release line as close to the discharge check valve as possible, after the pump. Recommended air release line size is:

Model 2122-3x3 and 2128-4x4	¾"	line
Model 2128L-6x6	1"	line
Model 2128L-8x8	1¼"	line

Terminate the air release line back into the sump, leaving the end of the line open to atmosphere.

## STARTING THE PUMP

**VERTIFLO Series 2100** pumps are designed to prime themselves provided the pump is filled with liquid before starting the pump. Fill the pump through the priming plug (98) provided on the top of the pump chamber.

All pumps are fitted with grease lubricated ball bearings and are greased at the factory prior to shipment. The seal cavity is filled with oil prior to shipment, but should be checked before starting.

Check the drive coupling and 'V' belt alignment before starting.

Check motor and wiring.

## WARNINGS – SAFETY FIRST

1. Electrical work must be done by a licensed electrician.
2. Turn off the power at the main junction box before working on any pump and/or motor.
3. Disconnect the fuse or circuit breaker and have the main switch properly locked out.
4. Ground the motor frame.
5. Replace all guards.

## LUBRICATION

It is recommended that all standard fitted pumps which have grease lubricated bearings be periodically inspected and lubricated with a lithium base grease with corrosion inhibiting properties. For optional oil lubricated bearings, use a good grade SAE #30 non-detergent motor oil. **VERTIFLO** pumps are shipped with oil, but should be checked before starting. Under normal service, drain and refill the powerframe housing with oil yearly. Fill the bearing housing through the fill plug item #30.

### BEARING CAVITY OIL Capacity

MODEL 2122-3X3 / 2128-4X4	56 fl. Oz.
MODEL 2128L 6x6	68 fl. Oz.
MODEL 2128L 8x8	68 fl. Oz.

The mechanical seal is a wearing part that eventually will need to be replaced. An overflow of liquid through the breather, item 114, is an indication of a possible seal failure.

### OIL CAPACITY OF SEAL CAVITY

MODEL 2122 - 3x3	20 fl. oz.
MODEL 2128 - 4x4	20 fl. oz.
MODEL 2128L- 6X6	20 fl. oz.
MODEL 2128L- 8x8	20 fl. oz.

### MOTOR BEARING LUBRICATION:

Lubricate per motor manufacturers' recommendation.

### COUPLING ALIGNMENT:

The faces of the coupling halves should be spaced far enough apart so that they cannot contact each other when the driver rotor is moved toward the pump. A minimum separation of  $\frac{1}{8}$ " is recommended. The normal tools necessary for checking the alignment of a flexible coupling are a straight edge and a taper gauge or a set of feeler gauges.

### COUPLING ANGULAR MISALIGNMENT:

A check for angular alignment is made by inserting the taper gauge or feelers at four points between the coupling faces and comparing the distance between the faces of four points spaced at 90 degree intervals around the coupling. The unit will be in angular alignment when the measurements show that the coupling faces are the same distance apart at all points.

### COUPLING PARALLEL MISALIGNMENT:

Checking for parallel alignment is made by placing a straight edge across both coupling rims at the top, bottom and both sides. The unit will be in parallel alignment when the straight edge rests evenly on the coupling rim at all positions. Allowance may be necessary for temperature changes and for coupling halves that are not of the same outside diameter. The straight edge must be parallel to the axis of the shafts. Shim under the motor as required.

### BASEPLATE GROUTING:

Foundation bolts should be tightened evenly but not too firmly. The unit can then be grouted to the foundation. The baseplate should be completely filled with grout. Foundation bolts should not be fully tightened until the grout has hardened, usually 48 hours after pouring.

### ALIGNMENT FINAL CHECK:

Parallel and angular alignment should be rechecked after the piping of the unit.

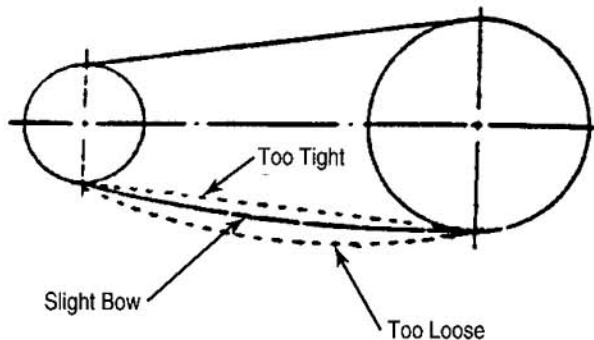
## "V" BELT DRIVE ALIGNMENT:

Proper alignment is important for long sheave and belt life. Make sure that the shafts are parallel.

## "V" BELT DRIVE TENSIONING:

"V" belts should be placed over the sheaves and in the grooves without forcing them over the sides of the grooves.

1. With all belts in their proper groove, adjust the centers to take up all slack and until the belts are fairly tight.
2. Start the drive, and continue to adjust until the belts have only a slight bow on the slack side of the drive while operating under a load.
3. Operation of a few days will allow the belts to seat themselves in the sheave grooves. It may be necessary to readjust so that the drive again shows a slight bow in the slack side.



The drive should now be properly tensioned and should operate satisfactorily with only an occasional readjustment to compensate for belt and groove wear.

## IMPELLER RUNNING CLEARANCE:

The distance between the impeller vanes and the wear plate is the impeller running clearance. This is adjusted at the factory at .020"-.030" prior to shipment. To adjust this clearance after installation, shut down the pump, disconnect the power supply and follow the instructions below.

1. Drain the pump case (1) completely by removing the drain plugs (2) from both the suction and discharge chamber.
2. Remove the clean-out cover (83) by unscrewing the hand knobs.
3. Reach inside the pump casing through the clean-out hole with a feeler gauge and measure the gap between the impeller vanes and wear plate (89).

Measure the gap at each impeller vane. If this gap is not within the allowable limits of .020"-.030", adjust the clearance as follows:

- a. Unscrew the three jack-screws (112) and jam nuts (111). Partially loosen the bearing carrier capscrews (45).
- b. Adjust the jack-screws (112) and capscrews (45) until the front clearance between the impeller vanes and wear plate falls within the allowable range of .020"-.030". Tightening the jack-screws (112) will increase the front clearance and tightening the capscrews (45) will decrease the front clearance. Tighten one set of screws and loosen the other to go in the direction required. Tighten jam nuts (111).

## SHAFT AND BEARING REPLACEMENT

1. Install the radial (impeller end) bearing (36) on the shaft (38).
2. Slide the carrier retaining ring (106) onto the shaft (38).
3. Install the thrust (coupling end) bearing (117) on the shaft (38).
4. Install the retaining ring (108) onto the shaft (38).
5. Install "O" ring into the bearing carrier groove. (optional - oil lube only)
6. Slide the bearing carrier (110) with optional "O" ring over the rear bearing such that the rear bearing slides into the bearing carrier (110). Install the retaining ring (106) in place.
7. Insert shaft assembly with bearings and carrier into the housing (31).

## REPLACING OR CLEANING CHECK VALVE:

Drain the pump casing (1) completely by removing drain plugs (2). Access to the check valve may be made by removing the check valve cover plate (76) from the top of the suction chamber of the pump casing.

Reach through the check valve cover plate opening, remove the two 5/16" Allen head shoulder bolts (118), and check valve keeper plate (53). Pull the check valve assembly out of the pump casing through the cover plate opening. Inspect the sealing surface of the check valve and make sure it is good condition and clean.

During reassembly, make sure the check valve (51) which has embossed on one side "pump side" and the VERTIFLO part number faces the inside of the priming chamber. Install the keeper plate (53) and the two 5/16" Allen head shoulder bolts. Do not overtighten.

## GENERAL DISASSEMBLY:

For replacement of: impeller, wear plate, mechanical seal, front oil lip seal, or bearing.

1. Drain pump casing completely by removing drain plug (2) from both the suction and discharge chamber.
2. Drain the seal cavity oil by removing drain plug (27) from bearing housing.
3. Drain bearing oil cavity (optional) by removing drain plug (28). NOTE: If oil is mixed with water, shaft and front oil lip seal must be inspected for wear.
4. Remove bearing housing support (35) capscrews from base.
5. Disconnect coupling or "V" belt.
6. Remove capscrews (102) which hold seal plate (10) to casing (1).
7. Pull complete assembly including bearing housing assembly, seal plate and impeller (91) from pump casing.
8. Remove impeller nut (4) and impeller washer (5) from the shaft (38). Remove impeller. NOTE: Refer to impeller-nut torque value before reinstalling impeller nut.
9. Remove wear plate (89) by removing locknut (116) through the clean-out cover (83) hole. Check wear plate for wear. Replace if required.
10. Remove seal assembly (17) from seal well as follows:
  - a. Remove spring and rotating element of the seal.
  - b. Remove the stationary element gently (silicon carbide is very brittle) from the seal cavity OR if the seal plate is removed from the shaft, the stationary seal will slide off the shaft along with the seal plate.

NOTE: Before reinstalling the seal assembly, make sure that the stationary rubber "L" cup and both mating silicon carbide rings, rubber bellows and shaft surface under the seal area are in good condition. Be sure to lubricate with water before reinstalling. If necessary, replace the seal assembly.

11. Remove capscrews (33) to disassemble bearing housing from seal plate. Replace gasket (105) if worn.
12. Remove the shaft assembly with bearings and bearing carrier out of the bearing housing (31).
13. Check both lip seals (42), replace if necessary.
14. Remove the snap ring (106) from the bearing carrier (110) which will allow the bearing carrier (110) to slide off the shaft (38) along with the optional "O" ring (109).
15. Remove the snap ring (108) from the shaft (38).
16. Remove bearings (36 & 117) from the shaft (38) using a hydraulic press. Replace the bearings if necessary.
17. **VERTIFLO** recommends replacing all gaskets when reassembling this pump.

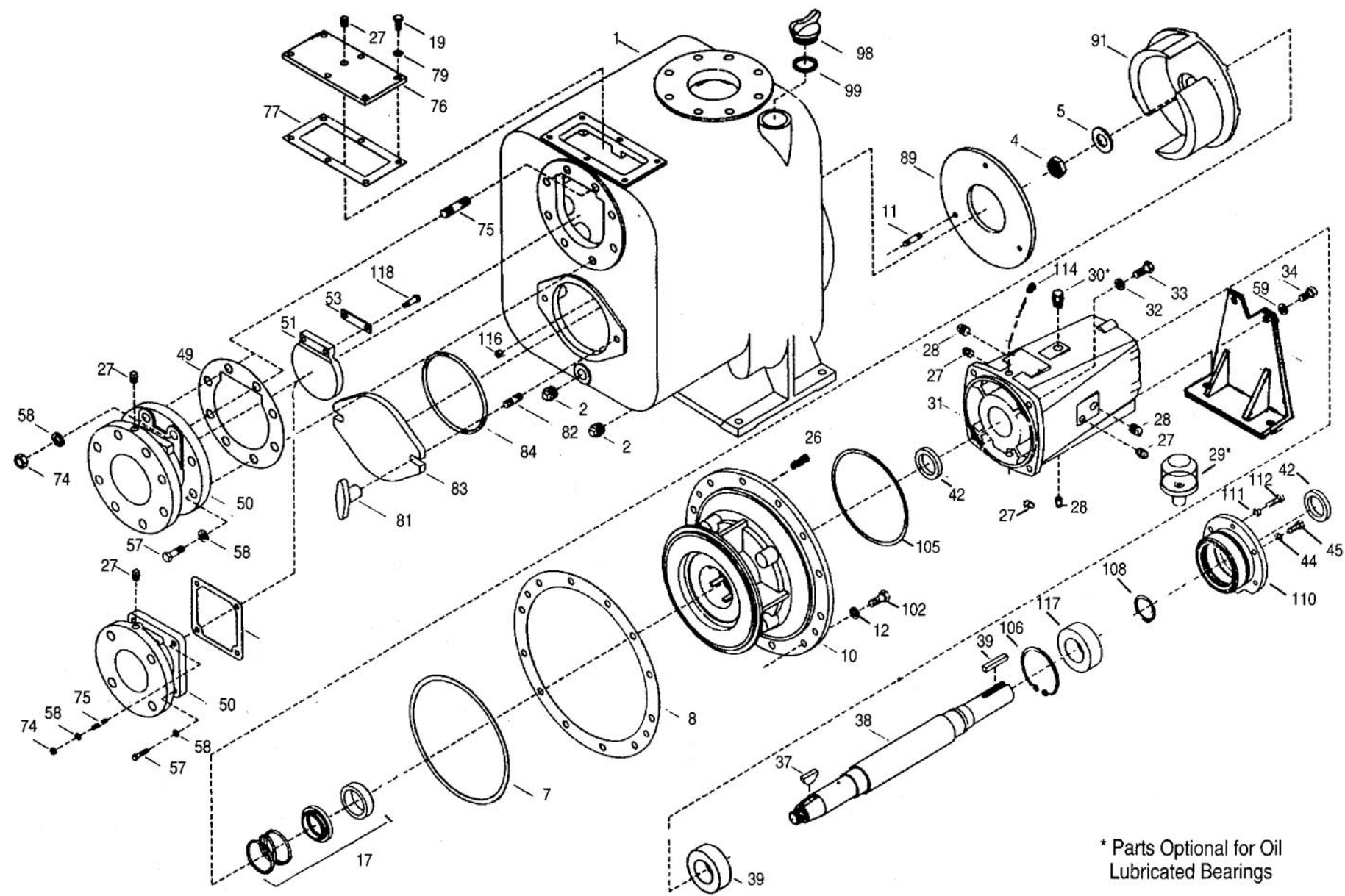
## IMPELLER NUT TORQUE AT INSTALLATION:

Use the following impeller nut (4) torque value during installation. NOTE: Before installing the impeller (91) onto the shaft (38), apply a coat of loctite grade 242 into the impeller bore to help prevent corrosion.

ALL PUMP MODELS ..... 125-150 FT. LBS.

## STORAGE

1. Flush the suction and discharge line, pump casing and impeller of all solids by pumping clean liquid for a short time.
2. Drain pump casing, suction and discharge line.
3. If complete draining is impossible, add a small amount of anti freeze into the pump casing. Rotate shaft by hand for mixing.
4. Drain oil from the bearing housing cavity (optional construction) and seal cavity and refill both cavity with proper grade of oil. (refer to the lubrication section)
5. Seal off the suction and discharge ports.
6. Spray the pump casing interior with a commercially available anti-rust and anti-corrosion petroleum aerosol.
7. Store the unit in a clean and dry area.
8. Once a month rotate the pump shaft by hand to avoid freeze up and to lubricate the bearings.



\* Parts Optional for Oil Lubricated Bearings

## Pump Parts List

<b>Key</b>	<b>Description</b>	<b>Key</b>	<b>Description</b>	<b>Key</b>	<b>Description</b>
1	Casing	33	Capscrew	83	Cover, Clean Out
2	Pipe Plug	34	Capscrew	84	O-Ring Cleanout
4	Locknut, Impeller	35	Foot, Mounting	89	Plate, Wear
5	Washer, Curved	36	Bearing, Radial	91	Impeller
7	Gasket, Seal Head	37	Key, Impeller	98	Priming Plug
8	Gasket, Case	38	Shaft	99	Gasket, Wing Plug
10	Cover, Seal Head	39	Key, Coupling	104	Gasket, Molded
11	Stud - Wear Plate	42	Lip Seal	105	Gasket, Power Frame
12	Lockwasher	44	Lockwasher	106	Ring, Snap
17	Seal, Single Mech.	45	Capscrew	108	Ring, Snap
19	Capscrew	49	Gasket, Suction Inlet	110	Thrust Bearing Housing
26	Seal Flush Plug	50	Inlet, Suction	111	Hexnut, Jam
27	Pipe Plug	51	Valve, Check	112	Capscrew
28	Pipe Plug	53	Keeper, Valve	114	Seal Chamber Vent Plug
29	Oiler (Optional)	76	Cover, Check Valve	116	Locknut, Wearplate
30	Pipe Plug (Oil Lube)	77	Gasket, Check Valve	117	Bearing, Thrust
31	Housing, Power Frame	81	Handknob	118	Allen Screw Shoulder
32	Lockwasher	82	Stud		

Refer to Pump Serial Number and Part Item Number when ordering parts.

# Trouble Guide

– The following are some common causes of problems that may arise:

SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
1. Will not prime.	<ol style="list-style-type: none"> <li>No liquid in pump casing</li> <li>Loose suction inlet (50) and / or suction check-valve cover plate (76)</li> <li>Worn suction inlet gasket (49) and/or cover plate gasket (77)</li> <li>Loose suction chamber drain plug (2)</li> <li>Worn pump shaft seal assembly (17)</li> <li>Loose clean-out cover (83) and/or worn clean-out gasket (84)</li> <li>Air release line clogged</li> </ol>	<ol style="list-style-type: none"> <li>Fill pump casing with liquid being pumped.</li> <li>Tighten bolts (57).</li> <li>Replace with new gaskets.</li> <li>Tighten plug, use pipe dope or Teflon® tape</li> <li>Install new seal.</li> <li>Replace with new gasket and tighten hand-knobs (81).</li> <li>Clean release line clogged.</li> </ol>
2. Suddenly stops pumping.	<ol style="list-style-type: none"> <li>Clogged suction line or suction strainer (if used).</li> </ol>	<ol style="list-style-type: none"> <li>Clean suction line &amp; strainer.</li> </ol>
3. Stops pumping until motor is stopped and restarted.	<ol style="list-style-type: none"> <li>Collapsing suction hose line</li> </ol>	<ol style="list-style-type: none"> <li>Replace suction line and strainer.</li> </ol>
4. Slowly stops pumping.	<ol style="list-style-type: none"> <li>Clogged impeller, volute, suction line or check valve</li> <li>Loose clean-out cover (83)</li> </ol>	<ol style="list-style-type: none"> <li>Clean-out debris from impeller eye area, suction check valve. (Follow instructions on other pages)</li> <li>Clean sealing surface &amp; "O" ring gasket and tighten hand knobs.</li> </ol>
5. Excessive leakage (oil + liquid being pumped) through seal cavity vented hole.	<ol style="list-style-type: none"> <li>Worn pump shaft seal (17)</li> </ol>	<ol style="list-style-type: none"> <li>Replace seal (follow instructions on other page).</li> </ol>
6. Will not hold prime.	<ol style="list-style-type: none"> <li>Dislodged or worn check valve (51)</li> <li>Loose cleanout cover (83).</li> <li>Loose check valve cover plate (76).</li> </ol>	<ol style="list-style-type: none"> <li>Clean or replace check valve— clean sealing surface.</li> <li>Check gasket (84), replace if necessary. Tighten cover plate.</li> <li>Check gasket (77). Replace if necessary. Tighten cover plate screws.</li> </ol>
7. Poor Performance.	<ol style="list-style-type: none"> <li>Worn impeller, seal or wear plate (89)</li> <li>Motor not up to speed: a) low voltage b) worn bearings</li> <li>Excessive clearance between impeller and wear plate.</li> </ol>	<ol style="list-style-type: none"> <li>Install new impeller, seal or wear plate.</li> <li> <ol style="list-style-type: none"> <li>Larger lead wires required.</li> <li>Replace or rebuild.</li> </ol> </li> <li>Adjust to .020" to .030" clearance. (Follow instructions on other pages.)</li> </ol>
8. Noisy Operation.	<ol style="list-style-type: none"> <li>Worn motor bearings.</li> <li>Low discharge head.</li> <li>Impeller clogged.</li> <li>Worn coupling or misalignment.</li> <li>Units operating at extreme left or right end of performance curve (capacity too high or too low).</li> </ol>	<ol style="list-style-type: none"> <li>Replace.</li> <li>Throttle discharge.</li> <li>Remove clean-out cover and clean impeller.</li> <li>Replace or realign coupling.</li> <li>Adjust for best performance point of operation.</li> </ol>

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