



Liquid Ring & Rotary Vane Vacuum Pumps and Systems

INSTALLATION AND OPERATIONS MANUAL

ROTARY VANE PUMP

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**Travaini Pumps USA, Inc.
Warranty**

Subject to the terms and conditions hereof, Travaini Pumps U.S.A., Inc. (hereafter referred to as the "Company") warrants that the products and parts of its manufacture specified below, when shipped, and its services when performed, will be free from defects in material and workmanship for following warranty time periods:

PRODUCT DESCRIPTION	WARRANTY PERIOD FROM DATE OF SHIPMENT
Liquid Ring Vacuum Pump system or pump products	Two (2) years
Rotary vane system or pump products	24 / 18 months if TPUSA oil used / not used
Centrifugal pump products	18 months, or 12 months from date of installation, whichever occurs first
Mechanical seals	3 months
Repaired pumps / systems	6 months for the repair / work performed

This Warranty shall apply to liquid ring vacuum products only if they are operated with Company approved seal fluids and to rotary vane products only if they are operated with Company approved lubricants. In-warranty repaired or replaced products are warranted only for the remaining unexpired portion of the warranty period applicable to the repaired or replaced product(s).

This Warranty does not extend to equipment such as electric motors, starters, heat exchangers and other accessories furnished to the Company by third party manufacturers and/or suppliers. Said accessories are warranted only to the extent of any warranty extended to the Company by such third party manufacturers and/or suppliers. Replacement of maintenance items, including, in particular, seals, bearings, filters, etc. supplied in connection with standard maintenance service provided by the Company are not covered by this Warranty. Any technical assistance, advice, or comments provided by the Company regarding system components, other than those manufactured by the Company, are not covered under this Warranty; the Company disclaims any liability in connection with same. The Company disclaims any liability in connection with the malfunctioning of any system(s) or component(s) of system(s) which conform to designs, specifications and/or instructions mandated by purchasers.

This Warranty is limited exclusively to products and/or parts of the Company properly installed, serviced and maintained in full compliance with the Operating and Maintenance manual of the Company. This Warranty shall not extend to products and/or parts which have been misused or neglected or not used for the purpose(s) for which they were intended, including, in particular, products operated at/in excessive temperature or dirty environments, products used in conjunction with corrosive, erosive or explosive liquids or gasses, and/or products malfunctioning as a result of build-up of material in the internal parts thereof. Products which are disassembled without the prior written consent of the Company and/or which are repaired, modified, altered or otherwise tampered with in any manner inconsistent with the Operating and Maintenance manual of the Company are not covered under this Warranty. Products and/or parts which are kept in "long term" storage, as such terms are defined in the Operations & Maintenance manual of the Company, and not maintained in accordance with Company long term care procedures specified by the Company are not covered under this Warranty.

Warranty claims must be made within the warranty period specified above for each of the Company's products and services and include the serial number thereof. The Company's obligations under this Warranty are limited, in the Company's sole discretion, to repair, replacement or refund of the purchase price received by the Company for the product, part or service. Notwithstanding the foregoing, the Company shall have the option to provide alternative solutions of a different design. In no event shall the purchaser and/or any subsequent owner or beneficiary of the products, parts and/or services be entitled to recover incidental, special or consequential damages arising out of the breach of this Warranty or any defect, failure or malfunction of the products and/or services supplied by the Company.

A written return authorization must be obtained from the Company prior to the return of any product and/or part under this Warranty. Products and parts are to be returned only to the Company's facilities or such facilities as the Company may designate in writing. Costs of uninstalling/ reinstalling the product and/or any part under Warranty, as well as all costs associated with the shipment thereof to and from the facilities of the Company shall be at the owner's sole expense.

THIS WARRANTY AND THE COMPANY'S OBLIGATIONS HEREUNDER ARE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. ALL WARRANTIES WHICH EXCEED THE AFOREMENTIONED OBLIGATIONS ARE HEREBY DISCLAIMED BY THE COMPANY AND EXCLUDED FROM THIS WARRANTY, WHETHER BASED ON CONTRACT, WARRANTY, NEGLIGENCE, INDEMNITY, STRICT LIABILITY OR OTHERWISE. NO EMPLOYEE OF THE COMPANY OR OTHER PERSON IS AUTHORIZED TO GIVE ANY OTHER WARRANTY OR TO ASSUME ANY OTHER LIABILITY ON THE COMPANY'S BEHALF.

Effective as of January 2007

Introduction

The Travaini Rotant Rotary Vane Vacuum Pump system will give you years of trouble-free service provided some of the basic maintenance guidelines as set out in this manual are followed. Our systems have been designed to provide safe and reliable service. Because a vacuum pump is a rotating piece of equipment, the operator must exercise good judgment and proper safety procedures to avoid damage to the equipment or personal injury. Please review and follow all instructions in this manual before attempting to install, start or operate equipment.

Safety

Your safety department should establish a safety program based upon a thorough analysis of industrial hazards. It is important that due consideration be given to hazards which arise from the presence of electrical power, hot liquids, toxic gases, and rotating equipment. Proper installation and care of protective devices is essential to safe system operation. These safety procedures are to be used in conjunction with the instructions contained in this manual.

Installation

The design of foundation, piping system and the areas of plant system design are the purchaser's responsibility. Travaini Pumps USA, Inc. may offer advice but cannot assume responsibility for operation and installation design.

We recommend that the purchaser consult an authorized dealer or specialist skilled in the design of foundation, piping and equipment location to supplement and interpret the information given in this manual to ensure a successful installation. Your dealer can provide start up assistance in most instances at reasonable cost.

Unpacking

Inspect the system immediately upon arrival for any sign of damage. All Travaini products are shipped F.O.B. factory, which means that any damage is the responsibility of the carrier and should be reported to them.

Location

Install the system in a well ventilated and dust free area. Cooling is an important aspect of the vacuum system operation. It is therefore important to install the system in a reasonably cool area where the temperature does not exceed 100°F (38° C). For higher temperatures, consult the factory. Allow sufficient space around the unit for checking fluid level, temperatures, pressures, and for general servicing.

Whenever the pump is transported, be sure to drain the oil before shipping to avoid damage to the vanes when the pump is restarted. **Do not tip pump over if filled with oil.**

Foundation

The pump system must be installed on a level surface in a horizontal position. The foundation must be designed to support the total system weight and be rigid and substantial enough to absorb any system vibration, and to permanently support the base plate at all points. We recommend the installation of standard neoprene mounting pads between the base frame and floor. Level the base frame using a machinist's level to determine the levelness.

Electrical

Travaini Rotary Vane Vacuum Pump systems include an electrical control panel as standard. The main motor and control instruments are wired to the panel at the factory and a typical electrical wiring diagram is included with this manual. The system must be connected according to the local electrical codes. A disconnect switch should be installed between the system control panel and plant power. The full load current rating is stamped on the motor nameplate and should be used in selecting protective ratings.

WARNING: Install, ground, and maintain equipment in accordance with the national electrical code and all applicable federal, state, and local codes.

After the electrical wiring connections are completed, the system must be checked for proper rotation. An arrow on the pump housing marks the direction of rotation. Jog the motor by pressing the Start button, and then the Stop button. If the direction is wrong, switch any two of the three main power leads on the contractor inside the control panel.

A diagram for the electrical motor terminal connections is located in the junction box of the motor or on the motor nameplate if the system does not contain a system control panel. The motor must be connected according to the local electrical codes. A fused switch must be installed to protect the motor against electrical and mechanical overload conditions. The overload of the motor starter must be set at a level equal to the full load motor current listed on the motor nameplate.

Pipe Connections and Sizing

Before installation, remove all protective inserts in the gas and liquid connections. Piping connected to the system must be installed without imposing any strain on the system components. Improperly installed piping can result in misalignment, pump failure, and general operating problems. Use flexible connectors where necessary. Piping should be cleaned properly before installation.

Note: Install a temporary screen at the pump inlet flange at first start up to protect the unit against carry over of pipe debris and welding slag. The screen must be removed after the initial run in period.

If the possibility exists that the inlet gas pumped contains dust or foreign particles, a suitable (5 micron or less) inlet filter should be installed at the inlet port. It is good practice to install this accessory at all times, as it will increase the life of the pump. All pumps are fitted with a stainless steel inlet screen. The larger models PVL 200-PVL 540 are equipped with a built in automotive type inlet filter. We still recommend that a separate inlet filter be installed for these larger models, in addition to the built in filters in installations where a reasonable carryover of solids can be expected.

The piping system has to be designed to ensure that no liquids such as condensation or liquid carried over from the process can reach the pump. If this possibility exists, a knock out liquid separator should be installed. Consult the factory for recommendation.

Inlet and discharge piping should be at least the size of the pump inlet and discharge. Install the system as close as possible to the process to minimize the length of the suction line. If the system has to be installed further away from the process, be sure that the inlet piping is oversized accordingly to minimize the overall line pressure drop. For more information consult your dealer or call the factory. Pump systems operating in parallel on a common manifold must each have a manual or automatic shut-off valve or, a suitable check valve installed in the suction flange.

Always install a check valve suitable for vacuum service providing a minimum of resistance close to the pump suction flange to prevent back flow of process gas and oil when the pump is stopped. Travaini Rotary Vane Vacuum Pump systems are supplied with an inlet check valve as standard.

Discharge Piping

It is recommended but not required to exhaust the gases from the pump system outside (not into the room where the system is installed).

For pump systems operating in parallel on a common discharge, we recommend the installation of a suitable check valve close to the discharge. When discharging more than one pump in a common discharge line and/or over a long distance, oversize pipe accordingly.

Following are the inlet and discharge connection sizes for the different pump models:

PUMP MODEL	SIZE
10-15	1/2" NPT FEMALE
35	3/4" NPT FEMALE
50-70	1" NPT FEMALE
51-71	1" NPT FEMALE
100-150	1 1/2" NPT FEMALE
200-270	2" NPT FEMALE
400-540	3" NPT FEMALE

Operation

At the heart of the Travaini Rotary Vane Vacuum Pump system is a reliable Rotary Vane Vacuum Pump. The pump design and principle of operation provides ample clearance between the impeller and casing elements. Grease lubricated bearings are mounted external from the pumping chamber, isolated by mechanical shaft seals. This means that the pump requires no internal lubrication. The function of the seal fluid in the system is to create a liquid piston action and to remove the heat of compression. The seal fluid in the system circulates in a closed loop. The heat exchanger, either air or water-cooled removes the heat of compression. The discharge separator/reservoir holds the seal fluid and incorporates a highly efficient separator arrangement to separate the seal fluid from the air or gases discharged by the pump system.

Pump Lubricant

All pumps are shipped dry without oil. A charge of our factory recommended lubricant is shipped in a separate container with each pump. Before filling the pump with oil, check that the pump is installed level. Fill the pump with the recommended lubricant (see table below) through the oil fill plug until it reaches the 1/2 way mark of the upper sight glass.

WARNING: Do not overfill the pump.
Do not add or fill when the pump is running.
Do not fill oil through the inlet or exhaust port.


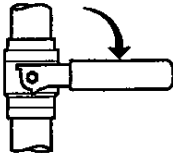
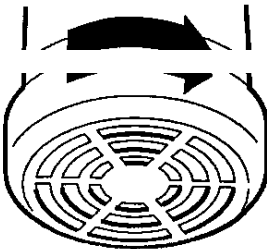


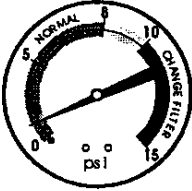

We recommend the use of our specially formulated Travaini oils for obtaining ultimate performance from your vacuum pump. The specially formulated Travaini oil is a high quality vacuum pump oil that provides better lubrication at high operating temperatures and prolongs the life of the pump and exhaust filters. When our specially formulated Travaini oils are used in new pumps shipped from the factory pump will be covered by an extended warranty period. For extended warranty information see the front of this manual.

If the above is recommended oil is not on hand use a good quality non-detergent oil of a viscosity and quantity as per table below.

Pump Model	Oil Capacity		Gallon Containers	Standard Oil	Synthetic High Temperature Oil
	Qt.	Liters			
PVL 10-15	1.1	1	1 GAL.	972-0068-A001	974-0068-A001
			5 GAL.	972-0068-A005	972-0068-A005
			55 GAL.	972-0068-A055	972-0068-A055
PVL 35	1.6	1.5	1 GAL.	972-0068-A001	974-0064-A001
			5 GAL.	972-0068-A005	974-0068-A005
			55 GAL.	972-0068-A055	974-0068-A055
PVL 50-70	2.1	2	1 GAL.	972-0068-A001	974-0068-A001
			5 GAL.	972-0068-A005	974-0068-A005
			55 GAL.	972-0068-A055	974-0068-A055
PVL 100-150	2.6	2.5	1 GAL.	972-0100-A001	974-0100-A0001
			5 GAL.	972-0100-A005	974-0100-A005
			55 GAL.	972-0100-A055	974-0100-A055
PVL 200-270	5.3	5	1 GAL.	972-0100-A001	974-0100-A001
			5 GAL.	972-0100-A005	974-0100-A005
			55 GAL.	972-0100-A055	974-0100-A055
PVL 400-540	10.3	10	1 GAL.	972-0100-A001	974-0100-A001
			5 GAL.	972-0100-A005	972-0100-A005
			55 GAL.	972-0100-A055	972-0100-A055

Note: For ambient operating temperatures lower than 40°F or higher than 100°F, we recommend our specially formulated Travaini synthetic oil.

Start up Procedures

1	Rotaryvane vacuum pumps are shipped from the factory dry, they do not contain oil. Before operating the vacuum pump system you must first add the recommend type and amount of oil to the pump(s). Fill the pump(s) to the top of the upper bullseye gauge before start-up.	
2	The first time the system is started or after changing the oil, completely close the suction inlet valve.	
3	Jog the motor briefly (press START then STOP) and check direction of rotation. The correct direction of rotation is clockwise and marked by an arrow on the end of the motor housing. If the direction is backwards switch any two of the three leads at the power connection. A loud grinding noise and absense of vacuum is an indication of improper motor direction.	
4	Start and run the vacuum pump system for approximatly five (5) minutes, then stop.	
5	With the pump system shut off, check the oil level again. The oil level should be visible in the top bullseye gauge. Add oil if necessary. WARNING: NEVER REMOVE THE OIL FILL PLUG WHILE THE VACUUM PUMP SYSTEM IS RUNNING.	
6	Start the pump system and adjust the inlet suction valve to your desired vacuum setting. Check that the discharge pressure does not exceed 2 psig when operating above 15" HGV. A pressure higher than 2 psig at start-up is a sign of high back pressure in the discharge pipe system. As the running time of the pump(s) increases the back pressure will increase.	
7	Check the voltage and motor current, they should be within the specifications for the motor. Note: This test should also be performed under normal system operating vacuum levels.	 Danger: High voltage and lethal shock hazards are present. Use extreme caution.

Shut Down Procedure

To stop the vacuum pump system, press the STOP button. A built-in-anti-suck valve will prevent oil from the oil reservoir being sucked back into the pump cylinder.

Gas ballast Valve

All PVL pumps are equipped with a gas ballast valve. Its main function is to prevent water vapor from condensing in the pump that causes emulsification of the lubricating oil resulting in possible pump seizure.

If the pump does not reach the ultimate vacuum of 0.35 Torr, it means that the oil is contaminated with process vapors. To clean out the pump, close the inlet valve completely and operate the pump for 10 minutes in order to remove any condensables from the oil. If after 10 minutes the pump still does not reach the ultimate vacuum stop pump and change oil.

Sequence of Operation

The following sequence of operation is a description of how the Travaini Rotary Vane Vacuum Pump system should operate. The description is general to cover simplex to multiplex (more than one pump) systems. It is assumed that all start-up procedures have been followed. Ensure that pump reservoirs are filled with oil (See start-up procedure.) If unsure about the function of one of the electrical controls mentioned below, see the “Electrical Controls” section for a description of the component. If any of the below do not occur, see the “Troubleshooting” section.

DANGER: high voltage!

Once the power connection to the system has been made, the following should occur:

If disconnects or circuit breakers are installed on the control panel, and are turned to the “on” position, the system will be energized. If “power on” indicating lights are installed on the panel, the lights will be illuminated.

If any other lights are illuminated, try resetting the alarm-reset button. If the light does not go out see the “Troubleshooting” section. (page-17)

If “hand-off-auto” selector switches are installed and are turned to the “Hand” mode, the pump(s) will immediately start. If “Pump-on” light(s) are installed on the panel, they should light up to indicate pump operation. We suggest that each pump be tested (“bump started”) in the “Hand” mode initially to check rotation of the pump. When facing the back end of the motor, the correct rotation is a clockwise direction. When in “Hand” mode, the pumps will run continuously unless an alarm condition is triggered. If such a condition occurs, see the “Troubleshooting” section. (page-17)

When the “hand-off-auto” selector switch is in the “Auto” mode, the pumps will operate from vacuum switches (if installed). In multiplex pump systems, each vacuum switch is set with a differential as well as an offset relative to the next switch. The switches should not be identically. The differential is usually between 4 to 6 inches of Mercury. For details on setting the vacuum switches, see the vacuum switch specifications section in this manual. The differential for each switch is 5”Hg; the offset between the two switches is 2”Hg. Below is an example for a duplex system.

Pump	Pump ON	Pump OFF
Pump one (lead pump)	@ 20”Hg.	@ 25”Hg.
Pump two (lag pump)	@ 18”Hg.	@ 23”Hg.

The switches are set in this manner so that if pump “one” cannot satisfy demand and the vacuum level drops below 18”Hg., the lag pump will start-up, it will then turn off when the vacuum level reaches 23” Hg.

All multiplex systems are supplied with “Automatic alternation” and “Frequent stop/start protection.”

“Automatic alternation” allows the pumps to operate equally (even run time) by alternating each pump whenever the pump(s) shut down. When alternation occurs, the “lead” pump becomes the “lag” pump and the “lag” pump becomes the “lead” pump.

Frequent stop/start protection” is used to allow the pump(s) to operate a minimum amount of time. The time period is factory set at 10 minutes. This allows the pump(s) to warm up and eliminates frequent starting of the pump(s), which can cause premature coupling failure and breakdown of electrical components. The pump(s) will continue to operate after the vacuum level has been satisfied. In order to maintain the desired vacuum level, a vacuum relief valve is usually supplied with the system. If a vacuum relief valve is not supplied with the system and the vacuum level is critical, a relief valve must be installed.

If the pump(s) are not alternating and/or are frequent starting, one of the electrical components may be defective. Contact the factory for more information.

System Alarm Conditions NFPA 99

The following is a description of how alarm conditions will affect the operation of the system.

If a “Lag pump in operation” alarm is installed in the panel, observe the following. Such an alarm is usually only supplied with medical packages. The alarm consist of a flashing light (usually a bubble light located on the top of the panel) and an audible alarm. The alarm will trigger when the “lag” pump starts up. The alarm will not affect the operation of the system. The light will flash and the audible alarm will sound. The audible alarm can only be silenced by physically pushing the “alarm silence” button. This will not stop the lag pump on light from flashing. The flashing light can be reset by physically pressing the “alarm reset” button.

Note: If the lag pump is still operating when the “silence” or “reset” buttons are pressed, the alarm will continue to “sound”. The alarm will only reset if the lag pump is not running.

“Transformer failure” light (optional). Only installed if more than one control voltage transformer is supplied. If the transformer failure light is illuminate, one of the transformers has malfunctioned and the second one has picked up. As long as a back-up transformer is available, the above alarm will not affect the operation of the system. If both transformers fail, the system will shut down.

“High temp” light. If the high temperature light illuminates, the affected pump will shut down unless otherwise specified at time of purchase of this equipment. The backup pump(s) will continue to operate unless a high temperature (or other) alarm occurs in those pump(s).

“Low level” light (optional). If the low oil level light is illuminated, the affected pump will shut down. The backup pump(s) will continue to operate unless a similar condition occurs in those pump(s).

Maintenance

WARNING: Before attempting any maintenance such as changing the fluid, remove all power from the system by switching off the main breaker or disconnect switch. This will prevent the system from automatically starting from a vacuum switch.

Pump oil level (Check daily):

Under normal circumstances it should not be necessary to add oil between recommended oil changes. A significant drop in oil level means there is either an oil leak, a broken exhaust filter or a leaking anti-suck back or inlet check valve.

It is normal for the oil to be foamy and lightly colored. If the oil is milky or dark colored, it is burned or contaminated and must be changed.

Check the oil level only when the pump is shut off. The best time to check is before start-up. Replenish oil if the level drops below the ¼ mark of the top sight glass. Oil must be added through the fill port only.

CAUTION: Do no add oil while the pump is running, since hot oil can escape from the fill opening.

Oil change

Change oil every 500 hours of operation or when oil darkens. Drain oil when hot, use caution and properly dispose of the oil.

CAUTION: A more frequent oil change might be required if the oil becomes milky or dark colored. A dark colored. A dark color is a sign of varnishing which would reduce the life of the pump, vanes and exhaust filters. Our specially formulated Travaini oils are generally far more resistant to varnishing than normal motor oils.

Inlet Filter (if installed)

Check after first 8 hours of operation. Clean or replace inlet filter element at every oil change or 1000 or 3000 hours depending on application or if excessive pressure drop is noticed.

CAUTION: Depending on the mounting position of the filter be careful not to allow accumulated foreign material to fall in the pump suction opening when removing the filter cartridge. Horizontal filter installation is recommended to prevent this.

Pump models PVL 200 through PVL 540 have built in inlet filters, which should be cleaned whenever the pump oil is changed.

Exhaust filter

Replace after every 1,500-2,000 hours of operation or every 5 to 6 months. All pumps fitted with a back pressure indicator should use this as a guide for changing the filter whenever the pressure has reached the red mark of the 10 psig.

Do not clean or re-use these filters. Filters must be disposed of in a proper way as they might contain toxic substances carried over from the process. Always replace the O-rings on filter when changing.

CAUTION: Over filling pump with oil may result in misting and if filter is oil soaked, it must be replaced.

Bearings and Shaftseals

Internal pump components do not require preventative maintenance. Bearings are self-lubricating needle bearings.

Maintenance Schedule

To help ensure trouble free system operation a basic maintenance schedule consisting of the following system checks is recommended.

First 8 hours of operation

Check oil level and inlet filter element. Clean strainers and remove temporary inlet screen. Check for water in sight gauge and drain if necessary. Check piping for signs of oil leakage and tighten if necessary. Repeat this procedure every 500 hours of operation under normal conditions.

Daily

Check oil level daily. Top sight glass should be have full when pump is stopped.

Weekly

Inspect inlet filter and replace if necessary.

Change oil every 500 hours of operation or when oil darkens. Drain oil when hot, use caution and properly dispose of the oil.

Replace the gas-ballast felt disk (pos. 55).

The operating life of the pump is greatly enhanced based on the oil quality and conditions of filters. Vanished or darkened oil is a sign of trouble. Plugged filters reduce performance and may damage pump. Periodic maintenance will offer the best protection for your equipment.

Note: Varnished pumps are not covered under warranty.

2000 Hours Operation/Every Year

Replace the oil separator (pos. 41)

Check and if necessary replace the coupling elastic insert (pos. 23)

Check the electrical connections

30000 Hours Operation/Every 5 Years

Pump overall utilizing “Major” Rebuild Kit

Electrical Controls

Disconnect Handles (if included) The Disconnect Handles are lockable and must be turned on to energize the system. The handles must be turned off to open control panel.

CAUTION: HIGH VOLTAGE, DISCONNECT MUST BE OFF WHEN SERVICING PANEL.

HOA Selector Switches **Hand**-Off-Auto selector switches are supplied only if vacuum switches are supplied. Pump units will start in “Hand” mode, (unless units are in a shutdown alarm condition). The pumps will bypass vacuum switches. “Auto” mode allows units to start upon contact closure of the vacuum switch.

Stop/Start Push Buttons Stop/Start Push Buttons are included if HOA selector switch is not installed.

Reset Button Reset Button is used to reset the starter overloads.

Power On Light Power On Light indicates that power is on in panel.

Pump Running Light The Pump Running Light indicated a pump is operating

High Temperature Overload Light The High Temperature Overload Light indicates a pump is overheating and shuts the pump down. The alarm-reset button needs to be pressed to reset the alarm condition. If high temperature condition has not been fixed, the alarm will not reset.

High Back Pressure Light The High Back Pressure Lights indicate the exhaust filter element in the vacuum pump needs to be replace and does not shut down the pump.

Transformer Failure Light Transformer Failure Light indicates the exhaust failure. If alternate transformers are included in the panel, the alternate transformer will pick up. The pump will not shut down unless only one transformer is present.

Lag Pump In Operation Light The Lag Pump In Operation Light is usually included as a bubble light, positioned on top of the panel. When the light flashes, the lag pump is in operation.

Audible Alarm The Audible Alarm signals that the lag pump is in operation. The alarm can be silenced by pressing the “alarm silence” button. The Audible Alarm is also used to signal other alarm conditions.

Alarm Silence Button Alarm Silence Button is used to silence the audible alarm, but the visual light will remain on.

Alarm Reset Button Alarm Reset Button is used to reset an alarm condition when the condition has been rectified. The Alarm Reset Button will stop the light and alarm if alarm condition has been corrected.

Hour Meter The Hour Meter is a running clock that indicates how many hours each pump has been operating. It should be used to determine when the oil is in the pump and the discharge filter element needs to be replaced. See Installations and Operations manual for oil life.

Accessories and Protective Devices

Accessories

The following accessories are available for Travaini Rotary Vane Vacuum Pump systems.

Flexible connectors. The flexible connectors are used in piping systems to eliminate vibrations from transmitting from machinery throughout the piping network. Types of flexible connectors used include braided type, flexmaster type and quick-joint type connectors. Braided type flexible connectors are used mostly on the Travaini Rotary Vane Vacuum Pump systems. Please refer to the attached specification sheet for further details on the braided type flexible connectors.

Vibration isolators. Vibration isolators are used to eliminate vibrations, noise and shock from transmitting from machinery to the floor. Floor mount type vibration isolators are used mostly for the rotary vane vacuum pump systems. The vibration isolators have a steel top plate and threaded insert and steel base both totally imbedded in an oil resistant neoprene. The isolators bolt onto a tank or base-frame with one bolt and have two mounting bolts to mount to the foundation or floor.

System isolation valve. Simply an isolation valve that is installed on the vacuum receiver tank or vacuum pump. The valve is usually to isolate the vacuum system from the piping network.

Inlet Filter. An inlet filter is installed as standard on the Travaini Rotary Vane Vacuum Pumps 7.5 Hp and up 5Hp and blow need to have an inlet filter installed in the inlet piping. Our standard medical packages include this feature.

Protective Devices

The following protective devices are used to protect the pump from being damaged and to help with maintenance.

High temperature switch. Supplied as standard on all rotary vane medical packages. The switch is used to signal when the temperature of the oil is exceeding the recommended level. Electrically, the switch will shut the pump down. The pump will not restart until the alarm condition is acknowledged and is reset. The switch is a “snap disc” type of switch that is normally closed. When the temperature reaches the maximum set-point, the switch will open. Once the switch has opened, there is a 10-20 degree differential that the temperature will need to drop in order for the switch to close.

High backpressure switch. Optional. The high backpressure switch is installed in the discharge box of the rotary vane vacuum pump. When the backpressure reaches a pre-determined level, the switch will signal the control panel. Installed on the control panel is a high backpressure light which, when lit, means that the exhaust element in the vacuum pump needs to be replaced. Note that the high backpressure switch will not shut the pump down, but the exhaust element must be replaced soon as possible.

Lag pump on alarm. An NFPA 99 requirement. An audio/visual alarm that signals lag pump operation. Once the alarm triggers, the alarm must be acknowledged and reset. The alarm will not reset if the lag pump is still in operation. This alarm is vacuum is greater than the supply of the lead pump only.

Transformer failure light. All standard **medical** rotary vane vacuum pump systems are supplied with two (2) control voltage transformers (One primary and one for backup). In the event that the primary transformer fails, the backup transformer will automatically pick-up and the transformer failure light will be illuminated. The faulty transformer should be replaced as soon as possible. When the primary transformer fails, the operation of the system will not be interrupted. If the backup transformer fails, the system will shut down.

Low oil level switch. Optional. The low oil level switch is installed in the separator/reservoir of the rotary vane vacuum pump. The switch is a float type of switch. If the level switch is triggered, the affected pump will shut down. The low-level light on the control panel will be illuminated. The low-level switch will be wired into the main alarm of

the panel. The alarm will have to be reset to restart the pump. **When filling the pump with oil, make sure that the power to the pump is off because if the alarm reset button has been reset and the level switches contacts close while filling the pump, the pump will start-up automatically.**

Frequent stop/start protection. Supplied standard on all multiplex systems. Allows each pump to run a minimum amount of time. Frequent stop/starting can reduce coupling life and is also less efficient from a power consumption standpoint.

Automation alternation. Supplied standard on all multiplex systems. Allows the pumps to alternate. The primary feature of automatic alternation is to equalize the run time on all of the pumps.

Troubleshooting

This troubleshooting chart is intended as a basic troubleshooting guide. We recommended that you consult your local dealer for service. Each Travaini Rotary Vane Vacuum Pump system is tested and checked at the factory. Always indicate system model and serial number when calling.

WARNING: Before attempting any repairs, remove all power from the system by switching off the main breaker or disconnect switch. This prevents the system from automatically starting from a vacuum switch.

PROBLEM		CHECK
1	Pump will not start.	A-B-C-D-E-F-G-H-I
2	Pump/motor will not turn	J
3	Pump is not drawing vacuum.	K-L-M-N-O-P-Q
4	Pump is overheating.	L-N-Q-R-S
5	Pump is not reaching ultimate vacuum level.	M-N-R-T-U-V-W-Y-Z
6	Pump starts, but labors and draws a very high current.	G-K-Q-AA-BB-CC-DD
7	Pump smokes at the exhaust side.	Q-EE-FF-GG-HH
8	Pump is running noisy.	R-II-JJ-KK

A	Check reset button on control panel. Overloads may have triggered.
B	Check setting of HOA switch and vacuum switches.
C	Check power. Make sure that supply voltage matches motor voltage.
D	Check electrical control panel. Make sure that all wires are tight, wires may vibrate loose during shipment or operation. See wiring diagram.
E	Check motor overload in control panel. Overload settings may be too low. Set overload setting in motor starter in accordance with the motor nameplate data.
F	Check fuses. Fuses may be burned.
G	Check motor wires. Motor wires may be wired incorrectly. Look at motor wiring diagram on conduit box of motor for correct wiring configurations.

H	Check wire size and length. Incorrectly sized wires can cause voltage drop at the pump. If temperature of wire is high, use larger wire size.
I	Check to see if motor turns.
J	Pump or motor may be seized. Contact the factory.
K	Check rotation. Rotation should be clock-wise when facing back end of motor.
L	Check oil. If oil is varnished, replace at once. Check hour meter. Oil should be replaced as specified in the Installation and Operations manual of the pump.
M	Check vacuum pump gauge. Gauge may be faulty.
N	Check oil level. Oil level should be maintained at the middle of the top sight glass on the side of the pump reservoir. (Check when pump is off and is stationary).
O	Check to see if the inlet to the pump is wide open.
P	Check coupling between pump and motor. If damaged, replace. In an inlet filter is installed, check to see if filter element needs to be replaced. Note: The rotary vane vacuum pump models PVL200-PVL540 have built in inlet filters.
Q	Check backpressure on pump. Exhaust element may need to be replaced. Refer to Installation and Operation manual For maximum pressure and replacement instructions.
R	Check oil for foaming. If foaming, replace.
S	Make sure that pump is being cooled correctly. Check that pump is located in a well-ventilated area. Maximum ambient temperature for the rotary vane vacuum pumps is 100 deg. F. All standard pumps are air-cooled. Inspect fan for damage. Clean motor and pump air grills if needed.
T	Check to see if the oil is contaminated. If the oil has been used longer than the recommended life expectancy, the pump will not draw ultimate vacuum. Allow pump to cool before changing oil.
U	Check to see I system is holding vacuum. This can be done by shutting the pump system down and observing over time if the gauge on the receiver is holding. If vacuum is not holding, check all pipe connections for leaks using conventional leak detection methods.
V	Check to see if inlet screen on pump is plugged. If plugged, clean wire screen and reinstall. If an inlet filter has not been installed, and the problem persists, install an air filter. Refer to Installation and Operation manual. Note that the rotary vane vacuum pumps models PVL200-PVL540 have build in inlet filters.
W	Check to see if inlet valve assembly is stuck in closed position from contamination. Disassemble and clean inlet valve and screen as required. Refer to Installation and Operations manual.
X	Check around pump for oil leaks. Oil tubing may be damaged or defective. Replace and/or tighten fittings as needed.
Y	Internal parts may be worn or damaged. Contact factory.
Z	Check pump model. The PVLB design will not achieve the same ultimate vacuum as the PVL.
AA	Check power supply. Excessively high or low voltage will damage motor.
BB	Check to see if pump is overfilled with oil. Oil level should be up to the middle of the top sight glass on the side of the pump reservoir. (Check when pump is off and is stationary).
CC	Check oil. Oil may be too heavy (high viscosity) or the ambient temperature is below 5 deg. C (41 deg. F). If oil is too heavy. Refer to the Installation and Operations manual and replace the oil with Travaini's recommended oil.
DD	Foreign particles may have carried over into pump causing damage to the vanes or other internal parts. Contact the factory.
EE	Check operating temperature. Excessive heat will cause smoking.
FF	Check internal exhaust element. Exhaust element may not be seated correctly with o-ring.
GG	Check anti-suckback valve. Valve may be clogged or may be functioning incorrectly. Refer to exploded view in Installation and Operations manual for position of check valve.

HH	Check oil return line. Line may be clogged or broken. If so, free clogged line or replace line. Be sure to use same size line when replacing. Refer to exploded view of pump in Installations and Operations manual for position of line.
II	Check coupling. If coupling is intact, spray lubricant on the inside of the coupling sleeve and reinstall. If noise persists, contact factory
JJ	Check bearings. If bearings are noisy, contact the factory for replacement instructions.
KK	One of the vanes in the rotor may stick. Contact the factory for instructions.

Customer Service and Information

Business Hours:	8:00 a.m. to 5:00 p.m., CST (central standard time).
Phone Numbers:	1-800-535-4243 1-757-988-3930
Sales Fax Number:	1-757-988-3975
Address:	200 Newsome Drive Yorktown, VA 23692
Internet Address:	http://www.travaini.com

When calling for Service, Parts or System information always indicate the System model number and Serial number. Refer to the System information tag located on the system control panel.

System information tag, record your system information her for future reference.

Model #: _____

Serial #: _____

Mfg. Date: _____

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