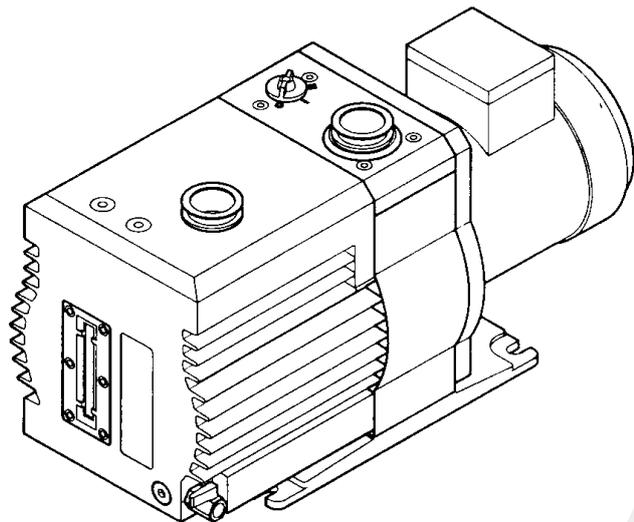


PHV K

*Dual stage oil lubricated
rotary vane pumps*



Operating and maintenance instructions

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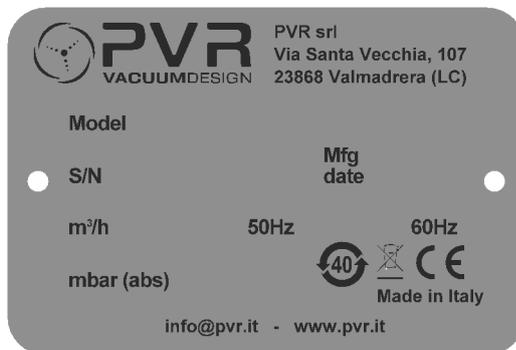
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1. General information

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

**READ THE OPERATING
INSTRUCTIONS**



HOT SURFACES



INLET PORT



**HARMFUL SUBSTANCES
EMISSIONS**



EXHAUST PORT



**DO NOT DISPOSE INTO
THE ENVIRONMENT**



DISPOSAL

2. Product specifications

2.1 Pump description

PHV K pump series are rotary vane oil lubricated two stage vacuum pumps. The flanged electric motor is coupled by means of an elastic coupling. The cooling is made by means of forced air by a centrifugal fan. At the inlet there is a mesh filter in order to protect the pump from solid parts. An integrated non-return valve prevents the oil from going back and the return of air in the chamber to be pumped down during the stop phase. The separation of oil smokes from discharged air takes place in the TMF oil mist filter (optional). The filtered oil is recovered automatically by the pump by precipitation (this take place when the machine is not working or during its operation at the maximum vacuum, i.e. inlet is closed). Adjustable gas ballast valve prevents the condensation inside the pump when small vapour quantities are sucked.

2.2 Expected use

The vacuum pumps described in this manual can pump only air and small quantity of water vapour. They are suitable to evacuate closed systems or to operate at a constant vacuum till 1×10^{-3} mbar. The ambient temperature and the inlet temperature must be included between 12 and 40 °C. In case you get temperatures outside this range, please get in touch with us. The suction or 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 and liquids.
For applications where this protection is not warranted it is recommended to install a pressure gauge on the oil tank for a visual control of the oil separator blockage.
The pump is supplied without 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 the operation are available:

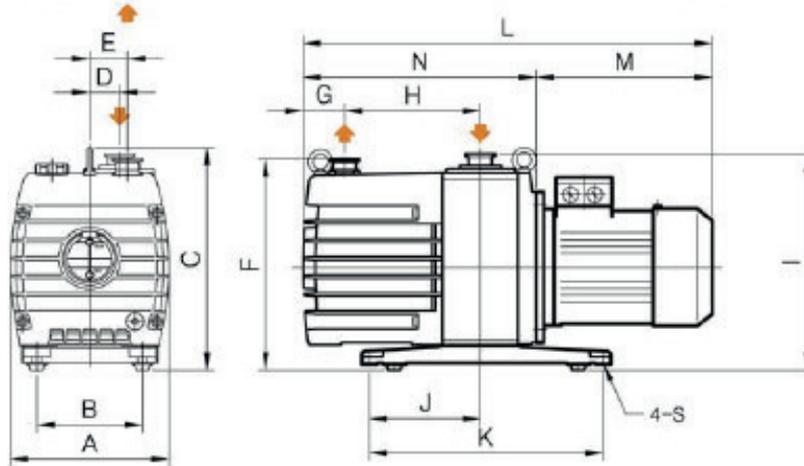
- external inlet filter
- discharge oil mist trap type TMF
- vacuum gauges/ vacuum switches
- pressure gauges / pressure switches
- pipe fittings

Operating and maintenance instructions

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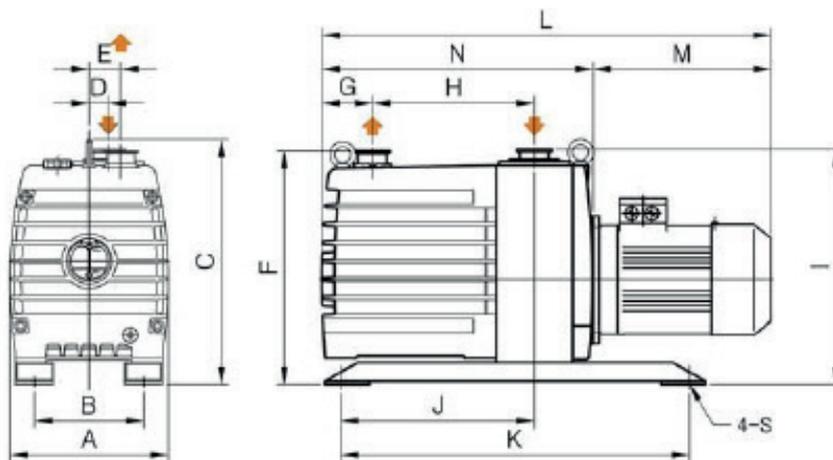
2.6 Weight and dimensions

PHV 5-10-20-30 K



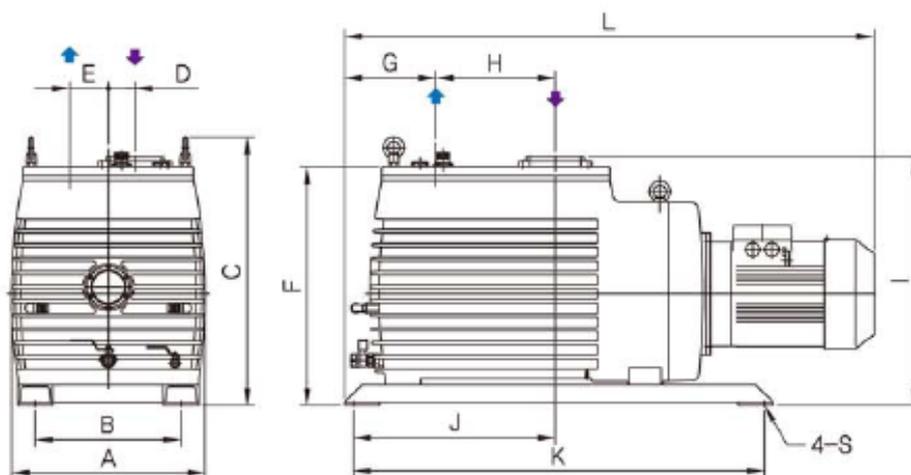
MODEL	A	B	C	D	E	F	G	H	I	J	K	N	S	M	L
PHV5K	170	120	261	24	40	247	45	130	253	94	240	244	Ø9	210	454
PHV10K	170	120	261	24	40	247	45	155	253	94	240	269	Ø9	210	479
PHV20K	210	140	297	40	50	282	55	180	288	147	310	309	Ø12	234	543
PHV30K	210	140	297	40	50	282	58	210	288	147	310	242	Ø12	234	576

PHV 50-75 K



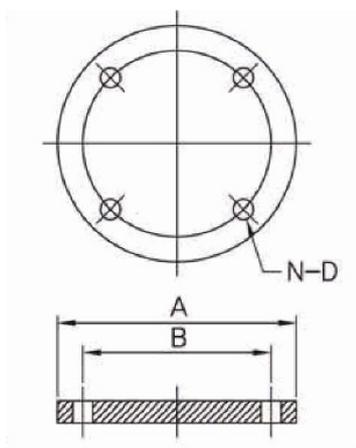
MODEL	A	B	C	D	E	F	G	H	I	J	K	N	S	M	L
PHV50K	250	185	387	30	50	368	80	255	370	305	550	428	Ø14	281	709
PHV75K	280	185	441	30	50	412	85	295	415	355	600	479	Ø14	312	791

PHV 120-180-270-360-450 K



MODEL	A	B	C	D	E	F	G	H	I	J	K	S	L
PHV120K	320	230	501	40	65	414	193	175	465	348	740	Ø14	974
PHV180K	400	305	575	58	75	490	195	200	528	375	805	Ø18	1101
PHV270K	400	305	645	58	75	560	203	250	598	433	895	Ø18	1179
PHV360K	550	415	771	76	110	686	258	225	714	458	1040	Ø18	1377
PHV450K	550	415	771	76	110	686	260	340	714	575	1170	Ø18	1507

DIMENSIONI FLANGE ISO



STANDARD	A	B	N	D
ISO40	Ø 100	Ø 80	4	M8
ISO63	Ø 130	Ø 110	4	M8
ISO100	Ø 165	Ø 145	8	M8

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 eyebolts 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 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.

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.

5.2 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.

5.3 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

5.4 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 of the motor:

1. Open the inlet and discharge ports.
2. Lay the transport protection caps on the inlet port.
3. Switch the pump on for 2 to 3 seconds checking that the plastic cap get tight on the inlet port.

5.5 Commissioning

Before using the pump, carry out the following operations:

- Check the oil level through the sight glass, if necessary fill it up.
- Make sure there isn't any oil leaks.



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



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

5.6 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 10 starting/hour. For more frequent starting, it is recommended to install a soft starter device.

5.7 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



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.

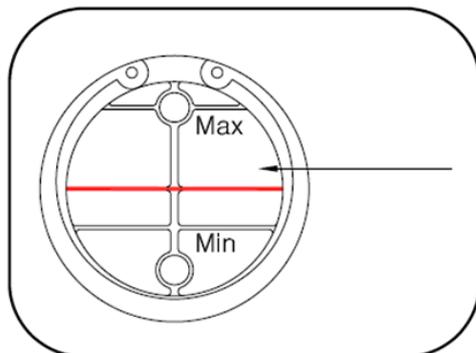
Introduce air in the inlet circuit.

The exhausted oil and the replaced spare parts must be considered as special waste products and handled according to the regulations in force in the Country of use.

6.2 Oil control

The oil level can be checked through the level sight glass placed in the rear part of the pump; in case of oil shortage, fill it up through the suitable plugs.

The oil condition can be checked visibly, the oil in good condition is clean and limpid. If the oil becomes dark, change it.



6.3 Oil change

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



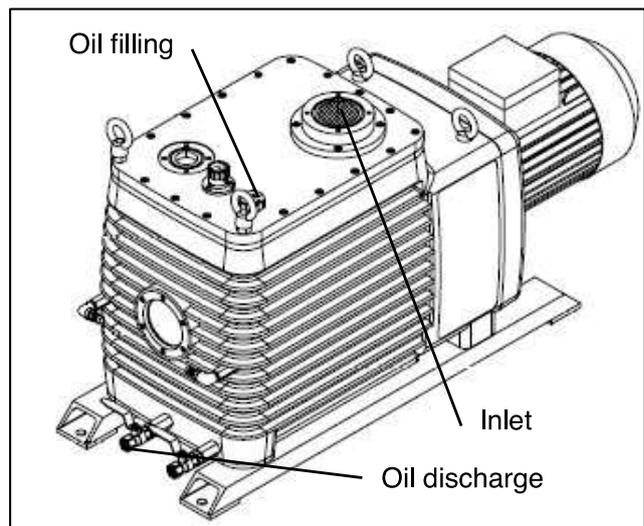
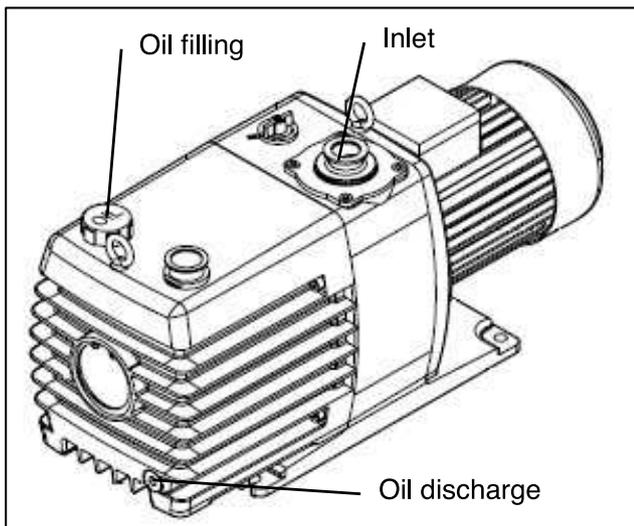
WARNING:
Use protective gloves to avoid injury caused by heat.

Oil should be changed as follows:

- After the first 100 working hours, if it is polluted.
- Next change, every 2000 ÷ 3000 working hours;
- When vacuum level decreases.

To change the oil, follow these steps:

- a) Switch the pump off.
- b) Drain the exhausted oil in the special containers by opening the drain valve or the discharge plug.
- c) Drain the exhausted oil remains by running the pump for a short period (10 seconds maximum) with the inlet port and the oil drain valve open.
- d) Go on making the pump run by filling with fresh oil from the inlet port in to remove the last impurities.
- e) Stop the pump, close the oil drain valve or the oil discharge plug and fill with fresh oil from the provided plugs in.



Operating and maintenance instructions

EN

6.4 Inlet filter cleaning

The cleaning depends on the ambient where the pump operates.
Remove the filter from the inlet port and clean it by means of compressed air.
Replace the filter if it is damaged.

6.5 Motor disassembly and re-assembling

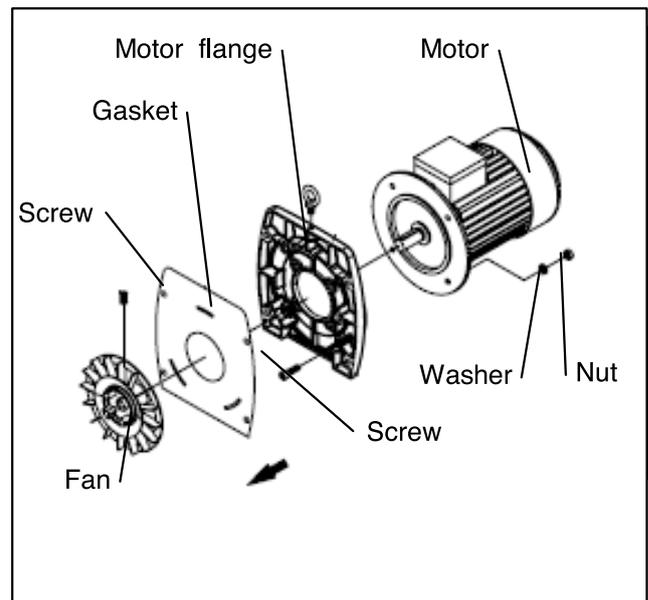
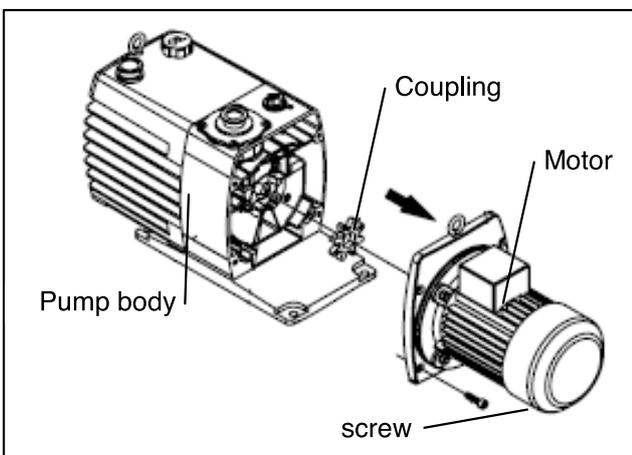
MODELS PHV K 5-10-20-30-50-75

DISASSEMBLY

- Make sure that the power supply is provided with a switch and that the pump is perfectly not operating and at atmospheric pressure.
- Loosen the two motor lower screws;
- Fasten the motor in order to avoid its fall;
- Loosen the two upper screws;
- Remove the motor and the flange from the pump;
- Remove the coupling element from the fan;
- Loosen the fan screw;
- Make the fan slide along the motor shaft;
- Remove the gasket from the motor flange;
- Loosen the four screws of the motor flange and remove the motor from the flange itself.

RE-ASSEMBLING

- Make sure that all the parts are clean and check their conditions;
- Fix the motor to the flange by means of the four screws;
- Fit the gasket to the motor flange
- Fit the motor and the fan by making them slide axially. Avoid sudden or forced movements to prevent the coupling surfaces from being damaged;
- Fix the fan to the motor shaft by means of its screw;
- Insert the coupling element on the fan;
- Assemble the motor and the pump and tighten the four screws.



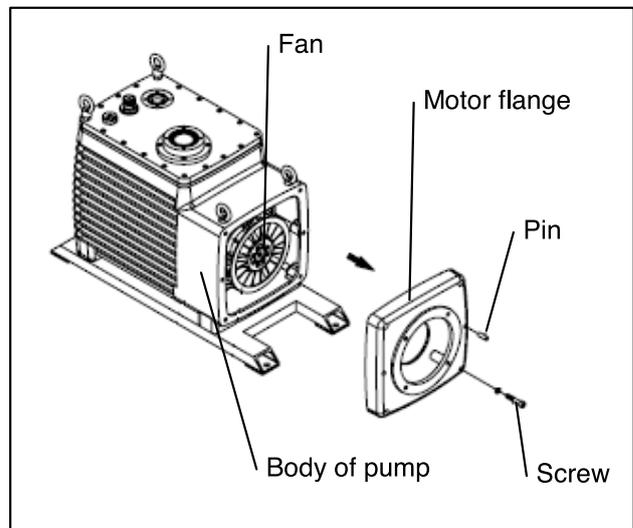
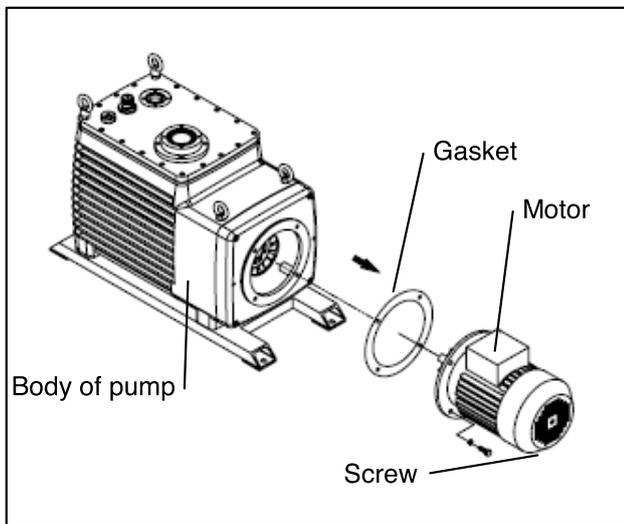
MODELS PHV K 120-180-270-360-450

DISASSEMBLY

- Make sure that the power supply is provided with a switch and that the pump is perfectly not operating and at atmospheric pressure.
- Loosen the two motor lower screws;
- Fasten the motor in order to avoid its fall;
- Loosen the two upper screws;
- Remove the motor and the gasket from the motor flange;
- Remove the two pins;
- Loosen the motor flange screws;
- Remove the motor flange from the oil tank.

RE-ASSEMBLING

- Make sure that all the parts are clean and check their conditions;
- Fix the motor flange to the tank tightening the four screws;
- Assemble the two pins on the motor flange;
- Fit the motor and the gasket by making them slide axially. Avoid sudden or forced movements to prevent the coupling surfaces from being damaged.
- Tighten the four screws.



Operating and maintenance instructions

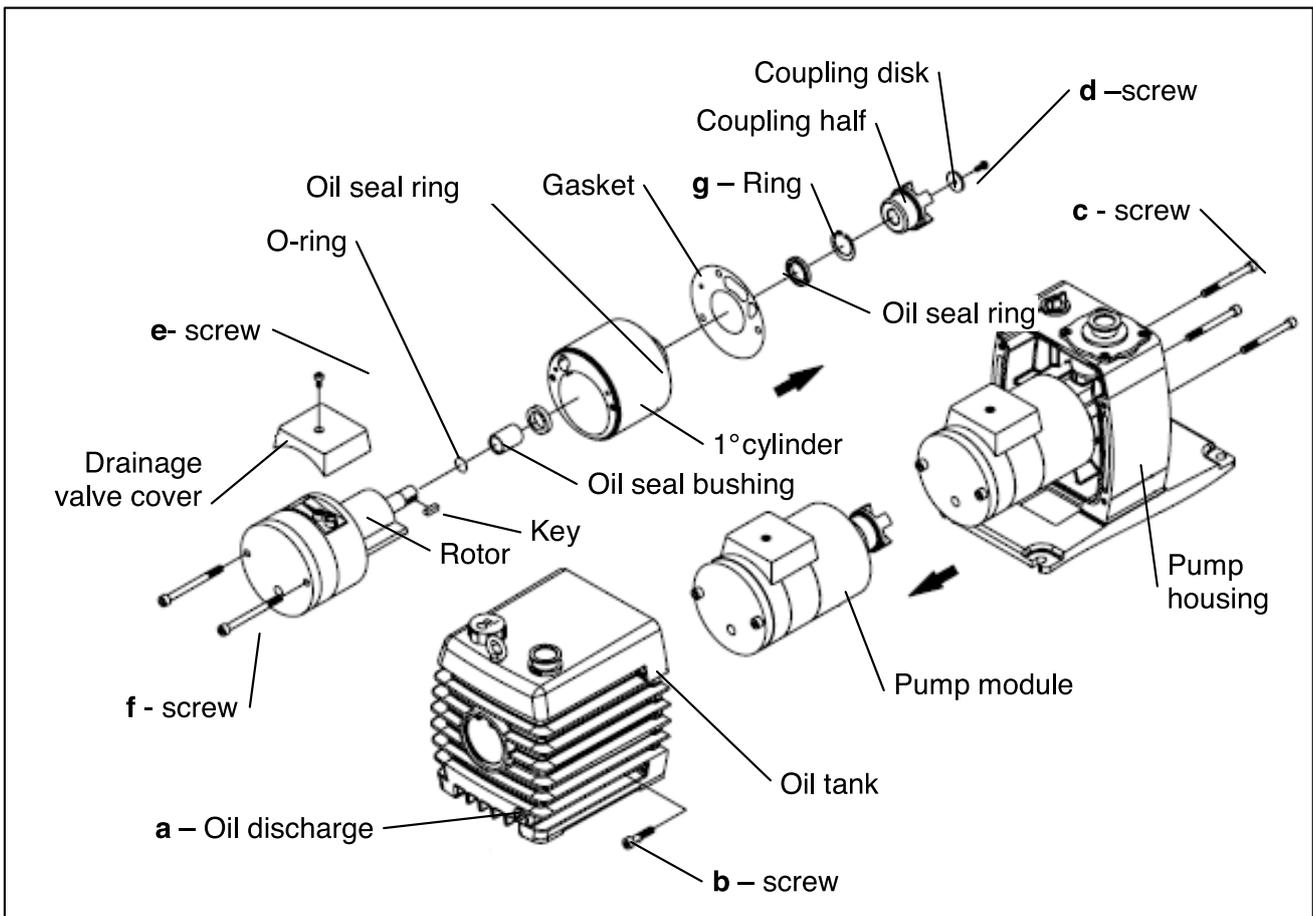
EN

6.6 How to replace the oil seal ring

MODELS PHV K 5-10-20-30

DISASSEMBLY

- a) Check that the power supply is provided with a switch and that the pump is perfectly not operating and at atmospheric pressure.
- b) Drain the oil in a proper container by opening the drainage valve **a**.
- c) Remove the motor from the pump unit
- d) Loosen oil tank screws **b** and remove the tank from the pump housing.
- e) Loosen the three screws **c** and remove the pump housing from the pump module with caution.
- f) Loosen the screw **d**.
- g) Loosen the screw **e** and remove the cover.
- h) Extract the key from its seat on the rotor.
- i) Loosen the two screws **f** of the pump housing rear cover and extract the first cylinder.
- j) Extract the seeger ring **g** using the suitable tools.
- k) Extract the oil seal with caution.

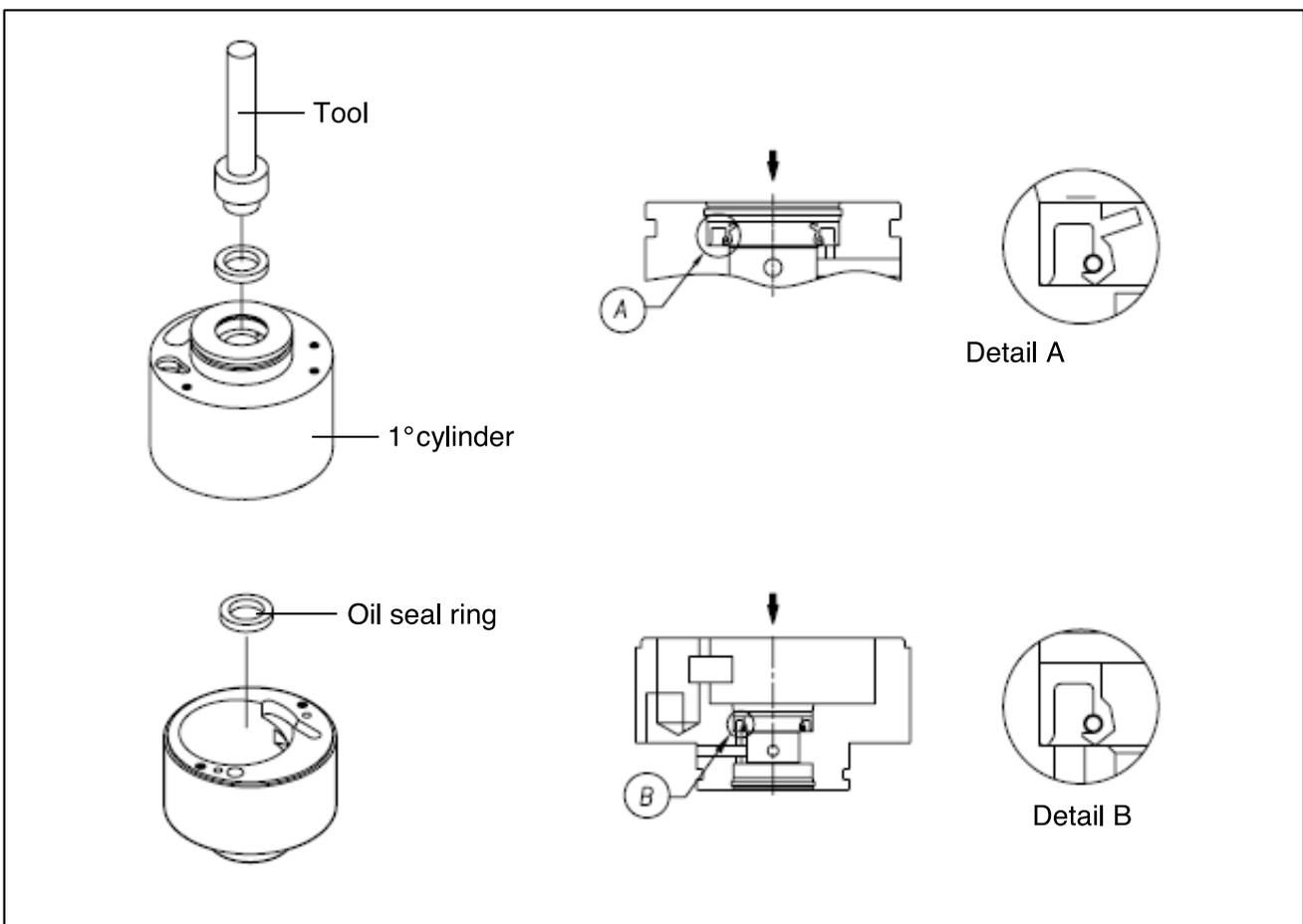


RE-ASSEMBLING

Use the following oil seal rings:

- Models 5 and 10: D20 x 30 x 7
- Models 20 and 30: D25 x 35 x 7

- Oil the external surface of the oil seal ring;
- Insert the first cylinder having the seal set upwards.
- Insert the seal in the first cylinder, with the writing upwards.
- Push the seal towards the bottom of the cylinder by means of the assembly tool. Pay attention to not damage the seal.
- Reassemble the remaining parts by following the disassembly procedure backwards.



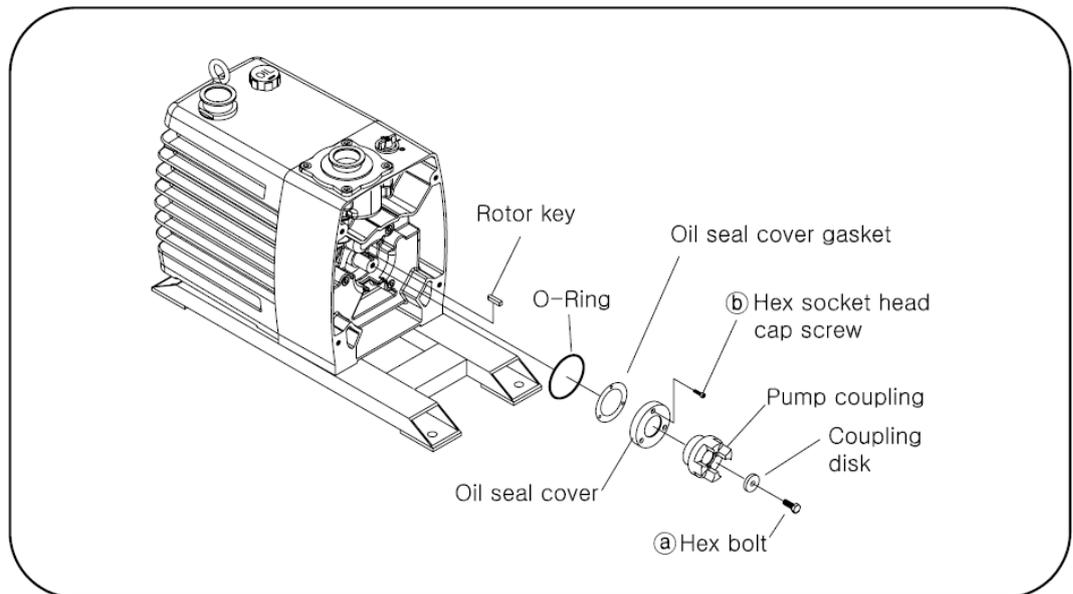
Operating and maintenance instructions

EN

MODELS PHV K 50-75

DISASSEMBLY

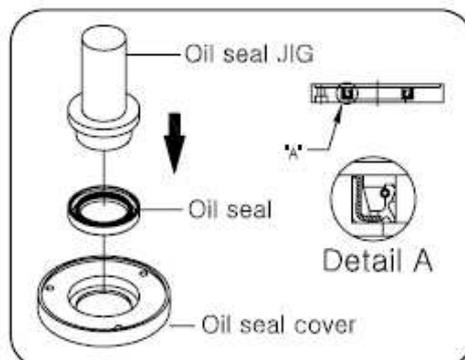
- Check that the power supply is provided with a switch and that the pump is perfectly not operating and at atmospheric pressure.
- Drain the oil in a proper container by opening the drain valve.
- Remove the motor from the pump
- Remove the coupling screw and extract the disk and coupling half.
- Remove the key.
- Unscrew the three screws of the cover and remove the cover.
- Lay the cover on a plane and remove the seal with caution.



RE-ASSEMBLING

Use a seal D32 x 44 x 8

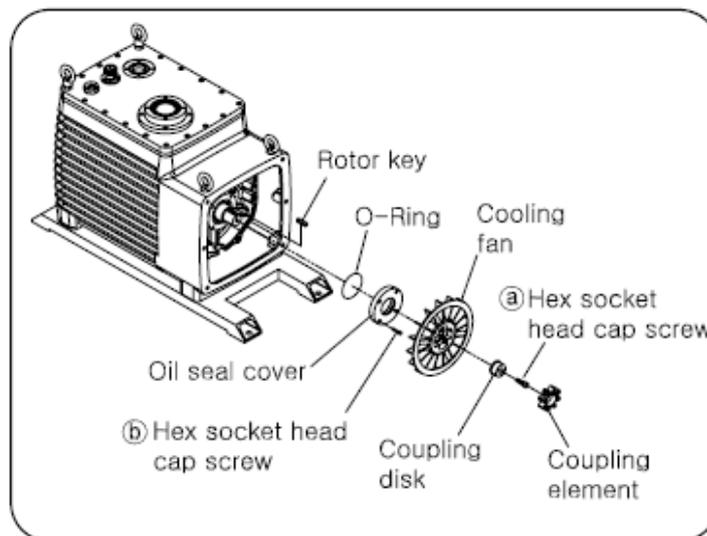
- Oil the seal.
- Insert the cover with the seal seat upwards.
- Insert the new seal in the cover, with the writing downwards
- Push to seal towards the bottom of seat by means of the suitable assembly tool. Pay attention to not damage the seal.
- Reassemble the remaining parts by following the disassembly procedure backwards.



MODELS PHV K 120-180-270-360-450

DISASSEMBLY

- Check that the power supply is provided with a switch and that the pump is perfectly not operating and at atmospheric pressure.
- Drain the oil in a proper container by opening the drain valve.
- Remove the motor from the pump
- Remove the coupling screw and extract the disk and coupling half.
- Remove the key.
- Unscrew the three screws of the cover and remove the cover.
- Lay the cover on a plane and remove the seal with caution.

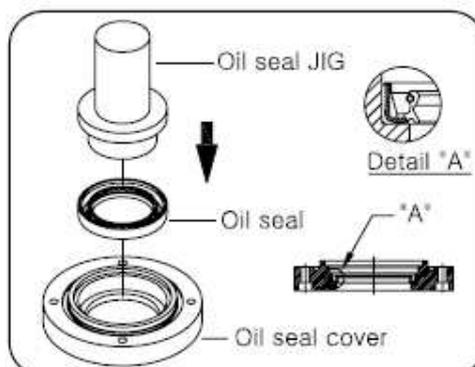


RE-ASSEMBLING

Use the following seals:

- Model PHV K 120: D40 x 60 x 10
- Models PHV K 180 270: D55 x 70 x 8
- Models PHV K 360 450: D65 x 85 x 13

- Oil the seal.
- Insert the cover with the seal seat upwards.
- Insert the new seal in the cover, with the writing downwards
- Push to seal towards the bottom of seat by means of the suitable assembly tool. Pay attention to not damage the seal.
- Reassemble the remaining parts by following the disassembly procedure backwards.



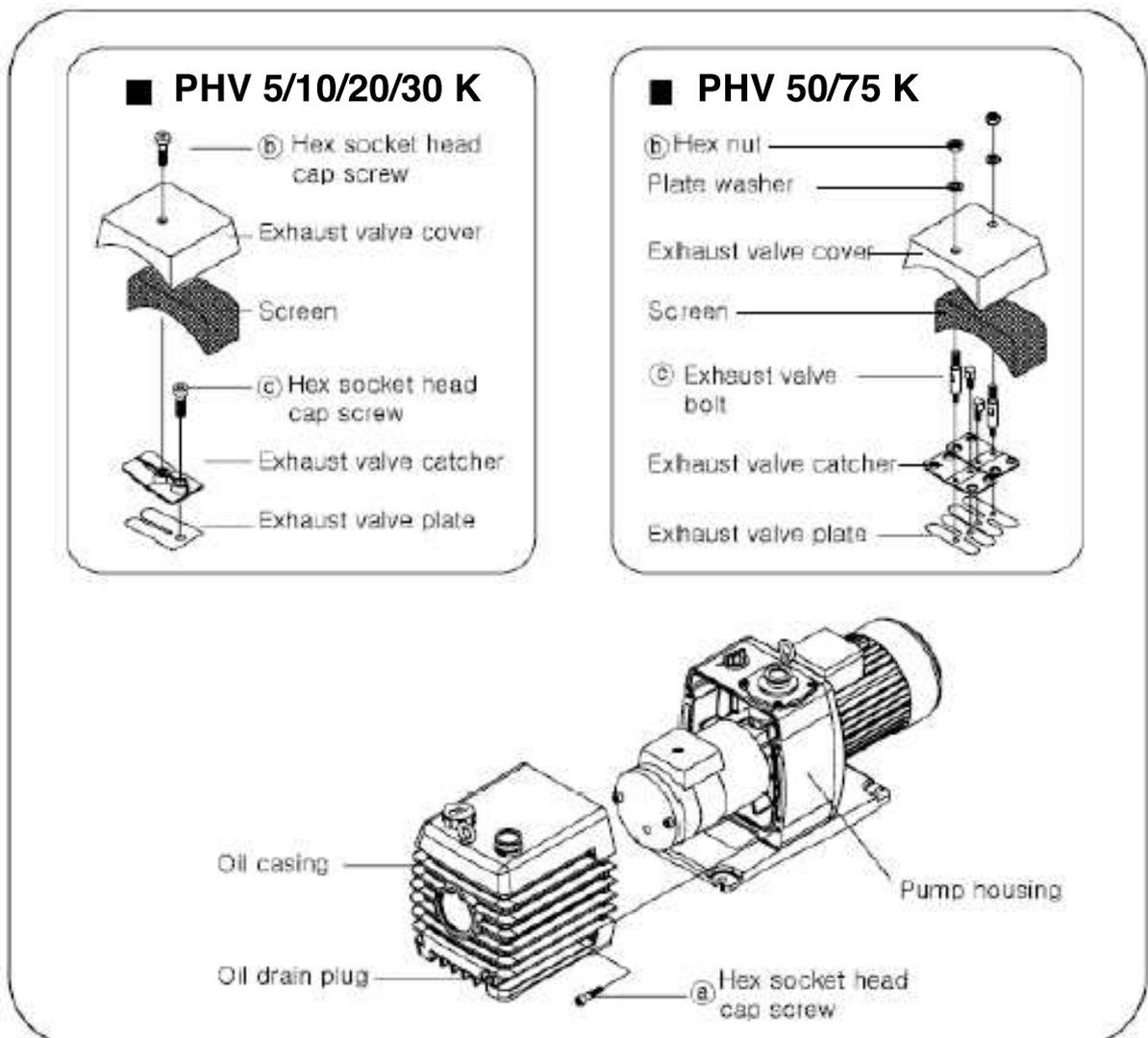
Operating and maintenance instructions

EN

6.7 Control and replacing of the discharge valve

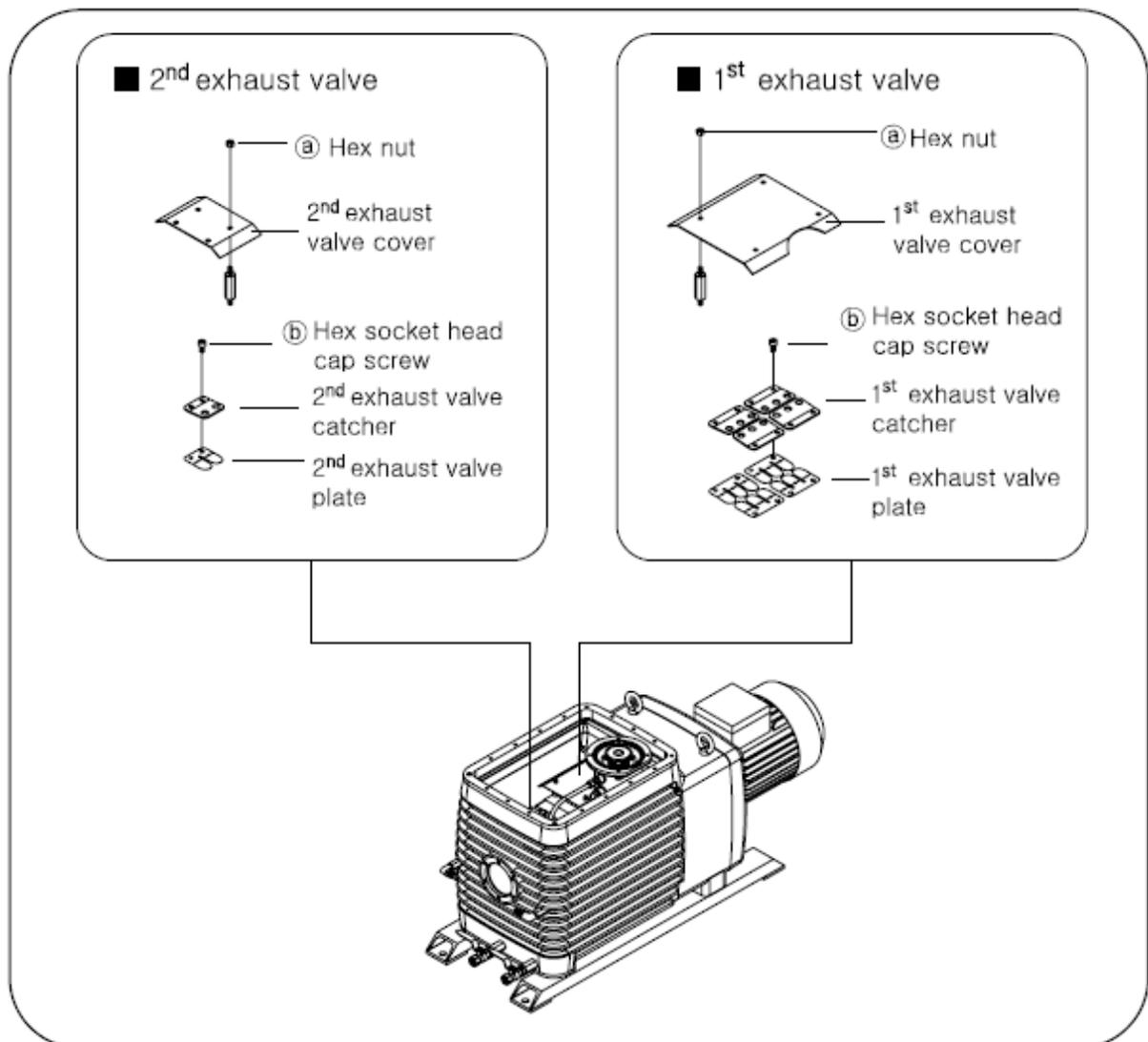
MODELS PHV K 5-10-20-30-50-75

- Check that the power supply is provided with a switch and that the pump is perfectly not operating and at atmospheric pressure.
- Drain the oil in a proper container by opening the drain valve or the discharge plug.
- Remove the tank from the pump by loosening the assembly screws.
- Loosen the screws or the nuts of the drain valve.
- Extract the discharge valve cover and the filter.
- Loosen the screw/s of the valve.
- Extract the valve catcher and the valve plate.
- Clean the parts and change the valve plate, if it has been damaged.
- Reassemble the remaining parts by following the disassembly procedure backwards.



MODELS PHV K 120-180-270-360-450

- Check that the power supply is provided with a switch and that the pump is perfectly not operating and at atmospheric pressure.
- Drain the oil in a proper container by opening the drain valve or the discharge plug.
- Remove the inlet port, the gas ballast valve and the upper cover.
- Unscrew the nuts and remove the valve covers.
- Unscrew the screws and remove the valve catcher and the valve plate.
- Clean the parts and change the valve plates, if damaged.
- Reassemble the remaining parts by following the disassembly procedure backwards.



Operating and maintenance instructions

EN

6.8 Checking the inlet valve

MODELS PHV K 5-10-20-30-50-75



WARNING:

Genuine spare parts are suggested to be used.

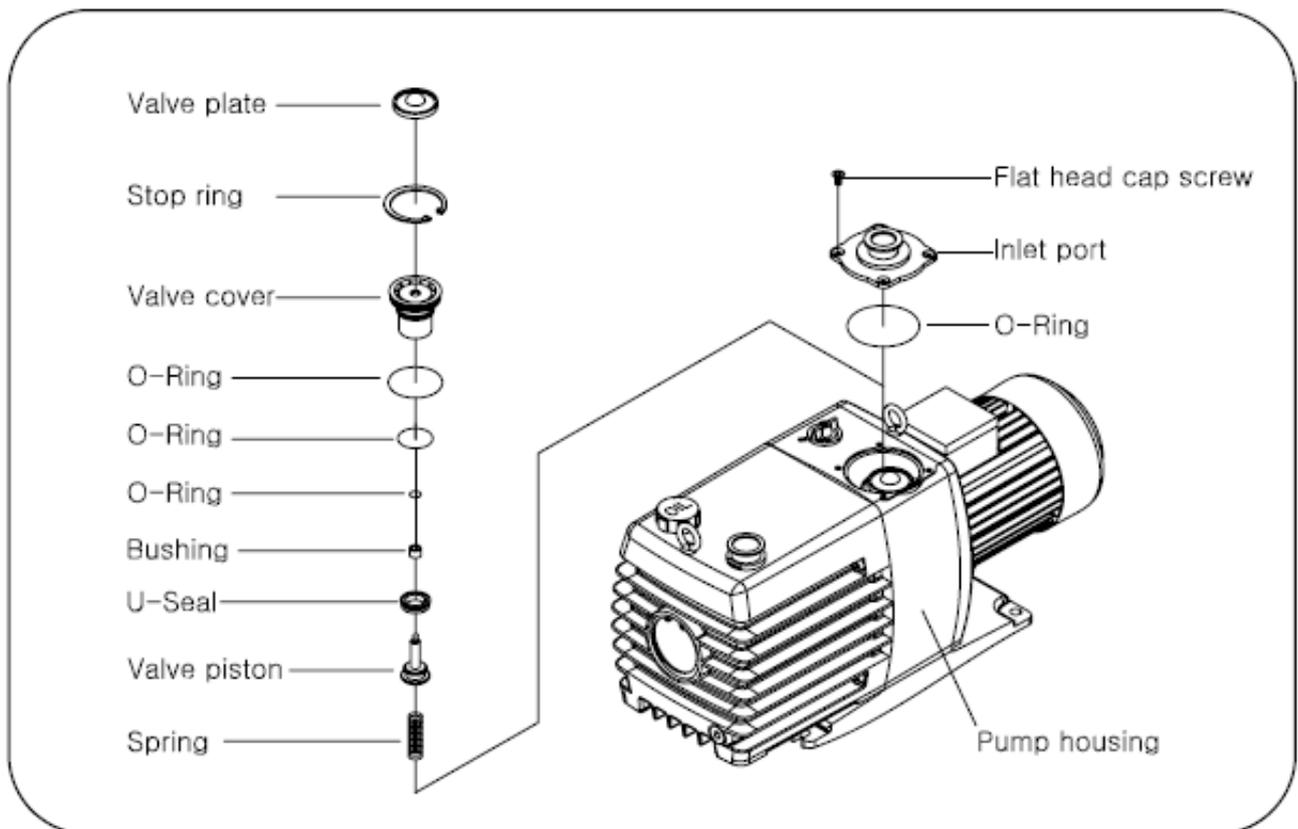
- a) Remove the inlet flange by loosening the four screws and extract the O-ring.
- b) Remove the valve plate.
- c) Remove the seeger ring.
- d) Remove the valve pulling the piston gradually.
- e) Remove the piston and the O-ring from the cover.
- f) Remove the gasket from the piston.



WARNING:

The spacer inside the cover is fixed with adhesive, do not try to remove it.

- g) Remove the O-ring from the valve cover.
- h) Extract the spring.



MODELS PHV K 120-180-270-360-450

WARNING:

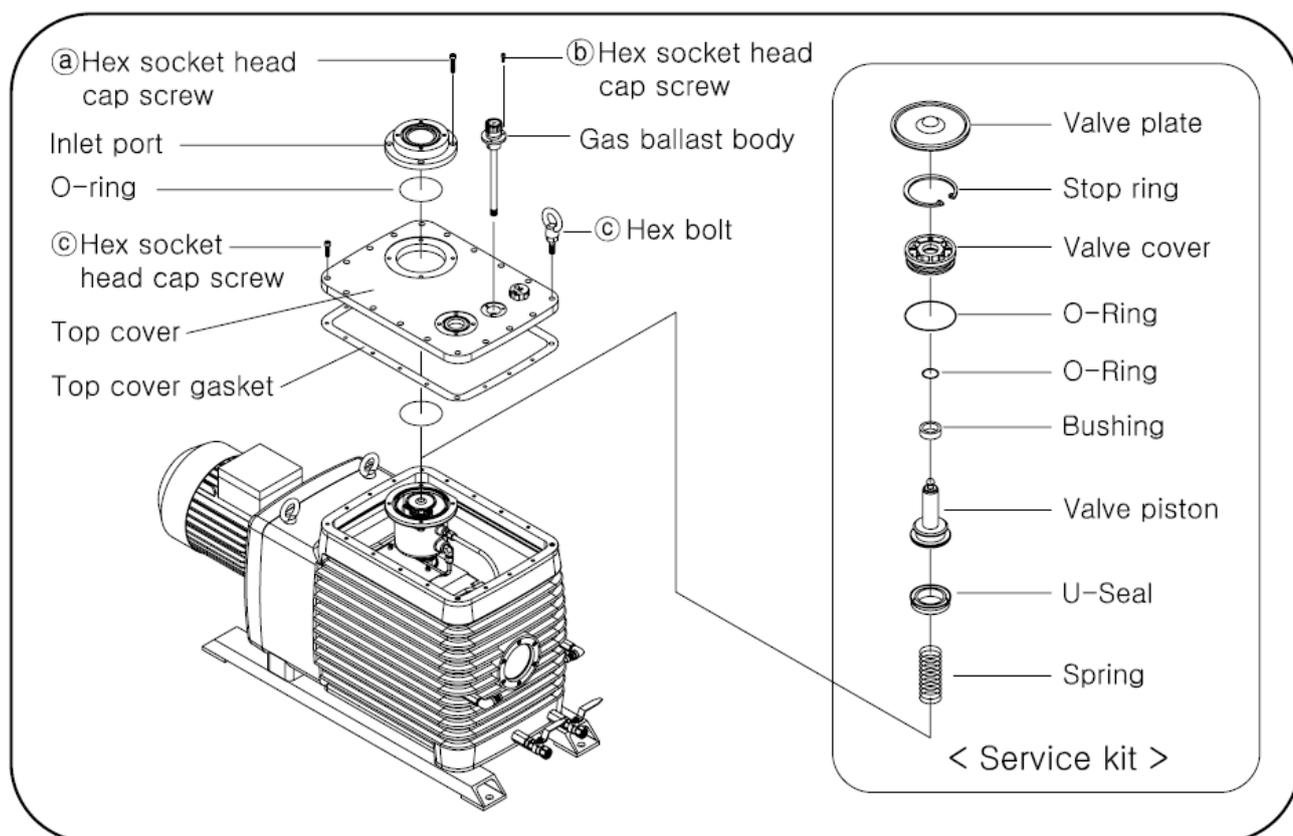
Genuine spare parts are suggested to be used.

- a) Remove the inlet flange by loosening the four screws and extract the O-ring.
- b) Remove the gas ballast valve by screwing its screws.
- c) Unscrew the screws of the upper cover and remove the cover and its gasket.
- d) Remove the valve by pulling the piston gradually.
- e) Remove the piston and the O-ring from the cover.
- f) Remove the gasket from the piston.

WARNING:

The spacer inside the cover is fixed with adhesive, do not try to remove it.

- g) Remove the O-ring from the valve cover.
- h) Extract the spring.



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6.9 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).

6.10 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.

7. Lubricants

Synthetic oil recommended for generic use		
Use the synthetic oil for compressors according to USDA/NSF H2.		
Ambient temperature	Grade	PVR oil
0 - 30°C	ISO 68	Rotant VF 403 H1

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
Failure in starting	1. Adherence among movable and fixed parts	1. Disassemble the pump and remove the adherence
	2. Very thick oil	2. Increase the room temperature or change oil
	3. Exhausted oil or deposition of foreign material	3. Change oil and clean
	4. Clogged oil circuit in the bearings	4. Disassemble and clean
	5. Wrong motor voltage	5. Replace the motor
	6. Wrong electrical connection	6. Verify and repair
	7. Motor failure	7. Contact P.V.R.
Maximum vacuum not achieved	1. Gas-ballast valve too much open	1. Close the gas ballast valve
	2. Inlet pipe connected to the outlet one	2. Rectify the connection
	3. Too much tight inlet pipe	3. Replace the pipe with one of larger diameter
	4. Outlet pipe with an inferior diameter than the one of the outlet port	4. Replace the pipe with one of proper diameter
	5. Seal leaks	5. Repair the leaks
	6. Problems with the inlet valve	6. Disassemble the valve clean it and if necessary repair it.
	7. Unsuitable oil	7. Change with the suggested oil
	8. Exhausted and/or scarce vacuum	8. Change and/or fill up
	9. Clogged oil circuit	9. Disassemble the pump and remove the clogging
	10. Broken oil seal	10. Replace the seal
	11. Vane not fitted properly	11. Disassemble and reassemble rightly
	12. Exhaust valve broken	12. Replace the valve
	13. Damaged vacuum gauge	13. Replace the vacuum gauge
Poor capacity at the outlet	1. Inlet and outlet pipe too tight or too long	1. Replace the pipes
	2. Exhausted oil	2. Change the oil
	3. Broken inlet valve	3. Replace the valve
	4. Clogged inlet filter	4. Clean the filter
	5. Not appropriate oil	5. Change with the suggested oil
	6. Seal leaks	6. Repair the leaks
	7. Pump with not sufficient performances	7. Replace the pump with one of better performances

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Trouble	Cause	Remedy
Dark and muddy oil	1. Exhausted oil	1. Change the oil
	2. Not suited oil	2. Change with the suggested oil
	3. Oil shortage	3. Fill up
	4. Loss of vacuum in the seals	4. Repair the leaks
Loss of vacuum at the stop	1. Loss of vacuum in the seals	1. Repair the leaks
	2. Broken inlet valve	2. Replace the valve
Unusual or loud noise	1. Broken coupling elements	1. Replace with new elements
	2. Oil shortage	2. Fill up
	3. Not working or worn oil pump	3. Replace the pump
	4. Broken vane	4. Disassemble the pump and replace the vane
	5. Exhaust valve screen out of position	5. Replace the screen
	6. Damaged motor bearings	6. Repair or replace the motor
Excessive oil Consumption	1. Worn drainage valve O-ring	1. Replace the O-ring
	2. Worn or misplaced oil seal	2. Replace the seal and clean the oil feeding circuit
	3. Corroded or worn oil seal sleeve	3. Replace the sleeve
	4. Leaks from the outlet or inlet ports	4. Replace the O-Rings
	5. Leaks from the gasket between pump and oil tank	5. Replace the gasket
Oil in the vacuum circuit	1. Inappropriate oil vapour tension	1. Clean the pump and change the oil with the suggested one
	2. Oil backflow at the pump stop	2. Verify and if necessary repair the suction valve
	3. Broken suction valve plate seal	3. Replace the plate
	4. Worn or corroded seals of the inlet port in the lower part	4. Replace the port

Trouble	Cause	Remedy
Overheating	1. Oil shortage	1. Fill up
	2. Inlet pipe connected to the outlet	2. Rectify the connection
	3. Clogged oil feeding	3. Disassemble the pump clean and replace oil
	4. Failure at the oil pump	4. Repair or replace the pump
	5. Deposition of foreign material in the oil pump	5. Clean the pump and verify the surfaces
	6. Room temperature higher than 40°C	6. Verify the air conditioning systems if existing
	7. Insufficient oil vapour pressure	7. Verify the air circulation
	8. Excessive sucked gas temperature	8. Intervene on the process or install a cooling system
Exhaust gas leaks	1. Broken outlet port O-Ring	1. Replace the O-Ring
	2. Scored or worn oil tank seal surfaces	2. Sand the surfaces or replace the tank
	3. Scored or worn seal surfaces of the body of the pump	3. Sand the surfaces or replace the body of the pump
Excessive oil mists	1. Excessive oil quantity in the tank	1. Reduce the oil quantity
	2. Gas ballast excessively opened	2. Close the gas ballast
	3. Clogged exhaust valve screen	3. Replace the screen



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