

LACO TECHNOLOGIES

USER MANUAL



W2V150 ROTARY VANE HIGH VACUUM PUMP

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1. SCOPE

This manual contains installation, operation, maintenance, and troubleshooting information for the W2V150 Rotary Vane Vacuum Pump. Please read the manual in its entirety before operating the pump.

LACO rotary vane vacuum pumps are designed to ensure safety when used properly. It is the responsibility of the user to follow safety-related warnings, cautions, notes, and other requirements described in this manual.

Returned equipment will not be accepted by LACO Technologies without prior authorization. Prior to shipping please call for a returned material authorization (RMA) number.

LACO Technologies reserves the right to cancel the warranty if the pump is disassembled without authorization, if pump fluids are used that are not compatible with the design and materials used in the manufacture of the pump, and if unauthorized spare parts are used.

2. SAFETY

Death or serious injury can result from improper use or application of this pump. If the pump will be exposed to toxic, explosive, pyrophoric, highly corrosive, or other hazardous process gases including greater than atmospheric concentrations of oxygen, contact LACO Technologies for specific recommendations.

WARNING Ground the motor properly during installation. Disconnect the power before beginning installation, maintenance or repair work or before interchanging the input leads when correcting the direction of rotation. Disconnecting the power also avoids an unexpected start-up for pumps with automatically resetting thermal overloads.

WARNING If hazardous gasses or vapors are expelled from the pump, do not operate the pump without an exhaust line and an adequate exhaust system.

WARNING Do not exceed a maximum backpressure of 7 psig. Excessive pressure in the pump could damage the seals, blow out the sight glass, or rupture the pump housing. In addition, excessive backpressure can result in hazardous process gas or contaminated oil leaking out of the pump.

WARNING Don't install an exhaust line with a smaller ID than the exhaust port or allow restrictions or deposit build up in the exhaust line.

WARNING If you are purging the oil casing with inert gas, limit the inert gas flow to avoid exceeding the 7 psig limit. Accidentally connecting the pump's exhaust port to a vacuum line containing a closed valve also causes a dangerous excessive pressure.

WARNING Hazardous process gases can concentrate in the vacuum pump, its oil, and its filters. If the pump has been used on toxic, explosive, pyrophoric, corrosive, volatile, or other hazardous substances, take the proper safety precautions before opening the pump or filters.

Proper precautions could include:

- inert gas purging before and after you drain the oil
- sweeping hazardous gas from the pump or filters
- wearing gloves or protective clothing to avoid skin contact with toxic or highly corrosive substances
- using a ventilated work area
- employing fume hoods
- wearing safety masks
- using a breathing apparatus



CAUTION LACO rotary vane vacuum pumps are two-stage units designed to operate continuously in the low torr and sub-torr (millitorr) pressure range (<10 mmHg). Operation for prolonged periods of time above 10 mm HG (Torr) can result in permanent damage to the pump.

3. SPECIFICATIONS

3.1 W2V150 BASIC PARTS



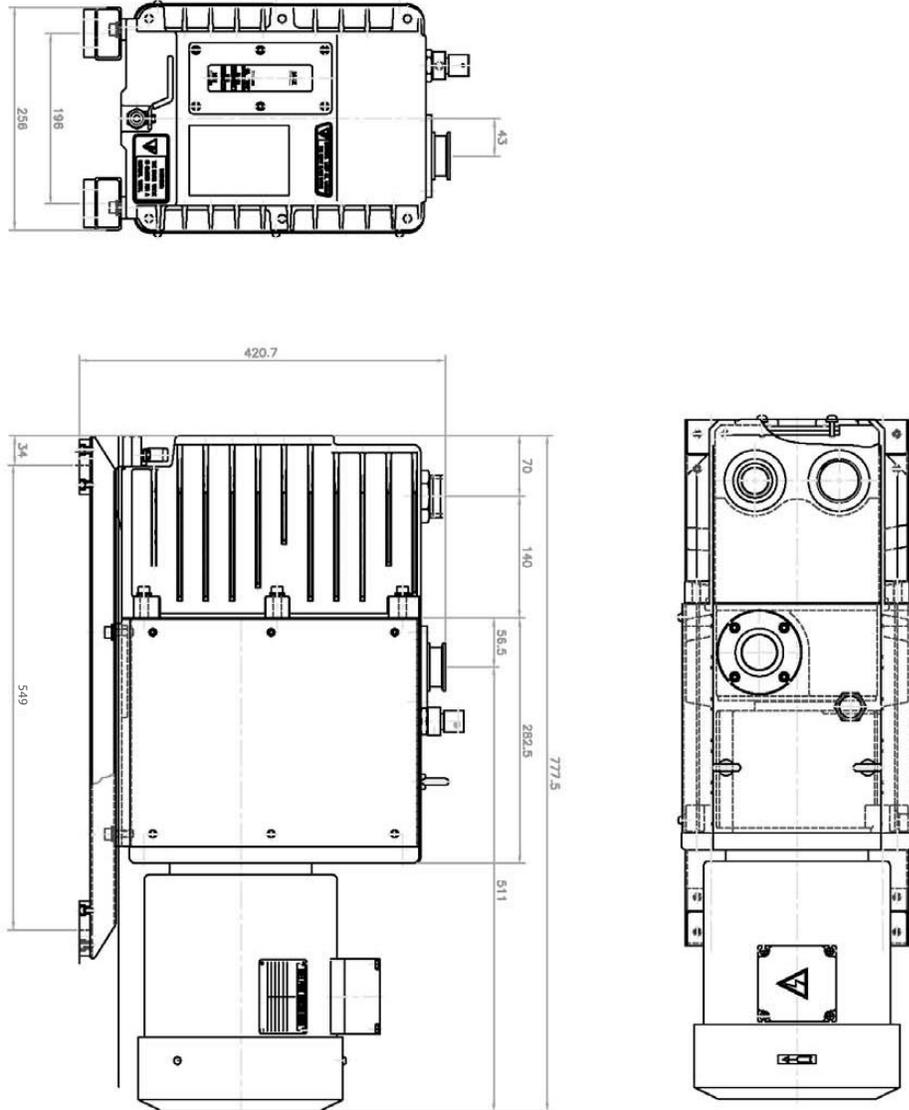
3.2 W2V150 SPECIFICATIONS

Table 1: W2V150 Specifications

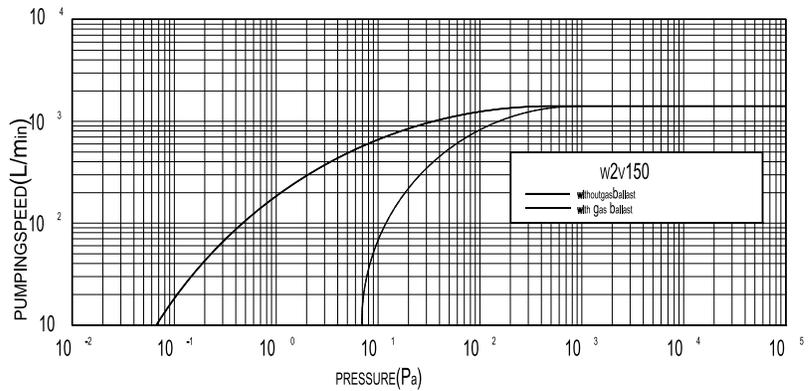
COMPONENT	DESCRIPTION
Pumping Speed @ 60 Hz	1500 l/m, 53 cfm, 90 m ³ /hr
Ultimate Pressure (Gas Ballast Open)	5 x 10 ⁻² Torr
Ultimate Pressure (Gas Ballast Closed)	5 x 10 ⁻³ Torr
Standard Motor, CE Marked	Three phase, 230/460V, 2 HP, 50/60 Hz
Power Connection	Junction Box
Motor Speed @ 60 Hz	1700 rpm
Oil Capacity	2300 cc (2.4 quart)
Weight Net	117 lbs, shipping 133 lbs
Intake/Exhaust type/ diameter	NW 40 O.D. tube
Ambient Operating Temperature	70° to 40° C (45° to 104° F)

3.2.1 W2V150 DIMENSIONS

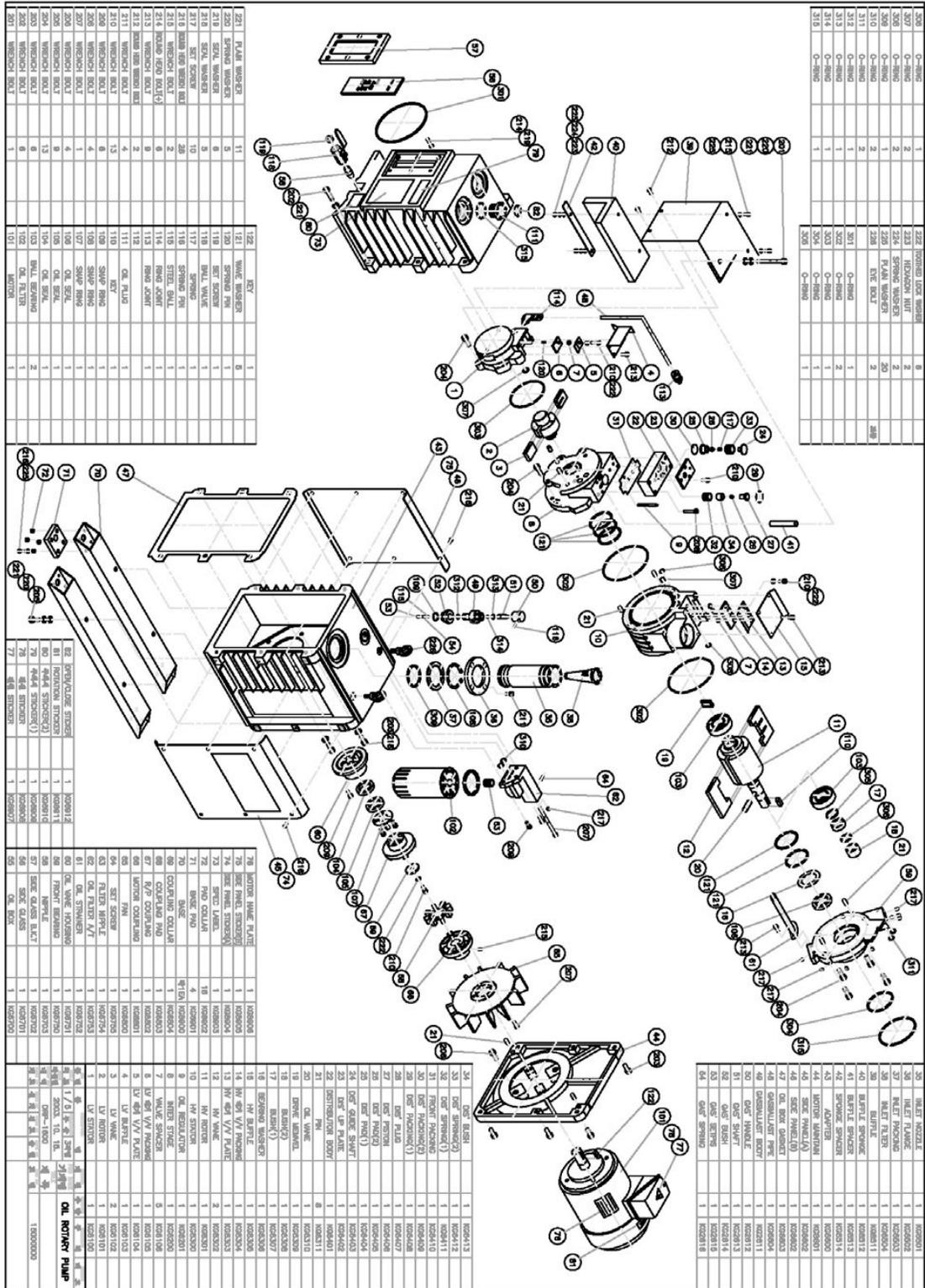
(Measurements in mm)



3.2.2 W2V150 CURVES



3.2.3 W2V150 DEVELOPMENTAL FIGURE



4. INSTALLATION

4.1 RECEIVING

Each rotary vane vacuum pump is inspected and carefully packed prior to shipment. Inspect it after carefully unpacking it. In case of external damage, retain the shipping container and notify the shipping agency and LACO Technologies immediately. The packing materials are designed specifically for the pump and should always be used when transporting the pump.

Unpack the pump and check for shipping damage as follows:

1. Inspect the outside of the shipping container for shipping damage.
2. Unpack the pump.
3. Thoroughly inspect the pump for damage.
4. If you find any damage, proceed as follows:
 - a. Save the shipping container, packing material, and parts for inspection.
 - b. Notify the carrier that made the delivery within 7 days of delivery.
 - c. File a claim with the carrier.
 - d. Contact LACO Technologies to make arrangements for replacing the damaged part(s).

4.2 REPORTING SHIPPING SHORTAGE

If you did not receive all the goods that you ordered, do the following:

1. Check the number of items listed on the packing slip. If the number of pieces listed is greater than the number of shipping containers received, contact the carrier concerning the missing piece(s).
2. Check the packing list to see if the missing item is on back order.
3. Carefully check the packing material and container to ensure that the missing item was not overlooked.
4. If you cannot find the item, please notify LACO Technologies immediately

4.3 REPORTING INCORRECT SHIPMENT

If the item received is not the item ordered, contact LACO Technologies immediately.

4.4 INITIAL FILLING WITH VACUUM PUMP FLUID

All LACO rotary vane vacuum pumps are shipped with a full change of vacuum pump fluid. Always be sure that the oil level is approximately in the middle of the low and high level marks in the oil level window and please note that upon start up of the pump, the oil level in the oil level window will drop slightly.

4.5 CONNECTING THE PUMP TO THE SYSTEM

4.5.1 PREPARATION

1. Select a well ventilated area, free of dust.
2. The pump should be placed conveniently to monitor the oil level of the pump.
3. We recommend the pump is operated in temperature over 7 °C.

4.5.2 ELECTRICAL CONNECTIONS

The pump should be mounted to a secure object so as not to be moved by the vibration of the pump. The pump should be installed and maintained horizontally at all times.

1. Use terminal box to make electrical connections (reference Section 3.1 “W2V150 Basic Parts” for terminal box location).
2. Open the cover of the terminal box. There should be 6 cords connected.
3. The W2V150 pump is a 3 phase motor therefore 3 external electrical cord should be connected for full operation.
4. Reference the terminal box cover for connection instructions.
5. Check the electronic connection and test that the pump is functioning correctly.



CAUTION After finishing connections do not connect the pump to the system. If the connection is wrong motor will operate opposite and can cause damage to the system. Test pump prior to connecting pump to the system

KF clamps and centering rings are supplied for the intake and exhaust ports of the pump.

CAUTION Do not connect power to your pump until the blank off plate is removed from the exhaust port. Operating the pump with the exhaust port blanked off will damage the pump and can injure the operator.

All connections must be vacuum tight for your pump to achieve its ultimate pressure. The o-ring on the centering ring must be clean to avoid leaks. Be sure that all quick release clamps are in place and properly tightened.

4.5.3 CONNECTING TO SYSTEM

1. Mount pump to a secure object so as not to be moved by vibration. The pump should be installed and maintained horizontally at all times.
2. Install pump to system including intake and exhaust lines.



CAUTION Remove the exhaust port cover before starting the pump.

WARNING Ensure that your vacuum line is connected to the pump's intake port and not to the exhaust port. If your vacuum line has a closed valve, accidentally connecting it to the pump's exhaust port causes a dangerous overpressure.

NOTE Ideally, the inside diameter of the vacuum line should be the same size or larger than the (ID) of the intake port. If the vacuum line is too narrow, it will reduce the pumping speed.

WARNING Do not install an exhaust line with a smaller ID than the exhaust port. Restrictions reduce the pumping speed and could damage the oil seals or cause dangerous overpressure in the pump.

3. If possible, install the exhaust line at a slightly descending angle to prevent condensate from flowing back into the pump and contaminating the pump's vacuum fluid.
4. If the exhaust line must be installed in the ascending position and the process gas contains high levels of condensable vapors, connect a condensate trap to the exhaust port. Condensate traps serve to collect the condensates from saturated vapors. Contact your distributor for more information on the correct trap for your pump.
5. If no exhaust line is connected and your pump will be running above 1 Torr inlet pressure, connect an exhaust mist eliminator to the exhaust port to remove pump fluid vapors and smoke. Contact LACO Technologies for more information on exhaust mist eliminators.
6. If the exhaust line is attached to a negative pressure exhaust system, adjust the negative pressure so that the vacuum pump fluid will not be drawn from the pump.

5. BASIC OPERATION



5.1 SETUP

Before starting the pump, please complete the following checklist:

CAUTION Do not connect power to your pump until the blank off plate is removed from the exhaust port. Operating the pump with the exhaust port blanked off will damage the pump and can injure the operator.

1. Be sure that the pump is filled with the appropriate amount of vacuum fluid.
2. Be sure that all electrical connections have been properly wired and that there are no bare wires that could cause an electrical shock or fire.
3. Be sure that the rotation of the pump is correct. You will find a rotational arrow on the front of the motor.
4. Be sure that all system connections have been secured with the appropriate seal rings and clamps.

WARNING If your pump has been prepared for oxygen service, check if an explosion-proof motor is required.

5.2 OPERATION

1. These vacuum pumps are not designed for use in corrosive service. When pumping hazardous or corrosive passes, we recommend the use of an inlet vacuum trap. In addition a pump specially prepared for perfluoropolyether vacuum fluid is required when pumping highly reactive or extremely corrosive gas. Contact us for recommendations.
2. Periodically check the vacuum fluid level in the sight glass to be sure it is between the low and high levels. If you are operating the pump with the gas ballast open, it will be necessary to check the oil level more frequently.
3. If the vacuum fluid within the pump becomes discolored or contaminated, change the fluid as soon as possible. Operating the pump with contaminated or dirty oil will greatly reduce the life expectancy of the pump and may lead to the cancellation of the warranty.

5.3 ANTISUCKBACK

If the pump stops with the inlet under vacuum the antisuckback system will stop air or oil leakage inside the module or into the vacuum chamber. The vacuum integrity is guaranteed by:

- Quality of machining from surfaces between the functional elements (stator, plates, housing, etc.).
- The exhaust valves on the exhaust orifice.
- A spring valve automatically closes the oil injection canal in the pump. When the pump stops, the oil pump exhaust pressure is decreased and a spring activated valve closes the oil injection canal.

5.4 GAS BALLAST

When condensable vapors (such as water vapor) are being pumped the gas is compressed beyond its saturated pressure and can condense, impairing pump performance. The vapor pressure of water at typical pump temperatures is over 100 Torr. Even small amounts of water in the pump fluid will have a big effect on pump performance. The gas ballast control button allows a quantity of air to be injected into the second stage of the pump during “compression” to reduce the partial pressure of the pumped gas below its saturated vapor pressure and thus prevent condensation. At the end of “compression” the pressure in the discharge chamber is greater than atmospheric. The saturated vapor pressure of pump fluid and the condensed vapors such as water is higher when it is hot than when it is cold; therefore it is necessary to wait until the pump reaches its operating temperature before pumping condensable vapor. Using the gas ballast increases the ultimate pressure the pump can achieve.

6. MAINTENANCE

6.1 INSPECTION

- Check vacuum oil frequently. You need to check whether the oil is brownish, dirty, or contains moisture.
- Always check oil level before you start up the pump.
- If oil level is lowered you can add oil to proper level.
- If the oil has been contaminated by any dust or water, you need to change the oil entirely.

To change the pump oil:

1. Allow the pump to cool for about 5 minutes.

2. Drain the contaminated oil completely through the drain plug (reference Section 3.1 “W2V150 BASIC PARTS” for oil drain plug location).
3. Close the drain plug.
4. Fill the new vacuum oil (LACO LVO19) through the oil filling plug and check the oil level.

NOTE The pump oil temperature should be typically less than 65°C when operating.

6.2 PERIODIC SERVICE ITEMS

6.2.1 VACUUM OIL

Below are guidelines for the rate of oil changes specific to various applications. There is no exact formula for the rate of oil change. Please note the specifics of your system and change the oil at a rate best for your specific application.

APPLICATION	CHANGE OIL WITHIN (HOURS)
High Vacuum in Lab environment, or system seldom exposed to the air	2,500
High Vacuum in manufacturing environment, often exposed to the air	1,200
Vacuum furnace, large gas-exhaust diffusion system, system with booster pump.	600
Vacuum drier, vacuum molding, vacuum packing	200
Vacuum distillation, low vacuum tank	120

6.2.2 OIL SEAL AND OTHER ITEMS

LACO supports 2 kinds of repair kits for W2V150.

1. Minor Repair Kit for W2V150 is for normal overhaul. Pump consists of various metal and rubber component and some component need to change periodically.
2. Major Repair Kit of W2V150 contains vane and other important parts of the pump.

In order to maintain high pump performance and long pump life, LACO recommends a pump overhaul once a year.

6.2.3 PUMP FLUID

Every vacuum pump is designed to work best with a specific pump fluid and the fluid is an active part of the pumping mechanism. For best performance from your pump, care must be used to select fluid with the physical and chemical properties engineered from you pump. For

LACO pumps the ideal fluid for general purposes pumping is LVO19. This is a moderately priced fluid that is engineered to give best vacuum and longest life in our pumps. Other fluids may give performance that is good enough for your needs but specification are based on regular use of LVO19.

6.2.4 CHECKING THE PUMP FLUID



WARNING If the pump has been used on corrosive, toxic or volatile chemicals, observe proper safety precautions before removing the drain plug.

CAUTION Hydrocarbon pump fluid should be changed at the following times:

1. After a 100 hour break-in period of pump operation.
2. When the pump fluid becomes contaminated or is discolored.
3. When condensation in the pump fluid is present.
4. Before and after the pump has been stored for a long period of time.
5. Perfluoropolyether fluid should be reconditioned when it becomes contaminated.

NOTE Always change the pump fluid while the pump is warm to prevent condensables, such as water, from remaining in the pump.

Turn the pump off and change the fluid as follows:

1. Drain the fluid from the pump. Use your fingers to remove the oil fill cap and the oil drain plug from the pump; allow the fluid to drain into a suitable container. If the fluid fill cap or fluid drain cap cannot be loosened with your fingers, cover them with a cloth and use pliers.
2. After the oil flow diminishes, switch ON the pump, allow it to run for about 10 seconds and then switch if OFF.
3. If the fluid drained from the pump is discolored, contains particulate, has a foul odor or is very dirty, flush out the pump using the procedure below until the drained fluid is clean. If your pump requires more than 2 flushes, a foreline trap or oil filtration unit should be installed on the pump.
 - a. Reinstall the fluid-drain plug with flat gasket into the fluid-drain port.
 - b. Refill the pump with LVOFF vacuum pump fluid until the fluid level is visible in the lower rim of the fluid sight glass.
 - c. Blank off/on valve off the inlet port.

- d. Turn ON the pump and allow it to run for about 10 minutes.
 - e. Turn the pump OFF and refer to step 1 to drain the vacuum fluid.
4. Charge the pump with fluid as follows:
 - a. Reinstall the fluid-drain plug with flat gasket into the fluid port.
 - b. Remove the fluid-fill cap and fill the pump to capacity with LVO10 vacuum pump fluid. Using other than LVO19 vacuum pump fluid may result in damage to the pump or compromise the pump performance and lifetime.
 - c. Reinstall the fluid-fill cap with flat gasket.

6.3 LONG TERM STORAGE (2 WEEKS OR LONGER)

Before placing a pump in long term storage, follow the procedure below:

1. Drain all fluids from the pump as described in the previous section.
2. Refill the pump with clean LVO19 or LVOFF vacuum fluid as described in the section for changing the pump fluid.
3. Always cover both the intake and exhaust ports with caps to keep any dust or foreign materials from entering the pump. Place pump in original container if available.
4. Be sure that the pump is stored in a horizontal position with the intake and exhaust ports facing up.
5. When putting a pump into storage, put a pin hole in both the intake and exhaust port caps.

6.4 AVOIDING OIL LEAKS DURING SHIPPING AND STORAGE

Always drain your vacuum pump of all fluids before shipping. Failure to do so can result in damaged shipping containers and delays by freight carriers due to possibility of the presence of hazardous materials in the event of a spill.

7. TROUBLESHOOTING

SYMPTOM	CAUSE	SOLUTION
Noisy motor, will not turn	Power line voltage and connections	Correct voltage or connections
	Any foreign materials inside the pump	Remove the foreign materials. If problem is with oil, change oil.
	Motor (open internal circuit)	Replace open windings.
Noisy and hot pump	Any foreign materials inside the exhaust valve.	Remove foreign materials.
	Leakage in the system. .	Fix the leakage
	If leakage, valve is open.	.Close the valve.
	All the valves in the vacuum line.	Close if found open
Vacuum level declines	Oil level	Add oil.
	Leakage on the device connected.	Close the intake and recheck.
	Moisture content of oil.	Change oil.
	Oil regulator.	Replace.
	If gas ballast is open.	C lose the gas ballast.
Motor runs, but not pump.	Worn out coupling mechanism.	Replace coupling.
	Worn out key between motor and pump.	Replace the key and the set screws.