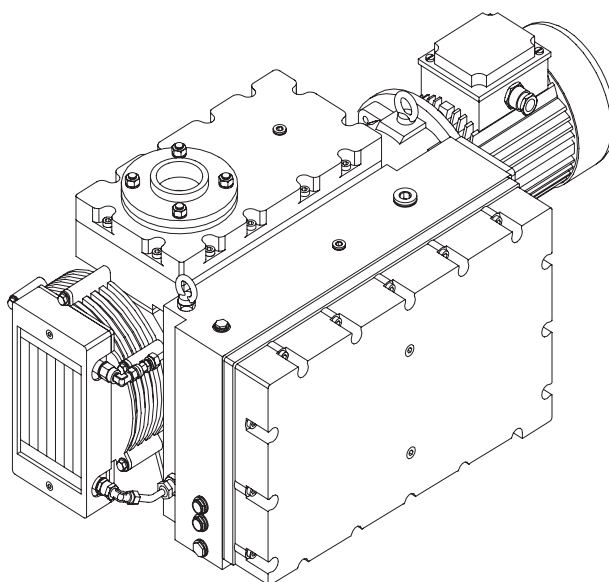


PVL 401 - PVL 401/B PVL 541 - PVL 541/B

***Lubricated vane
vacuum pump***



Operating and maintenance instructions

Publication Number:
LI 3019.03 January 2020

Operating and maintenance instructions

EN

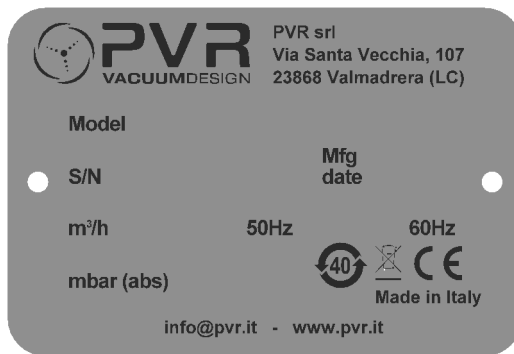
Index

1. General information	page 3
2. Product specifications	page 4
2.1 Pump description	page 4
2.2 Expected use	page 5
2.3 Forbidden use	page 5
2.4 Protections	page 5
2.5 Accessories	page 5
3. Safety rules	page 6
4. Transport/handling	page 8
4.1 Lifting	page 8
4.2 Unpacking and components control	page 8
4.3 Storage	page 8
5. Commissioning and operation	page 9
5.1 Assembly	page 9
5.2 Location	page 10
5.3 Connection to the machine	page 11
5.4 Discharge air pipe line installation	page 11
5.5 Electric connection	page 12
5.6 Commissioning	page 13
5.7 Tips for use	page 13
5.8 Water vapour suction	page 14
6. Servicing	page 14
6.1 General information	page 14
6.2 Oil change	page 16
6.3 Coupling rubber insert replacement	page 16
6.4 Exhaust filters replacement	page 16
6.5 Spares necessary for the normal servicing	page 17
6.6 Pump overhaul	page 17
6.7 How to order spare parts	page 17
7. Lubricants	page 17
8. De-commissioning	page 18
9. Return for repair	page 18
10. Disposal	page 18
11. Troubleshooting	page 19
Attachments	
Technical data sheet, exploded view and parts list (RDT)	
EC declaration of conformity (DC)	
Electric motor operating instructions	
Instructions for the accessories	

1. General information

This manual contains information necessary for the proper operation of the pump in order to prevent unsuitable use and for the safety of the operators. Do not attempt any other type of operation without having first contacted our **Service Department**. The information provided herewith does not intend to replace, integrate or change any rules, regulations, law by decree, directive or law of specific character in force in the Country where the installation takes place.

The suggestions given to the staff engaged in the installation and servicing assumes that the personnel is expert and prepared in facing any problem of servicing, both mechanical and electrical. For any questions or information not included in this manual, please contact our Service Department, always providing: model (Model), serial number (Serial), year of manufacture, stated on the pump name plate.



Symbols used:



WARNING:
Instructions that, if not followed,
could result in serious
personal injuries.



ELECTRIC SAFETY



NOTE:
Instructions that, if not followed,
could result in pump damages.



FIRE HAZARD



HOT SURFACES



**READ THE OPERATING
INSTRUCTIONS**



**HARMFUL SUBSTANCES
EMISSIONS**



INLET PORT



**DO NOT DISPOSE INTO
THE ENVIRONMENT**



EXHAUST PORT



DISPOSAL

2. Product specifications

2.1 Pump description

The pumps series PVL 401 - PVL 541 have a nominal capacity (50 Hz) of 403 and 536 m³/h respectively.

They are lubricated, with oil recirculation system, rotary vane vacuum pumps.

The flanged electric motor is coupled by means of an elastic coupling.

The cooling is made by means an air/oil cooler, cooled with a centrifugal fan.

At the inlet there is a mesh filter in order to protect the pump from solid parts having diameter bigger than 1,5 mm.

Furthermore, an integrated no-return valve prevents the oil from coming back and the return of air in the chamber to be pumped down during the stop phase.

In the tank there is a system of separation of oil smokes from discharge air (maximum residual 2PPM/weight corresponding to 2.4 mg/m³).

The separated oil is recovered automatically by the pump.

A gas ballast valve, always on, prevents condensation inside the pump when pumping down small quantity of vapour.

2.2 Expected use

These vacuum pumps have been designed to handle air and small quantity of water vapour only. They are suitable to evacuate closed systems or to operate at a constant vacuum within the following vacuum range:

PVL 401 - PVL 541 from 0.5 to 400 mbar (absolute)

PVL 401/B - PVL 541/B from 10 to 850 mbar (absolute)

The ambient temperature and the inlet temperatures must be included between 5° and 40°C.

In case you get temperatures outside this range, please get in touch with us.

Handling of other types of gas or vapours must be declared in advance to P.V.R. that will give the conformity to the specific use.

2.3 Forbidden use



ATTENTION:

The pump MUST NOT handle:

- liquids or solid substances;
- dangerous, explosive or aggressive gases and vapours;
- pure oxygen or air mixtures enriched with oxygen;

It is forbidden to use the discharge of the pump to create even limited pressures.



ATTENTION:

It is forbidden to install the pump in a potentially explosive environment.

2.4 Protections

The pump must be protected against suction of dust, solids or liquids.

For those applications where such a protection is not ensured, a vacuum gauge must be installed on the oil tank for a visual check of the exhaust filter clogging.

In order to get an automatic pump stop, a pressure switch set at 0.7 bar can be installed. The pump is supplied without electric control panel. The electric motor must be protected according to the regulations in force.



ATTENTION:

In case of applications where the pump stop or failure can cause damages to people or things, safety measures for the system must be adopted.

2.5 Accessories

The following accessories useful for the installation and for the control of the operation parameters of the pump are available:

- external inlet filter
- connection fittings
- vacuum meters/ vacuum switches
- pressure meters/ pressure switches
- temperature switch
- low oil level switch

3. Safety rules



WARNING:

Despite of all the precautions adopted when designing the equipment, there are some risk elements that arise during operation and servicing.



HOT SURFACES

The temperature of the pump surfaces may exceed 80°C.

Install the pump in a protected area accessible only by authorized personnel, to prevent possible personal injuries due to contact with hot surfaces.

The pump can be placed inside other machines by adopting the necessary safeguards. Before carrying out any maintenance on the pump, be sure the pump is cold.



HARMFUL SUBSTANCES EMISSIONS

The discharged air contains part of traces of oil mist.

Check the compatibility with the environment.

Make sure a correct air change is allowed otherwise convey the pump discharge outside. A failure or the seals wear can cause an oil leakage.

Avoid the dispersion to the ground and the pollution of other materials. In case that any air containing dangerous substances must be pumped down (for example, biological or microbiological agents), make sure to adopt filtering systems before introducing air in the work environment.

Used discharged oil from the pump must be disposed in accordance with the regulations in force in the Country of use.



Do not dispose into the environment.

HAZARD CAUSED BY VACUUM

Any contact with parts under vacuum can cause injuries.

Avoid any contact with the pump inlet port during the pump operation. Introduce air in the inlet circuit before every operation cycle.

HAZARD CAUSED BY PRESSURE

The pump tank is pressurized. Do not open the oil filling and discharge plugs during operation.

FOR A SAFE MAINTENANCE

All maintenance operations must be carried out with the pump idle, disconnected from the electrical supply, with the pump cold, vented to atmospheric pressure. Prevent unexpected start-up (e.g. block the power switch with a personal lock).



ELECTRIC SAFETY

Some components of the electric equipment are electrically charged during operation. Any contact may cause serious injuries to persons or objects.

Connection and control of the electric system must be carried out by skilled personnel only.

The electrical equipment must comply with the EN 60204-1 standard and with any other law in force in the Country of use.

Besides, electrical equipment must comply with EN 61000-6-4 and EN 61000-6-2 standards concerning electromagnetic compatibility and electromagnetic immunity for industrial environment.



FIRE HAZARD

WARNING! The use of the pump in situations unforeseen or not recommended by this manual, as well as lack of correct maintenance, may create high risks for overheating or fire.

In case of a fire do not use water to extinguish but use a powder CO₂ extinguisher or other means compatible with the electrical equipment and lubricating oil.

4. Transport/handling

4.1 Lifting

The orientation of the packed components must correspond to the instructions given by the pictograms on the external covering of the packaging.
For the unloading use a lifting equipment suitable for the pump weight.
Use the suitable lifting eyebolt to lift the pump.

4.2 Unpacking and components control

When receiving the machine, check that the packing is intact or if it shows signs of damages occurred during transportation.
If there is no damage, proceed to the unpacking and check further the machine.
In case damages are found, inform immediately P.V.R. and the carrier. A representative will contact you or it may be dispatched to the site to inspect and file full damage report.

4.3 Storage

The pumps must be stored or transported without oil and protected from the atmospheric agents at a temperature between -15°C and 70°C (normal humidity rate max. 95% non condensing).

5. Commissioning and operation

5.1 Assembly

If the pump is supplied without any electric motor, install a motor whose characteristics are the same as stated on the technical sheet, constructive form IM B 14.



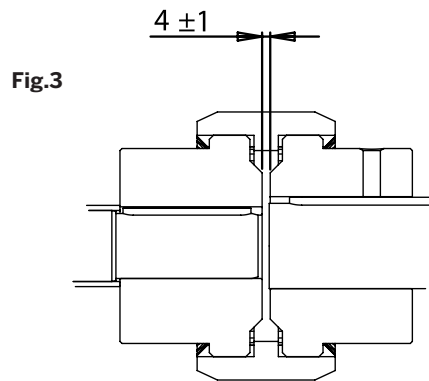
WARNING:

- Use lifting equipment suitable for the motor weight (about 30 kg)
- To assure the continuity of the equipotential circuit of the pump, clean the contact surfaces very well, by removing any grease or protective painting.



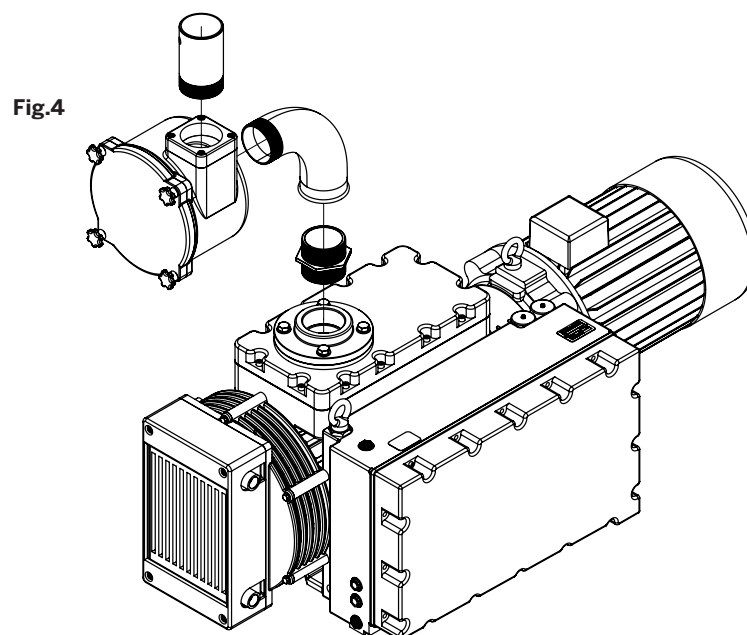
NOTE:

After the assembly, check that the distance between the two coupling halves is 4^{+1} mm (Figure 3)



Remove inlet and exhaust plastic caps.

Fit the external filter in horizontal position to prevent dirt coming inside the pump during the cleaning of the cartridge. (Figure.4)



Operating and maintenance instructions

EN

5.3 Location



WARNING:

- The pump must be installed in a protected area (see safety rules).
- It must be fastened with support feet on horizontal surface.
- It must be accessible for correct and easy maintenance, by respecting the minimum distances from possible obstructions (see figure 6).
- It must be accessible to suitable lifting equipment.



NOTE:

- Ensure the air exchange in the room or inside the machine where the pump has been installed.
To assure a sufficient cooling, avoid exceeding 40°C of ambient temperature.
- The pump must be protected against jets or sprays of water that may penetrate the tank through the exhaust port.
- Whenever the pump is installed outside, it must be protected against atmospheric agents and it must be used with an oil suitable for low temperature.
- Avoid warm air coming from the exhaust or the cooling fans causing discomfort to the personnel.
- Do not install the pump in a dusty area or where other materials may block or cover the cooling surfaces quickly.

A	B	C
300 mm	300 mm	300 mm

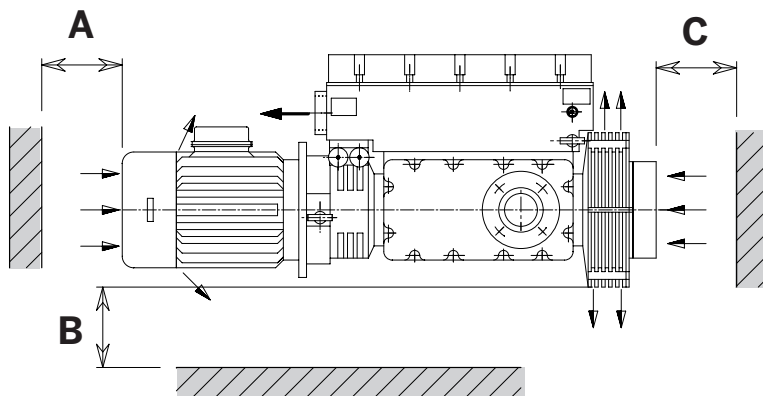


Fig.6

5.4 Connection to the machine

The connection to the chamber to be pumped down must be carried out by means of pipes of the same diameter as the inlet port.
Pipe weights and expansions, if any, must not rest on the pump.
It is advisable to make the final connection to the pump inlet port with flexible pipes or fittings.
It is important that all the pipes and the different fittings are tight.
Very long or small diameter pipes decrease the pump performances.



This symbol identifies the inlet port.

For further information, please refer to the RDT attached herewith.

5.5 Discharge air pipe line installation

- If the pump has been installed in a room with poor air exchange, it is possible to pipe the pump discharge air to other rooms or outside.
- Use pipes with the same diameter as the tank discharge port with a maximum length of 15 m.
For longer pipes increase pipe diameter. Pipe weights must not rest on the pump.
In the final length use flexible pipes or pipe fittings.



NOTE:
this pipe must be descending, to avoid the condensate going back to the tank.



WARNING:
do not connect ball valves to this pipeline.



This symbol identifies the exhaust port.

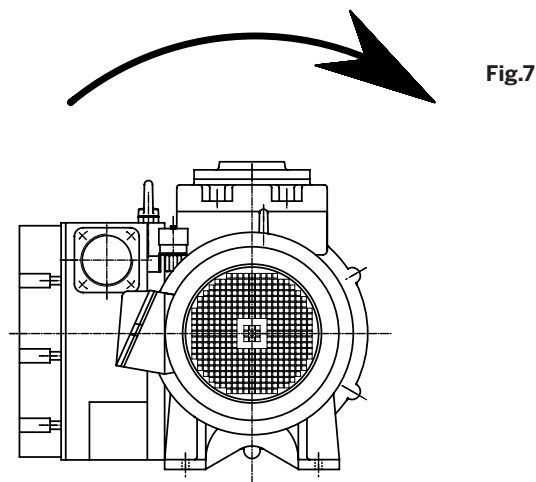
For further information, please refer to the RDT attached herewith.

Operating and maintenance instructions

EN

5.5 Electric connection

- The control panel and electric connections must be carried out by skilled personnel and conform to the EN 60204-1 rules or to other local regulations in the Country of use.
- The electric equipment must comply with EN 61000-6-4 and EN 61000-6-2 standard concerning electromagnetic compatibility, emission standard and immunity for industrial environments.
- Check the main voltage and frequency in use to correspond to the data stamped on the motor name plate.
- The electric motor must be protected against overload. The full load amperage value on the motor name plate must be considered when sizing the electrical components and motor protection against overloading.
- Make sure the grounding is correctly done.
- Carry out the electric connection following the diagram shown on the motor terminal box.
- Check direction of rotation by starting the pump for a short time (2-3 seconds). The correct direction is shown by the arrow on the pump (figure 7). In case of wrong rotation, it is necessary to change the motor rotation by exchanging position of two of the three connections in the motor terminal box.



5.6 Commissioning

The pump is supplied without lubricating oil.



NOTE:
the operation without oil causes big damages to the pump.

Carry out the first filling up through the plug (E) up to the half of the sight glass (F) and close the plug (E) (Figure 8).

Start the pump and take it to the maximum vacuum level for at least 2 minutes.

Stop the pump, check again the oil level and add the lacking oil, if necessary, in order to get the correct oil level.



NOTE:
a quantity of oil greater than necessary may clog the oil separator and damage the pump or the electric motor.

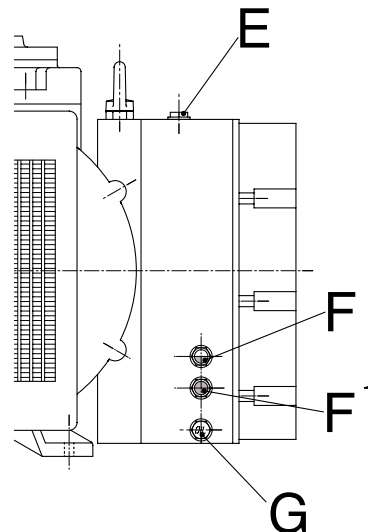


Fig.8

5.7 Tips for using

When the room temperature is lower than 10°C, it is a good practice to let the pump operate at the ultimate pressure (Inlet port closed, without load) for about 15 minutes. During this period the pump may not reach the stated pressure limits.



NOTE:
Avoid operating the pump for long periods with inlet port vented to atmospheric pressure.

Avoid frequent stop-starting, as this will lead to premature wear of the coupling elastic element.

It is recommended not to exceed 5 starting/hour. For more frequent starting, it is recommended to install a soft starter device.

Operating and maintenance instructions

EN

5.8 Water vapour intake

In order to pump down any water vapour, the following operations are recommended:

Let the pump run for thirty minutes at the maximum vacuum in order to bring the pump temperature to its operating value.

At the end of the working cycle, in case of further presence of condensate in the oil, let the pump run for at least thirty minutes at the maximum vacuum.

It is advisable to carry out this operation before stopping the pump for a long time. The gas ballast valve will allow the elimination of water condensate from the lubricating oil.

6. Servicing

6.1 General information

In order to keep the pump operating at a high efficiency level, it is mandatory to follow all periodical service points listed in the table below. However, more frequent service operations may be necessary depending on what the pump is used for (suction of condensable vapours, suction of powders or polluting substances).

For such cases, only direct experience can indicate the correct service frequency needed. The exhausted oil and the replaced spare parts must be considered as special waste products and handled according to the local regulations in the Country of use.



WARNING:

Before every maintenance operation:

- **Always ensure that the pump is insulated from the electrical network so that it can't start automatically.**
- **Wait until the pump gets cool and make sure it has reached a non-dangerous temperature.**
- **Introduce air in the inlet circuit.**



WARNING:

in the case of maintenance operations involving the removal of the carter, restore the electrical continuity of the pump by reconnecting the jumper between the carter and the fan cover.

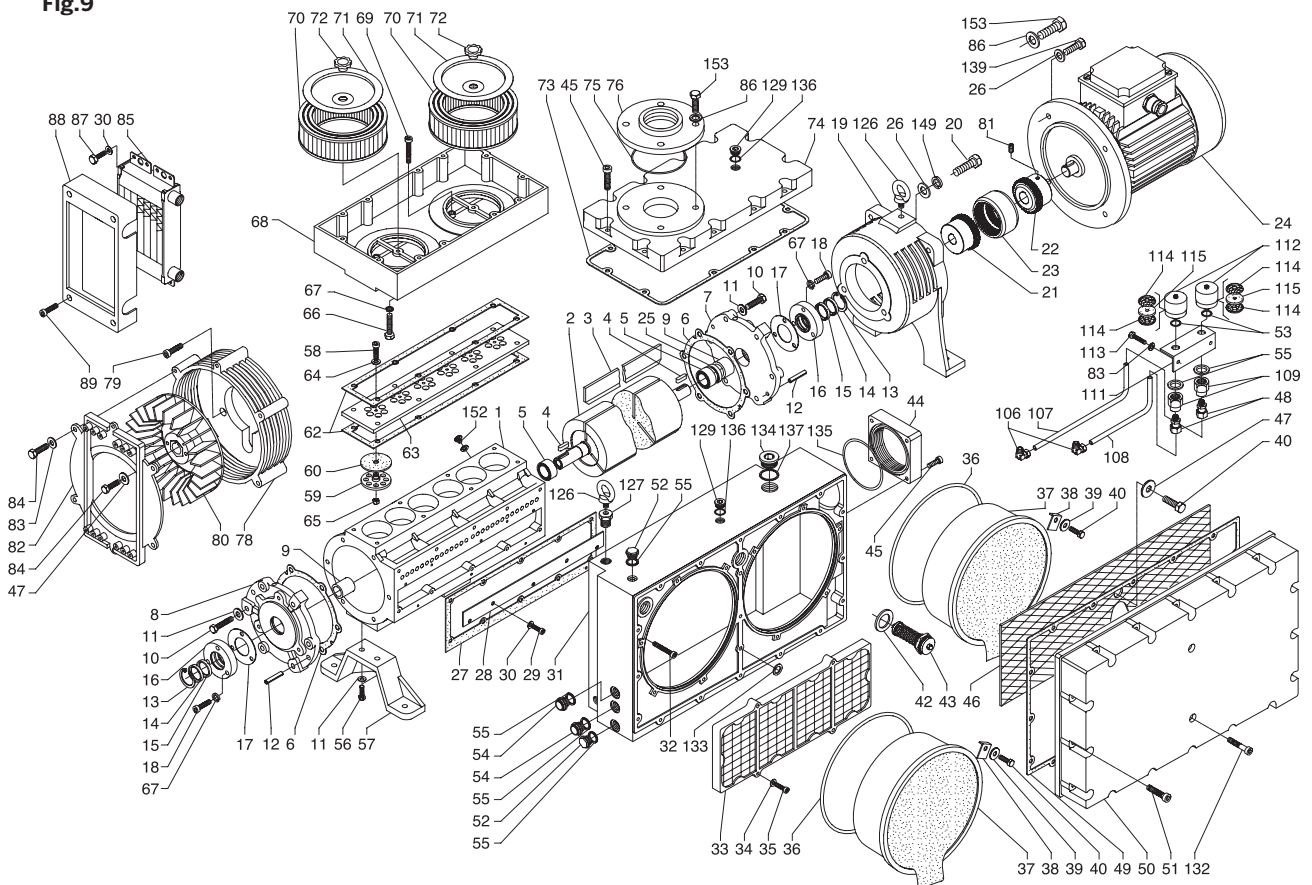
Operating and maintenance instructions

EN

SERVICING FREQUENCY	DESCRIPTION OF THE OPERATION	AUTHORIZED PERSONNEL
24 Hours/every day	Check oil level before starting.	Operator
100 Hours/every week	Clean the external inlet element with a blast of air	Operator
	Clean with a blast of air the cooling surfaces of the pump and of the electric motor.	Operator
*500/1000 Hours/every 6 months	Replace the lubricating oil.	Skilled Worker
	If the pressure gauge is fitted to the pump, check the oil separator (max 0,7 bar), if necessary, replace it.	Skilled Worker
	Replace the gas-ballast felt disk (pos.115).	Skilled Worker
	Replace the oil separator (pos.37)	Skilled Worker
2000 Hours/every year	Check and if necessary replace the coupling rubber insert (pos. 23)	Skilled Worker
	Check the electrical connections.	Skilled Worker
30000 Hours/every 5 years	Pump overhaul.	Customer Service

* The first oil change has to be done after 500 hours of operation. If any polluting substances are found in the oil, next oil change could take place within 1000 hours.

Fig.9



Operating and maintenance instructions

EN

6.2 Oil change

For a correct operation, oil change should be done when the pump is still warm.



ATTENTION:
Use protective gloves to avoid injury caused by heat.

If there are big quantities of pollution or if there is some water, clean the pump by letting it run with fresh oil at maximum vacuum level.

Change again the lubricating oil (see “commissioning” and “recommended oil table”).

6.3 Coupling rubber insert replacement

Remove the motor (pos.24) unscrewing the screws (pos.138/139) and check the coupling seeve (pos.23) conditions. If necessary, replace it. Assemble by screwing the screws.



ATTENTION:
please use suitable lifting equipment.
Weight expected for the electric motor between 23 and 27 Kg



NOTE:
the operation with damaged elastic element causes an anomalous pump noise, especially when starting the pump and may lead to coupling and pump shaft failure.

6.4 Exhaust filters replacement

Very dirty oil separators may cause a considerable pump temperature increase and in extreme cases oil lubricant spontaneous ignition. Maximum allowed pressure in the tank is 0.7 bar measured at the maximum capacity (when the pump is working with the inlet against atmospheric pressure).

If a pressure gauge is fitted on the tank, check the oil separators blockage with the pump still warmed-up.

For the replacement remove the cover (pos.50) unscrewing the respective screws.

Remove the screws (pos. 40) and replace the oil separators. If necessary replace the O rings (pos.36) and the gasket (pos. 49).

For the assembly proceed the opposite way.



NOTE:
the oil separator must be fitted so that the external tongue is in the lowest point, while the holes for the passage of air, which are inside, stay in the upper point.

6.5 Spares necessary for the normal servicing

The recommended spares are shown in the list of the exploded drawing marked with the letter “R” (see RDT). They are contained in the minor spare parts kit.

6.6 Pump overhaul

For this operation please request the proper instructions and direct any questions to our Customer Service department. The overhaul consists of a complete disassembly, cleaning of all components as well as replacement of parts that are subject to wear (pump and motor bearings, vanes and gaskets).

6.7 How to order spare parts

When ordering spare parts, always state the pump model, serial number, year of production, electric motor characteristics (manufacturer’s name, model, kW, V, Hz), position reference on the spare parts list, description and quantity needed. Different types of maintenance kits are available (ref. RDT attachment).

7. Lubricants

Mineral oil recommended for generic use		
Use the mineral oil for compressors according to DIN 51506 group VC-VCL or VDL classification ISO L-DAG.		
Ambient temperature	Grade	PVR oil
12 - 40°C	ISO 100	Rotant VF 204
5 - 30°C	ISO 68	Rotant VF 203

Synthetic oil recommended for generic use		
Use the synthetic oil for compressors according to USDA/NSF H2.		
Ambient temperature	Grade	PVR oil
5 - 40°C	ISO 100	Rotant VF 304
0 - 30°C	ISO 68	Rotant VF 303

Recommended oil for application in the food industry.		
Use the synthetic oil compatible for chance contact with food according to USDA H1.		
Ambient temperature	Grade	PVR oil
5 - 40°C	ISO 100	Rotant VF 404 H1
0 - 30°C	ISO 68	Rotant VF 403 H1

For ambient temperature outside the stated range, please get in touch with our Customer Service Department.

8. De-commissioning

Drain the oil from the pump prior to the removal.

If the oil is polluted, flush the pump with fresh oil (see “oil change”).

Drain the oil from the tank, plug the inlet and the discharge ports and store the pump without oil.

In case of pump disposal, separate the pump parts by materials and trash the parts in accordance with the local regulations in the Country of use.

9. Return for repair

In case of pump return for repair to P.V.R., provide a list of substances which have come in contact with the pump and advise the risks involved in handling, if any. Drain the lubricant from the pump prior to shipping the pump back.

10. Disposal

Meaning of the “WEEE” logo found in labels

The following symbol is applied in accordance with the EC WEEE (Waste Electrical and Electronic Equipment) Directive.

This symbol (valid only in countries of the European Community) indicates that the product it applies to must NOT be disposed of together with ordinary domestic or industrial waste but must be sent to a differentiated waste collection system.

The end user is therefore invited to contact the supplier of the device, whether the Parent Company or a retailer, to initiate the collection and disposal process after checking the contractual terms and conditions of sale.



11. Troubleshooting

TROUBLE	CAUSE	REMEDY
Drop in performances	Inlet filter is dirty	Clean or replace
	Leaks in the inlet pipe or on the using machine	Eliminate leaks
	Lack of lubrication	Check oil level and conditions. Fill with oil to the right level or replace the oil
Anomalous noise	No lubrication	See previous point
	Coupling element worn	Replace
	Motor or pump bearings damaged	Replace
	Damaged vanes	Replace
	Damaged contact surfaces	Pump overhaul at our workshop
Oil leak	Shaft oil seal rings worn	Replace oil seal ring (pos.14-15)
	Inefficient oil separator	Check and clean oil recovery pipe
	Inefficient oil recovery system	Replace oil separator (pos.37)
Motor protection is tripping	Blocked exhaust filters	Replace oil separator (pos.37)
	No lubrication	Oil level filling up
	Pump seizure and jam	Pump overhaul
	Broken vane	Replace vanes
Discharge oil mist	Inefficient exhaust filters	Replace oil separator (pos.37)
	High temperature due to polluted oil	Oil change
	High operating temperature due to high ambient temperature	Decrease room temperature by allowing a better air exchange



PVR Srl

HEADQUARTERS:

Via Santa Vecchia, 107 - 23868 Valmadrera (LC), Italy
T +39 0341 1918 51 - F +39 0341 1918 599
info@pvr.it - www.pvr.it

LOCAL UNIT:

Via IV Novembre, 104F
23868 Valmadrera (LC), Italy