



OWNER'S MANUAL



CDL GEAR PUMPS 1/2" AND 1"

Les Équipements d'Érablière CDL inc.

Thank you for choosing a CDL stainless steel gear pump. Our 40 years of experience working with sugarmakers ensures you that you acquired a performant and quality piece of equipment.

FINDING INFORMATION

Make a record for future use

Brand: _____

Purchased Date: _____

Model Number: _____



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GENERAL INFORMATION

Construction

Stainless steel rotary gear standard pump housings, shafts and helical gears are made of top quality stainless steel. Pumps are made with stainless bearings, grease fittings and carbon bearings. Dynamic seals insures long leak free operation.

Application Range

Stainless steel rotary gear pumps are of the external gear positive displacement type, displacing a finite volume of fluid with each shaft revolution. As such, capacity varies in direct proportion to pump speed. They are suited to handle clear lubricating and non-lubricating fluids, with PH ranging from 4 to 11, and temperatures to 400F. These pumps handle viscous fluids to 100,000 cps (462000 SSU) at reduced shaft speeds, with flow rates to 175 GPM (662 LPM), differential pressures to 150 psig (10.3 BAR), and suction lift capability to 20 feet (6.1 meters) for new pumps.

Field Inspection

Stainless steel rotary gear pumps may be readily inspected in the field usually without removal from the drive or system plumbing. Simply remove the cover screws to pull the cover. Before attempting an inspection, follow safety precautions and be sure to read and understand this manual.

New Pump Receipt Inspection

Upon receipt, check for obvious shipping damage and completeness to purchase order requirements. Shortages or damage should be reported immediately to the carrier and to your CDL representative.

Storage

If the pump is to be stored prior to installation, it is recommended that it be left in the original shipping carton with all shipping plugs in place and stored in a dry environment avoiding temperature variations. Contact the motor manufacturer for specific motor storage information.



INSTALLATION

Site Preparation

Choose a site that allows easy access to the pump for maintenance. Consider protection from the elements. Guard against drips and spray from nearby equipment. Choose a solid foundation for mounting. If noise is a concern, consider a rubber pad under the pump base to dampen.

Flow Direction

Gear pumps will perform equally well in either. To change flow direction effectively reversing the suction and discharge ports, simply switch driver rotation by following motor wiring diagram instructions and change the location of the relief valve as shown below. Most pump motor units are factory supplied with counterclockwise shaft rotation (when viewing the pump from the shaft end).

Suction Plumbing

Suction side plumbing considerations are key to desirable pump performance. Minimize head loss by assuring sufficient pipe size (especially important for highly viscous services). Generally the same size pipe as the pump ports is adequate. For long runs (beyond 3 feet) or viscous fluids, use one or two pipe sizes larger. Strive to keep the lines as short and straight as possible. If flexible lines are used, they should be selected to prevent wall collapse. To keep the pump from being starved or running dry, be sure there is sufficient fluid supply. A flooded suction is generally preferred. Suction lifts over 3 vertical feet and long horizontal runs (beyond 3 lineal feet) require a foot or check valve below the level of the liquid being pumped. When taking suction from a tank or vessel, position the inlet above the maximum expected level of solids. Use full-bore ball valves or gate valves to minimize restriction. Suction strainers should be properly sized to minimize pressure drop and positioned for easy cleaning access. If start-up screens are used, be sure they are removed prior to placing the system into regular operation. Orient lines so as to prevent formation of air pockets. Be sure all joints are tight. Flush out all suction lines prior to installing the pump.

General Piping

For further ease of maintenance, use union fittings to connect the pump to the system. Install a discharge priming tee for convenience. Do not spring the piping to connect the pump. Use piping supports or hangers as required. When necessary, provide for thermal expansion and contraction to avoid placing strain on the pump.

Alignment

Proper alignment is key to seal and bearing performance. Improper alignment can lead to premature pump failure. Check the alignment carefully between the pump and the drive. (See Figure #1 on Pg.4 for more information regarding Proper Alignment)

Belt Drive

Though alignment is not as critical as direct connected, ensure that the pump and motor shafts are parallel and in line. For units suitable for belt drive, be sure that the belt tension is adequate (per the belt manufacturer's recommendation) but do not overtighten. For heavy pulley loads, models are equipped with external ball bearing supports. A single 1/2" (A or 4L section) V-belt is satisfactory for drive speeds up to 1 HP 3450 RPM. For larger drive sizes, double-V belts are recommended. Install guards around all moving parts in accordance with OSHA or your local safety laws to prevent personal injury.

Fasteners

Unless the pump has been shipped directly from the factory, it is recommended to check all bolts and nuts for tightness to eliminate possible leakage problems or destructive vibration.



Pressure Relief

Discharge lines should be fitted with properly sized line pressure relief valves to protect both the pump and the system

WARNING

Follow National Electrical Code. Verify that electrical service is properly grounded, fused, and adequately sized for motor nameplate requirements. Check to be sure that motor wiring connections are correct referring to the wiring

diagram on the motor nameplate or inside the terminal box.

OPERATION

Pre-Startup

Prior to start-up, recheck installation as described above. Verify desired rotation by jogging the motor and make corrections if necessary. Before initial startup, pre-wet the gears and make sure the pump is adequately primed. Failure to do so could cause immediate damage to pump components. Make sure that discharge valves are open.

Startup

Start pump and check for proper operation. Mechanical seal require no adjustment. If the pump's bearing areas or seal area runs hot, shut the pump down and determine the cause. Depending on suction conditions, it may be necessary to reprime the pump for subsequent restarts.

WARNING

Dry running leads to immediate damage to pump components.

Due to tight running clearances, liquids containing solids and abrasives will accelerate pump wear.

When possible, flush the pump after each usage.

Allowing liquid to freeze in the pump can cause damage.

MAINTENANCE

Frequency

Since each installation differs, the frequency and extent of pump maintenance is best established based upon past performance. Keeping detailed maintenance records of past performance aids in determining future preventative maintenance intervals. During routine operating inspections, pay particular attention to seal and bearing areas of the pump. Consult the motor manufacturer for motor maintenance instructions.

CAUTION

Before attempting to service the pump: Disconnect motor power and release all pressure within the system. Flush the pump thoroughly with a neutralizing fluid before attempting to disassemble. Wear appropriate personal protection equipment and handle the equipment with care.



Changing Applications

Verify that all wetted parts of the pump are compatible with the new fluid to be handled and that the motor is adequately sized. Check with your CDL distributor if in doubt.

Inspect for wear

If your Gear Pump exhibits reduced flow, an inability to maintain pressure, is noisy or performs otherwise abnormally, first refer to the Troubleshooting Matrix on back. If the problem persists, the pump should be inspected for wear or damage. CDL Gear pump internals may be readily inspected in the field usually without removal from the drive or system plumbing. Simply remove the cover screws to pull the cover. Full pump removal and complete disassembly may be needed for a comprehensive inspection. Contact your local authorized distributor or the CDL service department.

Mechanical Seals

Pumps equipped with mechanical seals are of the standard pusher bellows type or wedge style. They can be expected to provide long and troublefree service provided:

- 1) Seal materials are compatible with pumped fluid and properly applied to the service.
- 2) Adequate cooling and lubrication is provided
- 3) Dry running is avoided
- 4) Abrasives are kept away from the seal area
- 5) Pump and driver are properly aligned

Recommended Spares

Repair kits are available for all CDL Gear Pumps. Each kit comes with detailed instructions. For the proper kit, contact your CDL Distributor or the factory.

Inspections for Possible Problems with Gear Pumps:

Close inspection of gear pumps removed from service will show if those pumps can be repaired. It is imperative that all disassembled parts be handled with extreme care. When necessary, clean each part individually in kerosene or other solvent which will depend upon the liquid being pumped.

Start inspection by removing the screws holding the cover to the body. A pump which has been in service for some time usually refuses to release its cover by finger pressure alone. The cover will lift off its flange if the exposed end of the drive shaft is tapped lightly with a mallet or on a wooden bench.

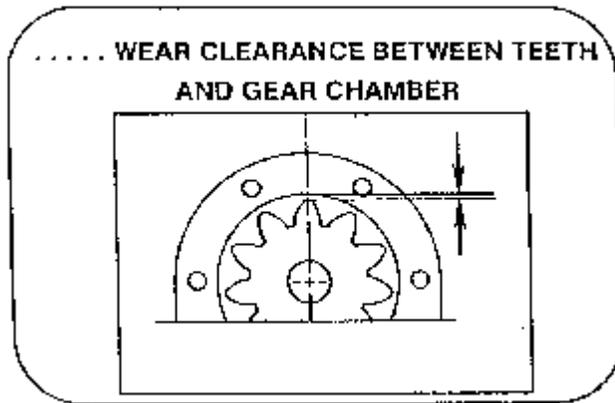
Once the cover is off and while the gears are still in the pump body, observe:

- **Wear Clearance Between Gear Teeth and Gear Chamber**
- **Bearing Wear**
- **Gear Wear**
- **Sheared Pin**
- **Bulged Cover**
- **Chemical Deterioration**
- **Scoured Shafts**



Wear Clearance Between Gear Teeth and Gear Chamber:

A new pump would barely permit a sheet of wrapping paper to be inserted (.005 - .007 inches). Greater clearance is a result of wear or scrubbing of the teeth on the chamber wall. This means metal has been scrubbed off both the gear tips and the wall. When pumping, hydraulic and mechanical forces tend to separate the gears and force the gear tips against the walls. For the gears to shift to this wear position, the shaft bearings, normally holding gears in alignment, must also be worn. Check bearing wear.



Bearing Wear:

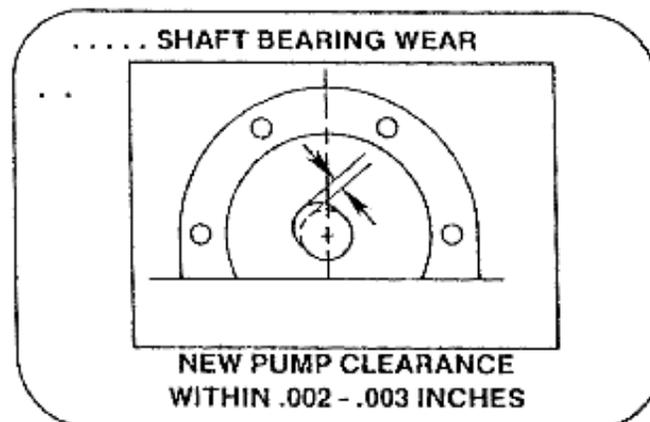
Check all bearings for wear. Since the idle shaft bearings are subjected to greater loads, they normally show greater wear. Severely worn bearings assume an egg shape. Some idea of bearing wear is obtained by removing the drive gear and shaft from the pump and re-inserting the exposed end of the shaft in each bearing as a plug gauge. (This is possible if the exposed shaft has not been damaged.) When a pump is new, clearance between the shaft and bearing is within .002 - .003 inches. This is the thickness of an average human hair. More clearance than this introduces the wear conditions described in the paragraph above. Severe wear between gear teeth and gear chamber, and bearing wear causes a pump to lose its ability to generate pressures and lift. Extreme noise and high power consumption are also symptoms. For gear tip wear, as described above, of .010 - .015 inches the pump would only have 30 - 40% of its pumping ability.

*** THIS PUMP SHOULD BE REPLACED, IT IS BEYOND REPAIR.**

Note Severe Wear Symptoms:

- Extreme Noise
- High Power Consumption
- Loss of Pressure
- Loss of Lift

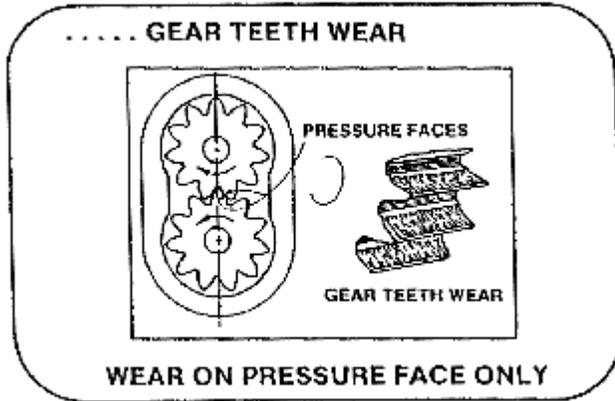
It is time to replace the pump!



Gear Wear:

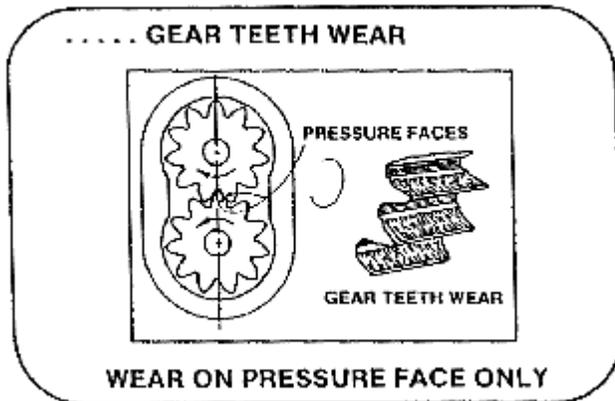
Gear teeth wear occurs on the pressure face of each tooth only. The extent of wear can be approximated by visualizing the tooth profile on the back face transposed to the pressure face. Wear can cause noise, loss of pumping, priming, or lift ability.

THIS PUMP SHOULD BE REPLACED – IT IS BEYOND REPAIR.



A second form of gear wear is on the gear side faces (thickness). It is extremely critical to pump performance (lift and pressure ability). Wear is observed by noting the level of the gear face below the flange surface. For a new pump, the gear face is even with or slightly above (.001 inches) the body flange. If the gear face falls below the flange by as little as the thickness of a sheet of wrapping paper (.005 - .007 inches) the pump will have only about 30-40% of its original ability to generate pressure and lift.

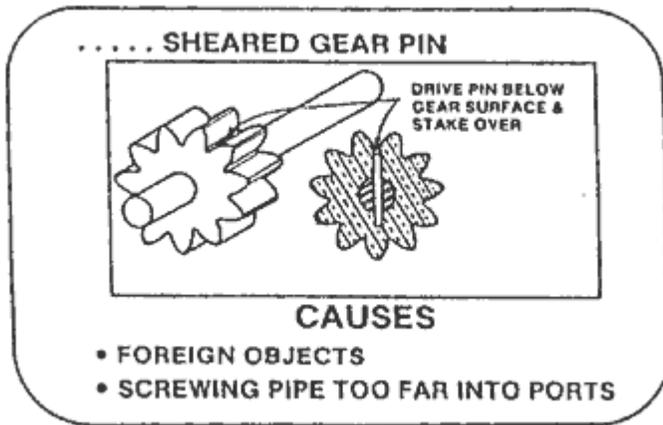
THIS PUMP SHOULD BE REPLACED – IT IS BEYOND REPAIR.



Sheared Pin:

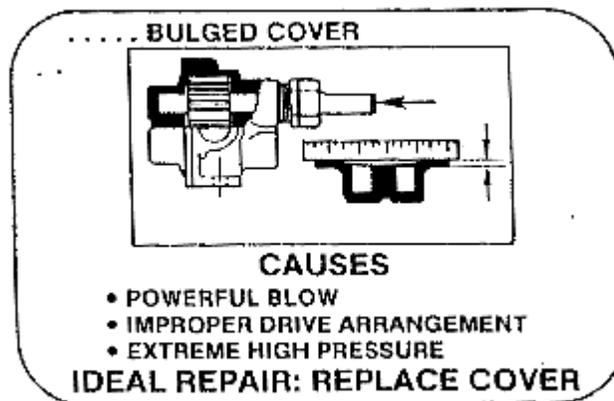
On all gear pumps, the drive gear is pinned to the shaft. The shaft of a pump with a sheared pin can be rotated but will have absolutely no pumping ability, since the gears are not turning. If the pin is sheared due to a foreign object entering the pump and jamming the gears, or by screwing the pipes too far into the ports to jam the gears, repair can be made by redrilling and driving a rod into the hole(s). Use size and number of pins as evident on damaged parts. Since bronze is a soft metal, care must be exercised when placing parts in a vice – lead or wooden vice jaw protectors should be used.

Be sure to stake over the hole to prevent the pins from working out when in operation. Check the gears for ability to mesh with each other and remove burrs or other damage with a fine file as necessary.



Bulged Cover:

A powerful blow or force on the exposed pump shaft can cause the bulged pump cover. Another cause for a bulged cover is an improper drive arrangement where excessive shaft thrust is exerted by the drive mechanism. This would also show wear on the cover and gear face. Extremely high pressure due to accidentally shutting off the pump discharge line, and where no pressure relief equipment existed, could also cause a bulged cover. Place a straight edge across the cover face and check for bowing. The clearance caused by a bulged cover permits by-pass and slippage. If the clearance is appreciable, the pump has little ability to lift and generate pressures. Emergency repair can be made by grinding or sanding the cover flat. Ideal repair is to replace the cover. When this type of damage is evident, inspect the drive gear for gear teeth damage and for a sheared pin described above.



Chemical Deterioration:

A pump exposed to a chemical not compatible with bronze and stainless steel will deteriorate rapidly to the points and symptoms described for extreme wear. The metal will have a spongy or "eaten" and etched appearance and is usually accompanied by strong, irritating odors emanating from the pump. Little can be salvaged. Caution: After handling a pump exposed to chemicals, scrub hands thoroughly to prevent bodily harm.

THIS PUMP SHOULD BE REPLACED PROVIDING ITS LENGTH OF SERVICE LIFE HAS BEEN SATISFACTORY TO THE USER.

Scoured Shafts:

A pump subjected to abrasives will show severe scour marks throughout, especially on shaft bearing surfaces. The abrasive nature of a liquid can be determined by rubbing residue or traces of liquid left in pump lightly between one's fingers. Severely scoured pumps will be worn . Wear will be accelerated and evident in the short life of the pump before loss of pumping ability. This pump should not be replaced unless abrasives can be removed from liquid.

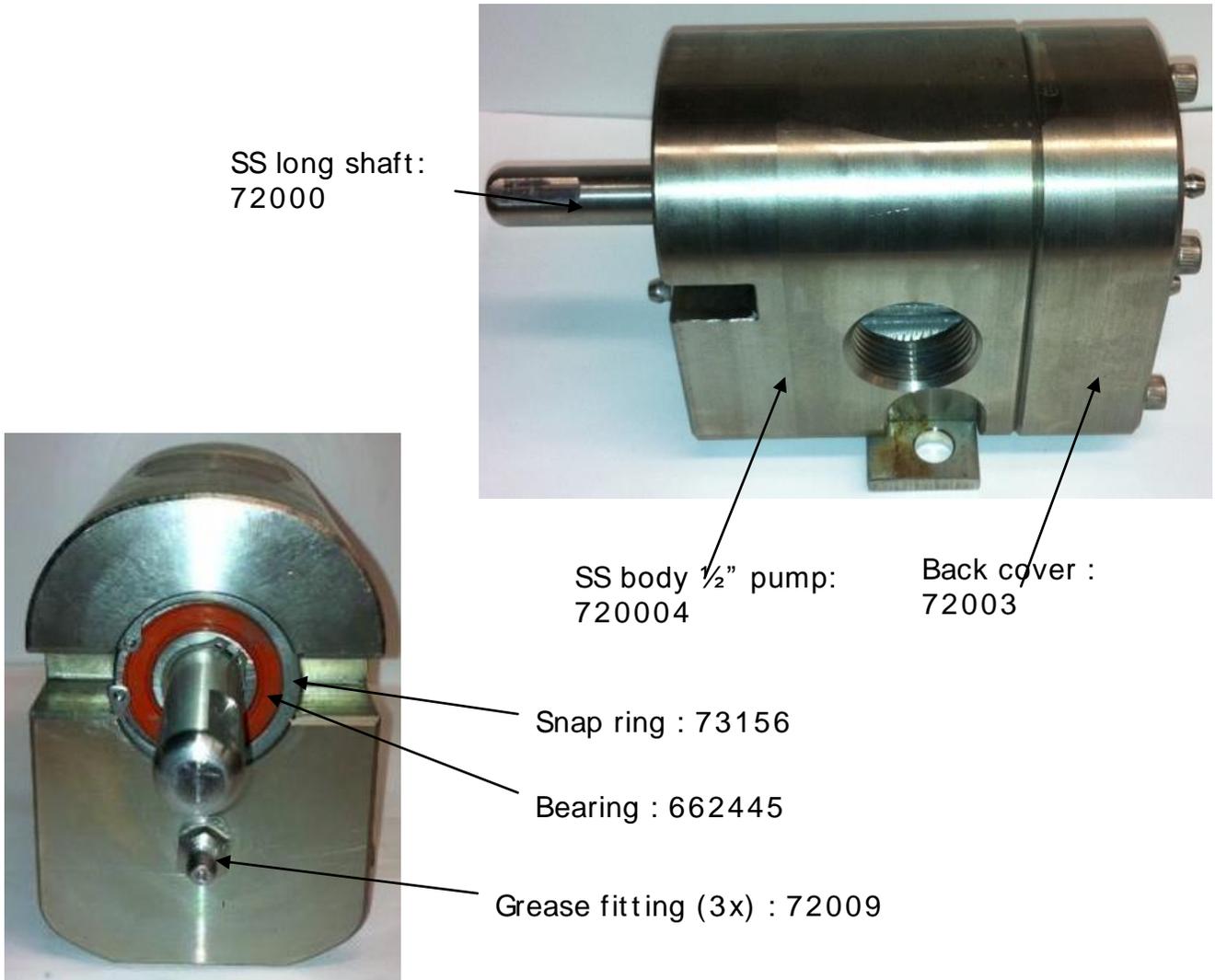


TROUBLESHOOTING GUIDE

Difficulty	Probable Cause	Remedy
No Liquid Delivery	1) Closed valves	1) Open valves
	2) Plugged suction	2) Eliminate restriction
	3) Air leak at suction	3) Locate and repair leak
	4) Suction lift too high	4) Do not exceed vapor pressure of liquid
	5) Motor wired incorrectly	5) Check wiring diagram
	6) Wrong rotation	6) Correct rotation
Low Liquid Delivery	1) Pump shaft speed incorrect	1) Check driver speed, motor wiring, pulley tension
	2) Discharge pressure too high	2) Reduce downstream pressure
	3) Air leak at suction	3) Locate and repair leak
	4) Worn or damaged pump	4) Inspect and repair as required
	5) Low viscosity	5) Verify original application conditions
Gradually Loses Prime	1) Suction lift too high	1) Improve suction pressure
	2) Air or gas in fluid	2) Eliminate air or gas from fluid
	3) Air leak at suction	3) Locate and repair leak
	4) Worn or damaged pump	4) Inspect and repair as required
Noisy	1) Cavitating	1) Improve system suction pressure, provide adequate NPSH
	2) Solid particles in fluid	2) Install suction strainer. Clean suction strainer.
	3) Air or gas in fluid	3) Eliminate air or gas from fluid
	4) Worn or damaged pump	4) Inspect and repair as required
Motor Runs Hot or Overloads	1) Discharge pressure too high	1) Reduce downstream pressure. Check relief valve setting. Be sure discharge pressure gages function correctly.
	2) Shaft speed too fast	2) Reduce speed
	3) Fluid viscosity higher than expected	3) Change to larger horsepower or higher service factor motor. Thin fluid.
	4) Incorrectly wired motor	4) Check wiring diagram
	5) Binding internal pump parts	5) Inspect and correct condition
	6) Motors normally feel hot	6) Verify if actual motor amperage draw is within range
Seal Leaks	1) Dry running	1) Open valves. Prime pump
	2) Solids in fluids	2) Add suction strainer
	3) Damaged during field replacement	3) Inspect and replace damaged components
	4) Seal material incompatible with fluid	4) Verify original application conditions. Consult factory.



PARTS: 1/2" pump



Other components:

5/8" seal:	665840
Viton O-ring:	70040V
Carbon bushing (3x):	664116
SS shaft short 1/2" pump:	72001
SS shaft short 1" pump:	72011
SS gears (2x) 1/2" pump:	72021
SS gears (2x) 1" pump:	72002

