

# **INSTALLATION AND OPERATING MANUAL**

**ROTANT ROTARY VANE VACUUM PUMPS  
PVL-PVL/B & EU-EU/B SERIES**



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# **INSTALLATION AND OPERATING MANUAL**

## **ROTANT PVL-PVL/B & EU-EU/B SERIES SINGLE STAGE ROTARY VANE VACUUM PUMPS**

### **IMPORTANT INFORMATION:**

Please read this manual before operating your Rotant rotary vane vacuum pump.

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## IDENTIFICATION

For model identification see the nameplate mounted on the pump.

Provide data stamped on the nameplate when ordering parts or requesting additional information.

### 1.0 General instructions

This manual is intended to provide reference to:

- application and operating safety
- installation and maintenance for pump
- starting, operating and stopping procedures for pump

**The manual should then be read carefully and filed for future reference.**

**It should always be available to the qualified operating and maintenance personnel responsible for the safe operation of the pump.**

( Qualified personnel should be experienced and knowledgeable of Safety Standards, should be recognized by the safety department head, as being capable to effectively deal with safety issues, should the need arise. A knowledge of first aid should also be required.)



The pump is to be used only for the applications specified on the confirming order for which the supplier has selected the design, materials of construction and tested the pump to meet the order specifications.

Therefore, the pump **CANNOT** be used for applications other than those specified on the order confirmation or otherwise agreed upon.

In the event the pump is to be used for different applications, please consult the sales office or representative of the manufacturer. The manufacturer declines to assume any responsibility if the pump is used for different applications without prior written consent.

The user is responsible for the verification of the ambient conditions where the pump will be stored or installed. Extreme low or high temperatures may severely damage the pump unless proper precautions are taken. These pumps are suitable for ambient and inlet air temperatures between 5 and 40 °C.

The manufacturer does not guarantee repairs or alterations done by user or other unauthorized personnel.

N.B.: Drawings appearing in this manual are only schematics. These drawings are not for construction. Certified drawings are available upon request

### 2.0 Safety instructions



**WARNING: CAREFULLY READ THE FOLLOWING INSTRUCTIONS.  
ALL OPERATIONS SHOULD BE CARRIED OUT BY QUALIFIED PERSONNEL.**

**Strictly adhere to the instructions listed below to prevent personal injuries and/or equipment damage.**

- Apply the pump for the conditions outlined on the confirming order or per supplier's instructions.
- Electrical connections on motor or accessories must be carried out by authorized personnel and in accordance to the local codes.
- Any work on the pump should be carried out by at least 2 people.
- When approaching the pump be properly dressed (avoid use of clothes with wide sleeves, neckties, necklaces, etc.) and/or wear safety equipment (hard hat, safety glasses, safety shoes, etc.) adequate for the work to be done.
- Stop the pump prior to touching it, for whatever the reason.
- Disconnect the power to the motor prior to working or removing the pump from the installation.
- Do not work on the pump when it is hot.
- After completion of the work re-install the safety guards previously removed.
- Be careful when handling pumps that convey acids or hazardous fluids.
- Have a fire extinguisher in the vicinity of the pump installation.
- Do not operate the pump in the wrong direction of rotation.
- Do not put hands or fingers in the pump or system openings or cavities.
- Do not step on pump and/or piping connected to the pump.
- Pump or piping (connected to the pump) must not be under pressure or vacuum when maintenance or repair is carried out.

### 3.0 In case of pump emergency

Should the pump break down immediately disconnect the electrical power following the instructions given in paragraph 6.3. Alert the maintenance personnel, at least two people should intervene using precautions as necessary for the specific installation: pump may be handling dangerous and/or hazardous fluids.

After correction of all the problems that created the emergency situation, it is necessary to carry out all the recommended starting procedures (see paragraph 6.1).

#### 3.1 - BASIC FIRST AID

In the event dangerous substances have been inhaled and/or have come in contact with the human body, immediately contact the medical staff and follow the instructions given by the company's internal medical safety procedures.

### 4.0 Pump technical data

**ROTANT PVL-PVL/B & EU-EU/B** are single stage oil sealed rotary vane pumps. The air cooled oil is automatically recycled by means of differential pressure. These pumps are especially suited for handling air (dry or wet) in the general industrial and medical applications for intermittent or continuous services.

**PVL & EU** pumps are the standard design. They are best suited for pressures from 400 to 0.5 mbar.

**PVL/B & EU/B** pumps are same as PVL but they have provision for additional oil recycle. They are suited for pressures from 850 to 10 mbar.

| PUMP MODEL                   | PVL-EU            | 10       | 15  | 25   | 35   | 45     | 65     | 105    | 160    | 205  | 300  |
|------------------------------|-------------------|----------|-----|------|------|--------|--------|--------|--------|------|------|
| Displacement,<br>Free air    | CFM               | 8.5      | 12  | 17.6 | 24.7 | 31.8   | 45.9   | 74     | 107    | 144  | 205  |
|                              | m <sup>3</sup> /h | 14       | 20  | 30   | 42   | 54     | 78     | 126    | 182    | 245  | 349  |
| Final pressure               | PVL-EU            | 0.5 mbar |     |      |      |        |        |        |        |      |      |
|                              | PVL-EU/B          | 10 mbar  |     |      |      |        |        |        |        |      |      |
| Noise level                  | dB(A)             | 67       | 70  | 68   | 69   | 70     | 70     | 70     | 72     | 72   | 73   |
| Motor size<br>3 Phase, 60 Hz | HP                | ¾        | 1.0 | 1.0  | 1.25 | 2.0    | 3.0    | 4.0    | 5.0    | 7.5  | 10   |
|                              | RPM               | 1750     |     |      |      |        |        |        |        |      |      |
| Oil<br>Capacity              | Liter             | 1.0      | 1.0 | 1.5  | 1.5  | 2.0    | 2.0    | 3.0    | 3.0    | 7.0  | 7.0  |
|                              | Quart             | 1.1      | 1.1 | 1.6  | 1.6  | 2.1    | 2.1    | 3.2    | 3.2    | 7.4  | 7.4  |
| Length                       | Inch              | 14.8     | 16  | 18   | 18   | 23     | 25     | 26.3   | 30     | 37   | 37   |
|                              | mm                | 245      | 407 | 455  | 455  | 581    | 641    | 668    | 760    | 947  | 947  |
| Width                        | Inch              | 9.6      | 9.6 | 10.8 | 10.8 | 13     | 13     | 17.3   | 17.3   | 18   | 18   |
|                              | mm                | 245      | 245 | 275  | 275  | 330    | 330    | 440    | 440    | 452  | 452  |
| Height                       | Inch              | 8        | 8.8 | 10.8 | 10.8 | 13.4   | 13.4   | 13.4   | 13.4   | 16.7 | 16.7 |
|                              | mm                | 205      | 218 | 275  | 275  | 340    | 340    | 340    | 340    | 424  | 424  |
| Weight                       | Lb.               | 50       | 55  | 77   | 84   | 119    | 143    | 190    | 242    | 398  | 422  |
|                              | Kg.               | 23       | 25  | 35   | 38   | 54     | 65     | 86     | 110    | 181  | 192  |
| Connections                  | Inlet             | ½"       | ½"  | ¾"   | ¾"   | 1 1/4" | 1 1/4" | 1 1/2" | 1 1/2" | 2"   | 2"   |
|                              | Outlet            | ½"       | ½"  | ¾"   | ¾"   | 1 1/4" | 1 1/4" | 1 1/2" | 1 1/2" | 2"   | 2"   |

| PUMP MODEL                   |            | PVL-EU            | 401  | 541  | 650  | 750  | 1000 |
|------------------------------|------------|-------------------|------|------|------|------|------|
| Displacement,                | CFM        |                   | 285  | 378  | 459  | 540  | 715  |
|                              | Free air   | m <sup>3</sup> /h | 484  | 643  | 780  | 918  | 1215 |
| Final pressure               | PVL-EU     |                   | 0.5  |      |      |      |      |
|                              | PVL/B EU/B |                   | 10   |      |      |      |      |
| Noise level                  | dB(A)      |                   | 79   | 80   | 79   | 80   | 81   |
| Motor size<br>3 Phase, 60 Hz | HP         |                   | 15   | 20   | 25   | 30   | 40   |
|                              | RPM        |                   | 1750 |      | 1170 |      |      |
| Oil<br>Capacity              | Liter      |                   | 10.0 | 10.0 | 20   | 25   | 25   |
|                              | Quart      |                   | 10.6 | 10.6 | 21.2 | 26.5 | 26.5 |
| Length                       | Inch       |                   | 53   | 53   | 66   | 66   | 66   |
|                              | mm         |                   | 1352 | 1352 | 1680 | 1680 | 1680 |
| Width                        | Inch       |                   | 23.7 | 23.7 | 37   | 37   | 37   |
|                              | mm         |                   | 602  | 602  | 275  | 940  | 940  |
| Height                       | Inch       |                   | 21   | 21   | 25   | 25   | 25   |
|                              | mm         |                   | 532  | 532  | 625  | 625  | 625  |
| Weight                       | Lb.        |                   | 741  | 779  | 1351 | 1815 | 2112 |
|                              | Kg.        |                   | 337  | 354  | 614  | 825  | 960  |
| Connections                  | Inlet      |                   | 3"   | 3"   | 4"   | 4"   | 4"   |
|                              | Outlet     |                   | 3"   | 3"   | 4"   | 4"   | 4"   |

## 5.0 Installation

### 5.1 Unpacking

Inspect the box and pump carefully for any signs of damage incurred in transit. Since all pumps are ordinarily shipped FOB our plant. Such damage is the normal responsibility of the carrier and should be reported to them.

Remove all fastenings and pull the pump out of the container. The pump inlet port may be protected with a plastic cap or similar to prevent any material from entering the pump. **Do not** remove such protection until the pump is ready for piping to the system.

### 5.2 Location

Do not install the pump in dusty environments or where foreign materials may quickly block or cover the cooling surfaces of the pump.

The pump must be installed in a horizontal position on a level surface so that the pump is evenly supported on its feet. Rubber pads between the pump feet and the supporting surface will minimize vibrations. Allow at least 250 mm (more for larger pumps) of air space between the pump and any walls or other obstructions to provide proper air flow for cooling.

The room should have adequate ventilation for the pump and motor fans.

Allow easy access to the oil sight glass in order to inspect and control the oil level properly. Allow proper access to the pump oil tank in order that the exhaust oil separator may easily be changed.

### 5.3 Moving

Normally the pump is shipped from the plant without oil. Whenever the pump is moved or transported, be sure to drain the oil prior to shipping. Do not tip pump over if filled with oil. Breakage of pump vanes may occur if started with cylinder full of oil.

### 5.4 Lifting

Use the provided lifting fittings to lift the pump assembly. Always use both lifting points (pump & motor), if fitted. Do not use pump and/or motor lifting points to lift other attached equipment if any, such as tank, baseplate, etc. Prevent uncontrolled rotation when lifting the pump assembly.

Maximum hand lift is 20 Kg below shoulder, but above ground level. See section 4 for pump weights.

### 5.5 Electrical power requirements

The schematic diagram for the electrical connections is located in the junction box or on the nameplate of the electric motor.

Motor must be connected according to the local electrical codes through a fused switch, or breaker, in order to protect the motor against electrical or mechanical overloads. The motor starter should be sized consistent with the motor amperage listed on the motor nameplate.

Pumps with power requirements 7.5 HP and over and starting against vacuum, should employ a starter that provides soft starting (or an unloading device should be installed so that the pump can vent to atmospheric pressure prior to stopping).

**5.6 Pump rotation**

Correct direction of rotation is marked by an arrow on the pump housing. It is recommended to check the pump rotation prior to filling the pump with oil. With the suction port open, jog the motor briefly to make sure the rotation is correct. If backwards, reverse any two leads of the three at the power connection. In case of single phase motors follow the instructions given by the specific motor manufacturer.

**5.7 Piping the connections**

Pipe size to pump inlet should be at least the same size as the pump inlet connection. Smaller lines will result in lower pumping speeds than the rated values.

When more than one pump is connected to a common header, install a manual and/or automatic isolating valve (check valve) in each pump suction line. Remove any opening’s protection (such as plastic caps) from the pump prior to connecting the piping at the pump.

Pump discharge can be connected to outdoors or other areas, in such cases use pipe size same as the pump outlet connection if the pipe run is less than 15 m. For longer pipe run increase the pipe diameter to minimize the pressure drop. Pipe weights should not rest on the pump, but should be supported.

**5.8 Inlet filters**

Pump models up to 5 HP are fitted with inlet screens under the suction flange, to stop particles larger than 1 mm. Larger models, 7.5 to 20 HP, are fitted with replaceable paper cartridge filters at the suction casing, to stop particles larger than 20 μ. Should the gas handled contain dust or other foreign particles, additional inlet filters may be required in the pump suction line. Consult the factory for recommendations.

**5.9 Oil filling**

**CAUTION: Do not add/fill oil with the pump running or through the pump exhaust/inlet ports!**

The pump is normally shipped without oil (unless otherwise arranged). After level installation and after correct rotation has been established, fill the pump with recommended vacuum oil through the oil filling port. The oil level with pump not running, should be at half way of the upper sight glass. Be sure to replace the oil cap. See table below for recommended oil grades and required oil quantity for each pump size.

**Recommended Oil Types**

| PUMP MODEL   | Oil Qty. Liters                              | Oil Viscosity | PETRO-CANADA   | AGIP      | ESSO       | MOBIL               | SHELL                        |
|--|--|---------------|----------------|-----------|------------|---------------------|------------------------------|
| PVL10-15<br>PVL25-35<br>EU45-65  | 1.0<br>1.5<br>2.0                            | ISO 68        | Compressor 68  | Dicrea 68 | Exxcolub68 | Rarus 426<br>DTE 26 | Comptella 68<br>Corena S 68  |
| PVL100-150<br>EU105-160<br>EU205-300<br>PVL200-270<br>PVL401-541<br>EU650<br>EU 750-1000 | 2.5<br>3.0<br>7.0<br>5.0<br>10.0<br>20<br>25 | ISO 100       | Compressor 100 | Dicrea100 | Nuto H100  | Rarus 427           | Corena S 100<br>Tellus S 100 |

In the event above oils are not available it is acceptable the use of motor oil SAE 10W-30 or multigrade type. The use of synthetic polyalphaolefins (PAO) oils will extend the frequency of oil change to 2000 hours of operation.

**6.0 Operation**

**6.1 Start-up**

Check pump rotation by jogging the motor, see point 5.6.

Fill the pump with oil per point 5.9 and or 7.1.

Start the pump and immediately close the inlet port or line. Run the pump for a few minutes. Stop the pump and check that the oil level is at approximately half way the upper sight glass, add oil if necessary or drain oil if the level is too high (no air bubble seen at the upper sight glass).

### 6.2 Gas ballast

All Rotant pumps are fitted with gas ballast valves. These valves are left open all the time and they do not affect the pump performance. Their function is to prevent water vapor from condensing in the pump which could cause oil emulsification, with possible loss of oil lubricity and consequent rotor seizure.

### 6.3 Stopping the pump

Turn the power off to stop the pump. A check valve should be installed before the vacuum pump if multiple pumps are connected in parallel and/or to isolate the system from the pump.

## 7.0 Maintenance

ROTANT rotary vane vacuum pumps require little maintenance; however, to ensure optimum pump performance, it is recommended that the steps listed in this section be observed.

### 7.1 Pump oil

Every day, make sure that there is sufficient amount of clean oil in the pump, this should be done with the pump stopped. Add oil if it drops below the upper oil sight glass through the oil filling plug.

**CAUTION: Do not attempt to add oil with the pump running since hot unfiltered oil fumes and vapors may escape through the oil fill connection.**

While the pump is running the oil may appear foamy; this is a normal occurrence because the oil is aerated.

### CHANGE OIL EVERY 500 HOURS OR 3 MONTHS OPERATION.

Under normal circumstances it should not be necessary to add or drain oil from the pump between recommended oil changes. A significant drop in oil level means there is an oil leak or that the oil separator filter is no longer effective and the pump is smoking excessively.

Normally the oil will be light colored and foamy. Oil with milky or dark colored appearance requires changing because it's contaminated or burned. Oil type and quantity required is listed in section 5.9.

ROTANT single stage rotary vane pumps do not require nor use oil filters.

### 7.2 Oil separator filter

#### REPLACE OIL SEPARATOR FILTERS EVERY 2000 HOURS OR EVERY YEAR.

The service life of the oil separator filter varies widely with the pump application. It is only necessary to be changed when the filter becomes clogged with foreign materials or burned oil. Indications of clogged oil separator filters can be smoke or oil mist being discharged by the pump, higher than normal motor current or pressure build-up in the pump oil tank is more than 7-9 PSI.

Oil separator filters are not repairable and must be properly disposed of. Always insist on new and original parts.

### 7.3 Inlet vacuum filter

Pump inlet filters and auxiliary inlet filters (if any) require periodic cleaning and/or replacement of filter element.

Depending on the pump application and on the amount of foreign materials the pump is being exposed, the filters should be cleaned or replaced on a weekly basis (100 hours operation).

### 7.4 Oil cooler

Larger size pumps are fitted with radiator type oil coolers. In a dusty environment these coolers may become clogged, periodically use blast of air to blow away the dust.

### 7.5 Maintenance chart (see sections 7.1 to 7.4)

| EVERY DAY              | EVERY WEEK                                  | EVERY 500 HOURS | EVERY 2000 HOURS            |
|------------------------|---|-----------------|-----------------------------|
| Visual oil level check | Inspect inlet filters<br>Inspect oil cooler | Change oil      | Change oil separator filter |

7.6 **Pump overhaul** is recommended every 30,000 hours or 5 years of service.

## 8.0 Trouble shooting

| PROBLEM   | LIST OF POSSIBLE CAUSES |
|---|-------------------------|
| Pump takes too long to evacuate the system                            | 1-2-3-4-5-6-7-8-10      |
| Pump does not reach blank-off pressure                                | 1-2-3-4-5-6-7-8-9-10    |
| Pump will not start   | 11-12-13                |
| Pump starts but draws very high current                               | 14-15-16-17-18-19       |
| Pump smokes at discharge side or expels oil droplets from the exhaust | 20-21-22                |
| Pump runs very noisy  | 23-24-25-26             |
| Pump runs very hot  | 27-28                   |
| Pump is seized  | 29-30-31-32-33          |

| No. | CAUSES  | SOLUTIONS   |
|-----|---|---|
| 1   | Contaminated oil  | Allow the pump to run, drain warm contaminated oil and fill with new clean oil  |
| 2   | Vacuum system or piping not leak-tight  | Check system and piping for possible leak   |
| 3   | Inlet filter is plugged   | Clean and/or replace filter element   |
| 4   | Oil level is low or there is no oil   | Shut off the pump, drain any oil from the pump and add new oil  |
| 5   | Shaft seal leaking  | Replace shaft seal ring, see repair instructions  |
| 6   | Vanes are stuck in rotor or damaged   | Clean pump, replace vanes if required   |
| 7   | Radial clearance between rotor and cylinder no longer adequate                        | Disassemble and reassemble pump resetting the proper radial clearances  |
| 8   | Internal parts worn or damaged  | Disassemble and reassemble repairing or replacing the affected parts  |
| 9   | Pump model is PVL/B series  | To achieve lower blank-off pressures it is necessary to remove the outside fitted oil return line. Request details.                                       |
| 10  | Instrumentation is out of calibration   | Check the instruments (gauges) for accuracy   |
| 11  | Pumps is seized   | Remove fan guards, rotate pump or motor by hand. If either one is blocked disassembly is necessary to check the problem                                   |
| 12  | Defective motor or wired wrong  | Check the voltage, frequency, motor type, power consumption, rotation, wire connections, phase load consistency   |
| 13  | Wrong motor connections   | Check wiring connections, fuses, breakers, heaters, power supply line   |
| 14  | Oil too viscous or ambient temperature is below 5°C                                   | Change oil to lighter weight (less viscous). Change the oil back to the recommended type when ambient temperatures rise.                                  |
| 15  | Pump run in the wrong direction   | Reverse the rotation by reversing any two leads of the three phase power or follow instructions usually given on motor nameplate for single phase motors. |
| 16  | Pump is overfilled with oil   | Drain some oil until level is half way of the top sight glass   |
| 17  | Oil separator filter is clogged due to burned oil or process material                 | Replace oil separator filter, maintain proper oil conditions. Install pump pre-filters.   |
| 18  | Loose connection in motor terminal box or motor starter. Motor operates on two phases | Check motor wiring diagram for proper hook-up, tighten or replace loose connections.  |
| 19  | Foreign material in pump, vanes broken, bearings seized                               | Disassemble pump and reassemble with new parts. Install pre-filters   |
| 20  | Oil separator filter clogged or ineffective   | Replace oil separator filter  |
| 21  | Oil return line is plugged  | Clean or replace  |



|    |  |   |
|----|--|---|
| 22 | Pump is handling vapors  | Water vapor will escape through the pump vent, not usually trapped by the filter.                 |
| 23 | Coupling insert worn   | Replace rubber inserts in coupling  |
| 24 | Bearing noise  | Replace bearings  |
| 25 | Vanes are stuck  | Replace vanes or clean. Use proper oil.   |
| 26 | Loose pump or motor cooling fans                                     | Check, repair or replace the fan  |
| 27 | Not enough air ventilation to pump                                   | Clean pump and motor fins. Clean oil radiator fins if applicable, install in well ventilated area |
| 28 | Not enough oil in pump or oil is degraded                            | Drain and refill with non-detergent recommended oil, change oil more often                        |
| 29 | Pump operated without oil and vanes broke                            | Disassemble and replace vanes   |
| 30 | Pump run in the wrong rotation for too long                          | Inspect vanes and replace   |
| 31 | Liquid carryover into pump cylinder while running breaking the vanes | Install condensate trap in pump suction line  |
| 32 | Multiple pumps on same line without automatic isolation              | Install check valve or automatic operated valve in each pump suction line                         |
| 33 | Too much oil in pump cylinder at start-up breaking the vanes         | Allow pump to discharge excessive oil before stopping or install soft starter                     |

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