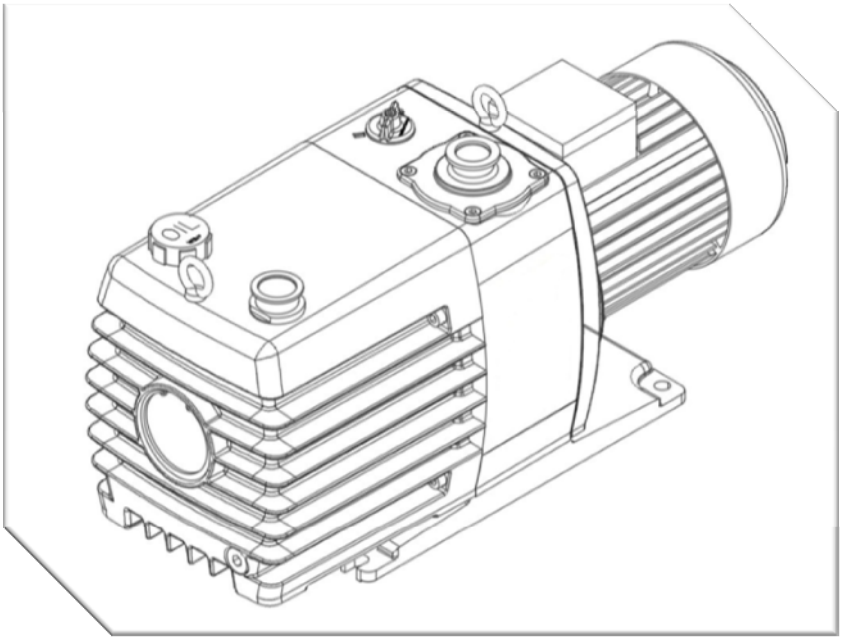
RV Series Direct-Coupled Dual Stage Rotary-Vane Vacuum Pump

Operation Manual

Model:RV 6，8，14，18，24



KYKY TECHNOLOGY CO., LTD

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1. Brief Introduction

RV Series Direct-Coupled Dual Stage Rotary-Vane Vacuum Pump is characterized by stable pumping rate, excellent final vacuum degree and excellent water vapor removal capacity to satisfy customer's requirements. The Instruction describes Installation Method, Operation Guide and Maintenance Instruction of RV series rotary vane pump. The pump must be operated in accordance with the Instruction and Guide herein. Please read the Instruction carefully before use of the pump.

2. Safety Precautions

2.1 The Instruction describes the installation, operation, maintenance and troubleshooting of RV pump. For the sake of safety, please read the Instruction carefully before use the pump.

2.2 We bear no compensation liability for any damage in transportation.

2.3 Please disconnect the wire before inspection or maintenance.

2.4 Please check the Air inlet pipe and exhaust pipe before use of the pump.

2.5 Place the pump in a well-ventilated open place for inspection when the pump is used with hazardous / explosive Air.

2.6 Maintenance shall be performed by skillful technicians from Head Office or Authorized Sales Office. We bear no compensation liability for any damage caused by self-repair.

2.7 Important security information is highlighted as Warning and Caution, which is defined as follows and must be followed:

Warning

Warning is given for injury or death caused by non-compliance with the Instruction.

Caution

Warning will be given if non-compliance with the Instruction may cause damage to equipment, related equipment and process.

Units used herein conform to the standards of the international system of units.

■ Symbols for Warning and Caution

Warning - See Attached Documents

Warning - Scalds

Warning - Electric Shock

Caution– Noise

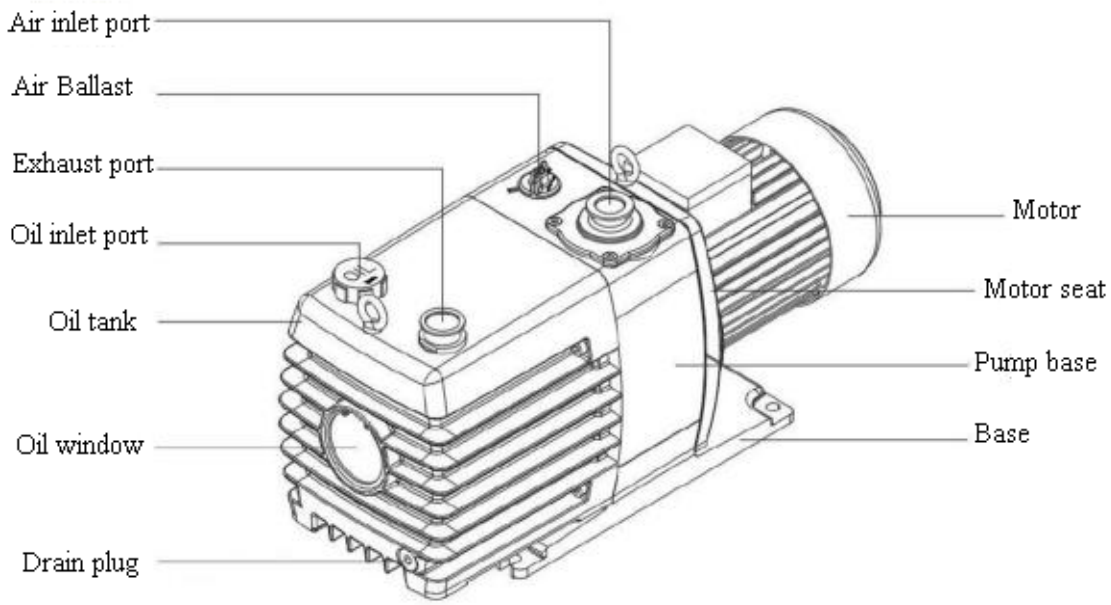
3. Technical Parameters

3.1 Working Principle

The pump and the motor are connected by elastic coupling. When two rotary vanes are placed in the rotary vane of rotor and rotate, the rotary vanes will contact the inner surface of the chamber due to effect of centrifugal force. When the rotary vanes pass through the inlet way, the inhaled Air is sandwiched between the two rotary vanes. When the rotary vanes continue to rotate, the Air between the two rotary vanes will be compressed and finally exhausted through the exhaust valve.

3.2 Name

3.2.1 RV6, RV8, RV14, RV18，RV24



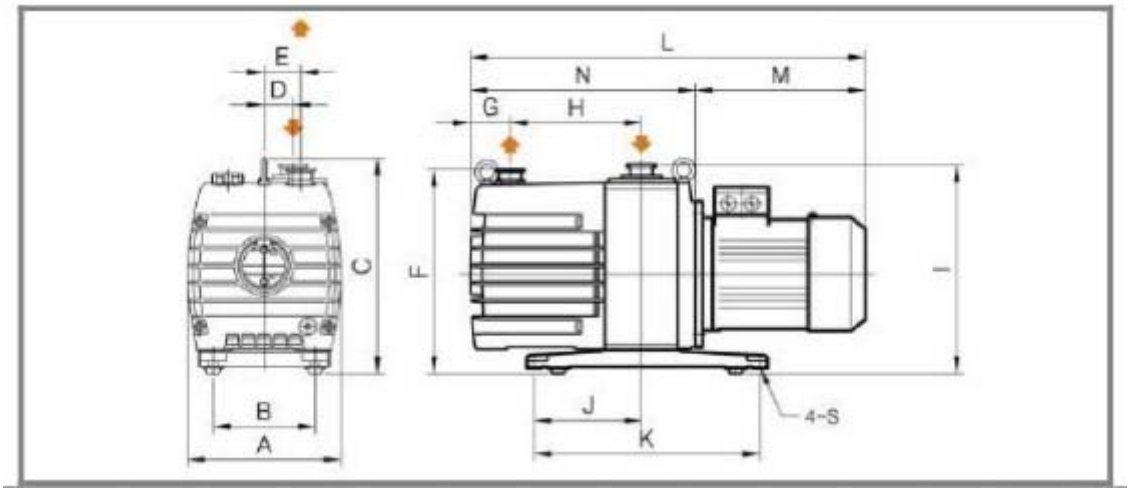
3.3 Technical Parameters

3.3.1 RV6, RV8, RV14, RV18,RV24

DESCRIPTION		Unit	RV6	RV8	RV14	RV18	RV24
Displacement speed	50Hz	L/s	6	8	14	18	24
	60Hz	L/s	7.2	9.6	16.8	21.6	28.8
Ultimate Pressure	Gas ballast C	Pa	$4x10^{-2}$				
	Gas ballast I		$4x10^{-1}$				
	Gas ballast II		4				
Permissible Pressure of Water Vapor		Pa	3000	3000	5000	5000	5000
Oil Filling		L	2.0	2.3	4.5	4.5	6.5
Inlet Port		DN	25KF/40KF		40KF		
Outlet Port		DN	25KF		40KF		
Motor Power		kW	0.75		1.5	2.2	
Rotation Speed	50Hz	R.P.M	1420				
	60Hz		1710				
Noise (without gas ballast)		dB	52	52	56	56	58
Weight		kg	35	37	66	77	88

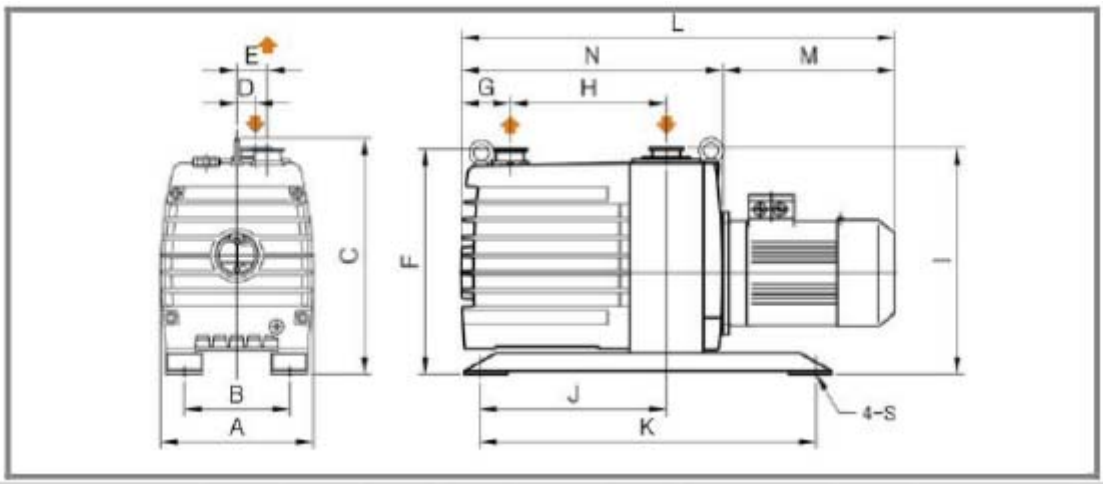
3.4 Overall Dimensions

3.4.1 RV6, RV8



Model	A	B	C	D	E	F	G	H	I	J	K	N	S	M	L
RV6	210	140	297	40	50	282	55	180	288	147	310	310	Ø12	250	560
RV8	210	140	297	40	50	282	58	210	288	147	310	340	Ø12	250	590

3.4.2 RV14, RV18, RV24



Model	A	B	C	D	E	F	G	H	I	J	K	N	S	M	L
RV14	250	185	387	30	50	368	80	255	370	305	550	428	Ø14	286	714
RV18	250	185	387	30	50	368	80	255	370	305	550	428	Ø14	318	746
RV24	280	185	441	30	50	412	85	295	415	355	600	479	Ø14	318	797

4. Installation

4.1. Products Receipt List

Upon receipt of products, please check as follows:

4.1.1 Is it the product you ordered?

4.1.2 Is any bolt loosened during transportation without any damage?

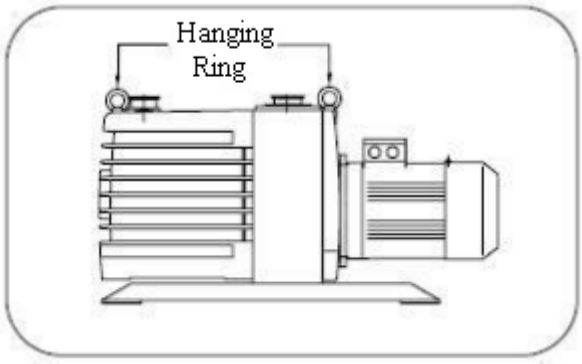
4.1.3 If any special requirement is required, can the product meet the Order Requirement ?

4.1.4 Is any damage or defect in the product?

※ Please contact us or authorized distributors for any above query.

4.2. Transportation and Installation

4.2.1 Be careful to avoid any damage to equipment caused by any negligence in loading/unloading or transportation, and hence avoid degradation of the pump performance arising out of such damage.



Warning

Move the pump with appropriate lifting equipment.

4.2.2 Install the pump in a flat place to avoid any vibration and failure caused by instable installation.

4.2.3 Choose proper place for installation from the following aspects.

- Easy to move and operate
- Well ventilated
- Easy electrical wiring
- Easy to maintain

4.2.4 Fix the product on the system by using the hole on the pump base.

4.2.5 Optimal working ambient temperature is 12℃~40℃.

※ Please contact us or authorized distributor for any noise or vibration problem of product

4.3. Electrical Wiring

Warning

- To avoid electric shock, be sure to power off before wiring.
- Ensure electrical installation of pump motor to meet local and national safety requirements.
- It must be connected to the place where the fuse switch is available, and shall be grounded.

Caution

- Electrical wiring must be operated only by qualified engineer.
- Please lead and connect the wire according to schematic diagram on the motor board.
- Please provide applicable wiring for appropriate voltage.
- Please remember to confirm the rotating direction after the wiring is completed.

4.3.1 Make sure to power off the motor.

 Wiring shall be started after power off to prevent any damage caused by electric shock.

4.3.2 The wiring must be operated by authorized electricians.

4.3.3 The wiring must be operated according to voltage (Refer to diagram below)

 In addition, please refer to the wiring diagram displayed on the motor cover.

4.3.4 Check the rotating direction after the wiring is completed.

 Refer to arrow direction connected to the motor.

4.3.5 The correct rotating direction shall be counter-clockwise if seen behind the motor.

 The wiring must be wrong if the suction force is not felt at the Air inlet port. Check and operate the wiring again.

4.4 Pipeline and Vacuum System

4.4.1 Pipes at Air inlet/outlet port of the vacuum system are connected with the international standard “Fast Fixture” and “ISO Flange”.

4.4.2 Use a central ring with a *dust exhaustor* at the inlet port.

4.4.3 The connecting pipes and flanges must be kept clean all the times.

 Any contaminated connecting pipes and flanges are fatal to pump performance, so keep them clean all the times.

4.4.4 The connecting pipe between the pump and the vacuum system is optimal short and wide pipe. It is very important to connect the pipe without stress to the pump.

4.4.5 It is optimal if the diameter of pipe is the same as the diameter of inlet/outlet port of the pump.

 The exhaust speed of the pump may be reduced if diameter of the inlet pipe is smaller than that of the inlet port.

 If diameter of the exhaust pipe is smaller than that of the exhaust port, excessive pressure may be produced and pump temperature may rise, resulting in instability of vacuum degree.

4.4.6 Check thoroughly whether any leakage occurs in pipe and flange before operation.

5. Operation

5.1 Inspections Required Before Operation

5.1.1 Check oil level by oil tank/gauge.

5.1.2 Check whether any leakage occurs in the pump.

5.1.3 The rotating direction mainly depends on the change of wiring, so check whether the rotating direction is correct.

5.1.4 If the vacuum pump oil will be replaced or the pump will be stored for a long time without running, the final vacuum can be reached only after the Air of the vacuum pump oil is exhausted.

□ Air in the oil may be removed by blocking the inlet port of the pump and by running the pump continuously for about 30 minutes.

5.1.5 Vacuum pump oil may be contaminated by the dissolved water vapor, resulting in corrosion of pump core assembly, please run the pump when the Air inlet port is closed and the air ballast valve is opened, until the water vapor is removed from the oil.

5.1.6 According to the pressure load, the surface temperature of the running oil pump is about 40℃~80℃.

5.1.7 If the compressible Air is required to be extracted from the pump, please close the Air inlet port before the pump is closed, and run the pump for 30 minutes.

5.1.8 Block the Air inlet port if long-term storage is required, so as to prevent corrosion.

5.1.9 Eliminate the vacuum state after the pump operation, enable the pump to reach the ambient pressure, and close the pump.

Warning

Make sure no blocking at exhaust port before the pump runs, otherwise, pump performance may be degraded and potential safety hazards may occur.

5.2 Air Ballast Device

Air ballast device is a device that enables vacuum pump to reduce the partial pressure of water vapor generated during compression, and to remove toxic/corrosive/explosive Air by injecting air from the environment. The device can reduce the partial pressure of water vapor in the Air, and prevent the water vapor from remaining in the pump core assembly and from dissolving the hazardous Air. However, if ballast device is open, pump operation may cause reduction of the limit pressure and cause faster oil consumption of vacuum pump.

6. Maintenance

Warning

Obey the following safety instructions, and pay attention to proper prevention measures. If you do not do this, you may cause personal injury and equipment damage.

- Power off the pump, and remove the pump from the system.
- Follow the required Safety Precautions if the pump runs with hazardous or explosive Air.

 Repair or maintain the pump in well-ventilated place if the pump is operated with hazardous/explosive Air.

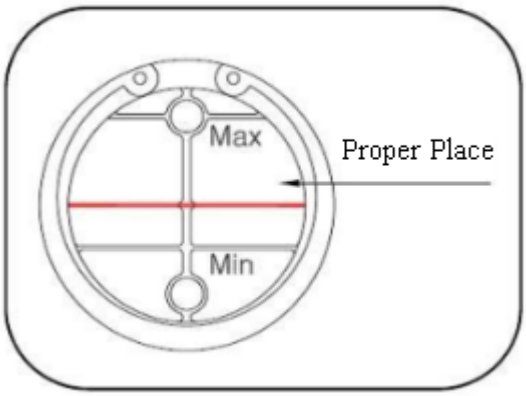
- Keep the oil circulation system and safety mesh clean if the pump is running in polluted air.

 Keep the pump clean all the times because the pump may be damaged or adhered by foreign materials or dust.

- Replace the vacuum pump oil before storage to protect the pump if the pump is operated with corrosive Air.
- Check oil level.

 Oil level shall be at an appropriate level during operation. (See right diagram)

 Power off to fill oil when necessary. Replace oil if polluted.



6.1 Oil Inspection

6.1.1 Check oil as follows:

 Oil shall be clean and transparent

 Replace darkened or turbid oil.

 Replace oil if viscosity index is higher than 150 at 25℃.

6.1.2 Oil replacement

 It is very important to use the recommended oil and keep it clean to protect the pump and ensure its normal operation.

 Oil replacement is required for vacuum pump.

♦ Acidity or viscosity test shall be conducted if oil replacement is required for vacuum

pump.

♦ Replace pump oil once for every running for 2000~3000h (about 3-4 months)

♦ In the case of gradual decrease of vacuum degree, operation with corrosive Air or high oil-consumption requires frequent replacement of oil products.

※ Time for oil replacement varies greatly with the pump environment, choose appropriate time for oil replacement, as appropriate.

□ Use oil filter of vacuum pump for frequent replacement of oil.

□ Power off and replace the oil when the oil is still warm.

□ Discharge the contaminated oil through the drain plug, open the Air inlet port, run the pump for 10s (max. 10s) to remove the remaining dirt from the pump core.

□ Pour a little clean oil into the Air inlet port and run the pump for 10s (max. 10s) to remove the remaining dirt from the pump core.

□ Pour clean oil into the oil-filling hole.

6.2. Remove Motor from Pump

Remove motor from pump if the pump fails to work properly, and try turning the pump coupling by hand.

□ "Rotation of the pump coupling" indicates no problem with the pump, otherwise, the pump must be repaired.

※Pump must be repaired by skillful technician from Head Office or Authorized Sales Office. We bear no liability for any damage caused by self-repair.

6.2.1 For RV6, RV8, RV14, RV18, RV24, remove the motor from the pump (see right diagram)

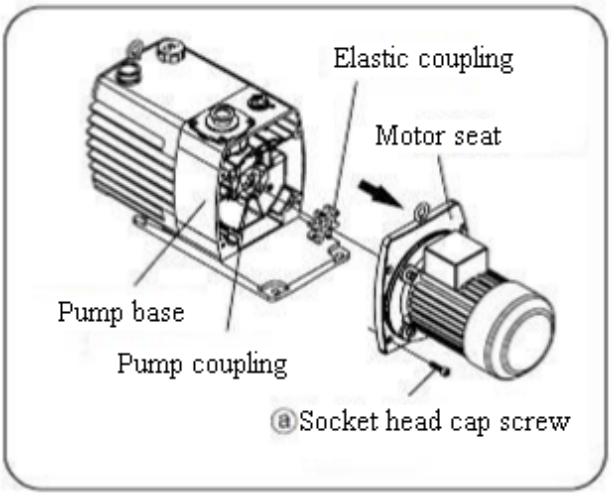
(1)Remove the motor from the pump base, as shown below.

a. Check whether the pump is "power off".

b. Unscrew the screw ⓐ, and hold the pump base and motor seat from below.

□ Support the motor with one hand and loosen the bolt at the upper end at the same time to prevent the motor from falling abruptly and damaging due to its separation from the pump.

c. Separate the motor from the pump coupling.



(2) Separate the motor from the motor seat, as shown below. (See right diagram)

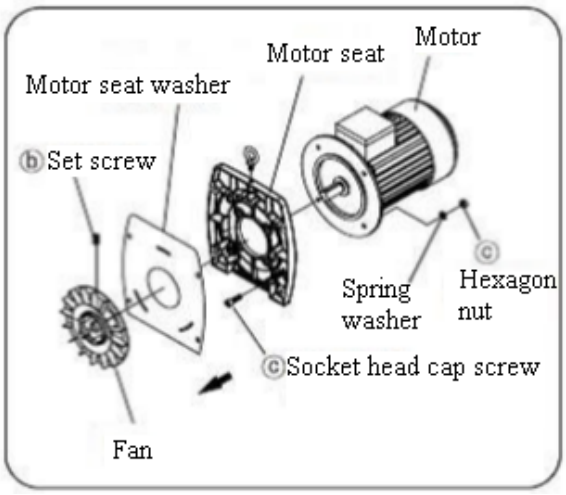
a. Use inner hexagon spanner to unscrew the set screwⓑ from the cooling fan.

b. Pull out the cooling fan from the motor shaft.

c. Separate the washer from the motor seat.

d. Unscrew the bolts and nuts ⓒ that fixes the motor seat and the motor, and separate the motor from the motor seat.

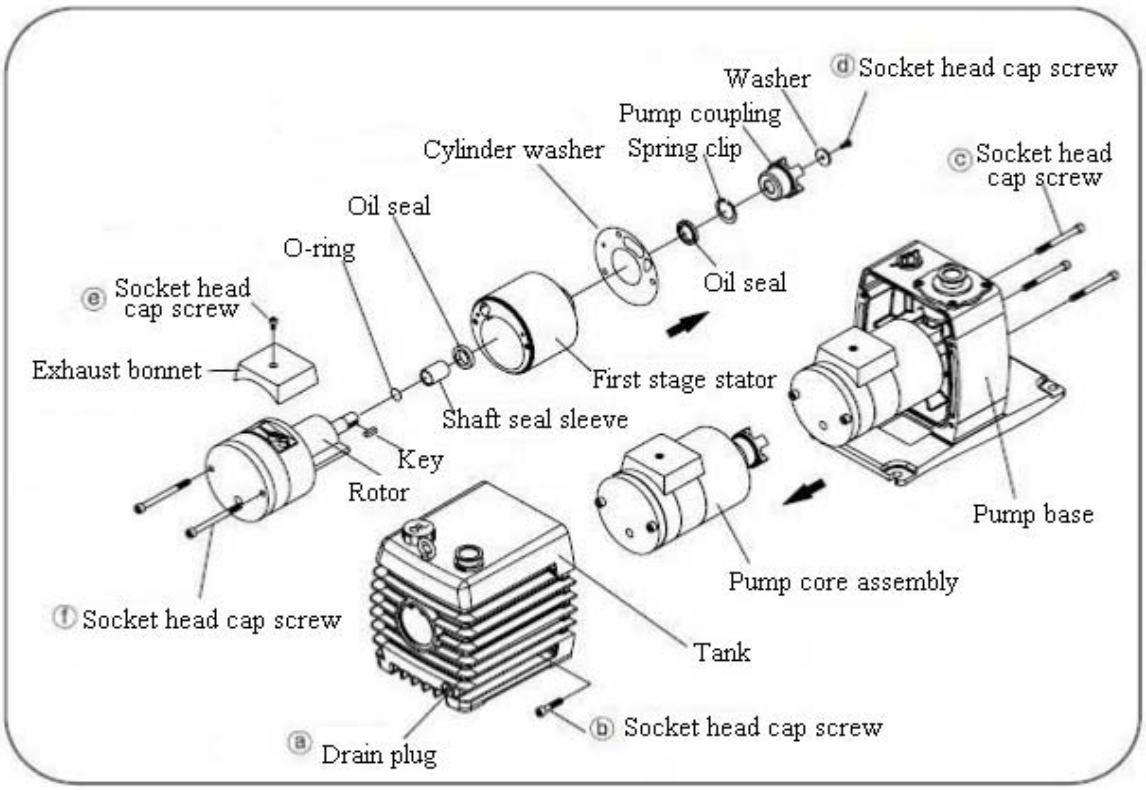
□ Assemble according to the appropriate sequence.



6.3 Replacement of Oil Seal

For RV series pump, oil seal is provided in the first chamber. This kind of oil seal can prevent oil leakage of pump shaft, and has a great impact on the pump performance. Check the oil seal in case of pump leakage.

6.3.1 Separate oil seal from RV6 and RV8.



a. Power off the pump, and discharge oil from sleeve through drain plugⓐ.

b. Separate motor and motor seat from pump. (See Section 6.2.1)

c. Unscrew the bolt ⓑ that fixes the tank and the pump base together; separate the tank from the pump base.

d. Unscrew three bolts ⓒ that fix the pump core assembly and the pump base together;

separate the pump core assembly from the pump base.

e. Unscrew the bolt ⓓ that fixes the pump coupling, and pull out the pump coupling.

f. Unscrew the bolt ⓔ, and remove the exhaust bonnet from the pump core assembly.

g. Unscrew two bolts ⓕ that fix the pump core assembly together, separate the first stage stator.

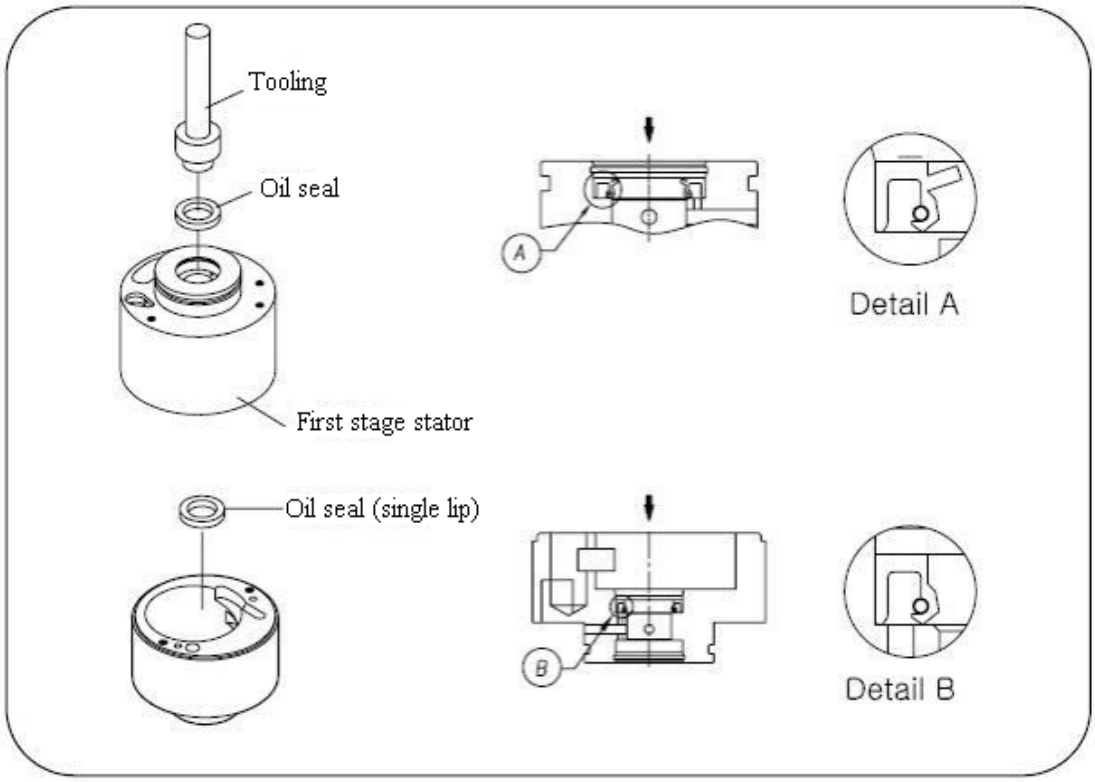
h. Remove the stop ring with appropriate tool from the first stage stator, and remove the oil seal with hammer and screwdriver.

6.3.2 Reassemble the oil seals of RV6 and RV8

□ Prepare new oil seal for reassembly

□ Oil seal standard

▷ RV6，RV8 → D25x35x7, SCV 25x35x7



□ Reassemble the oil seal as follows:

a. Apply vacuum grease to the outer surface of the oil seal.

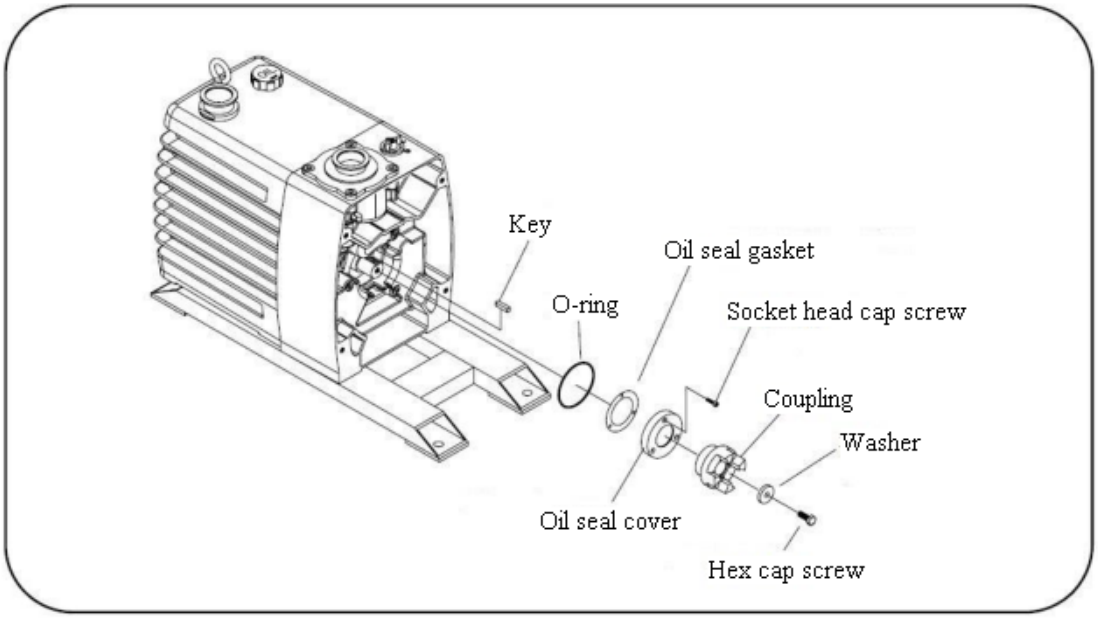
b. Shaft end of the first stage stator is upwards, so the obverse side of the assembling part of oil seal is also upwards.

c. Shaft end of the first stage stator is downwards, so the surface (with letters) on the oil seal is also upwards.

d. Push the oil seal into the base with special assembly fixture.

□ Do not damage the oil seal while pushing in.

6.3.3 Separate oil seal from RV14 , RV18 and RV24.



a. Power off the pump and discharge the oil from the tank through the drain plug.

b. Separate motor and motor seat from pump. (See Section 6.2.1)

c. Unscrew the set bolt ⓐ from the pump coupling, and pull out the pump coupling and washer.

d. Pull out the key from the rotor.

e. Unscrew the bolt ⓑ, and remove the oil seal cover from the pump core assembly.

f. Place the oil seal cover on a flat surface, and remove the oil seal with hammer and screwdriver.

6.3.4 Reassemble the oil seals of RV6 and RV8

□ Prepare new oil seal for reassembly

□ Oil seal standard

□ Reassemble the oil seal as follows:

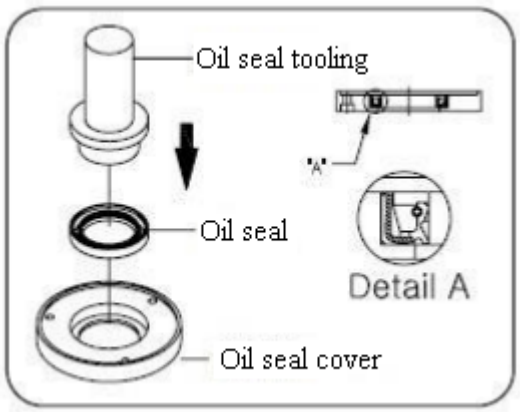
a. Apply vacuum grease to the outer surface of the oil seal.

b. Place the oil seal cover, so the obverse side of the assembling part of oil seal is upwards.

c. Place the oil seal on the oil seal cover, so the surface (with letters) on the oil seal is upwards.

d. Push the oil seal into the base with special assembly fixture.

□ Do not damage the oil seal while pushing in.



6.4 Inspection and Replacement of Exhaust Valve

■ The exhaust valve plate is designed to prevent the Air exhausted during pump operation from flowing back into the pump. If the exhaust valve plate is damaged, the pump may produce noise and affect performance, i.e., the final vacuum cannot be available. Please replace the exhaust valve plate in case of this problem of the pump.

6.4.1 RV6, RV8, RV14, RV18, RV24

a. Power off the pump and discharge the oil from the tank through the drain plug.

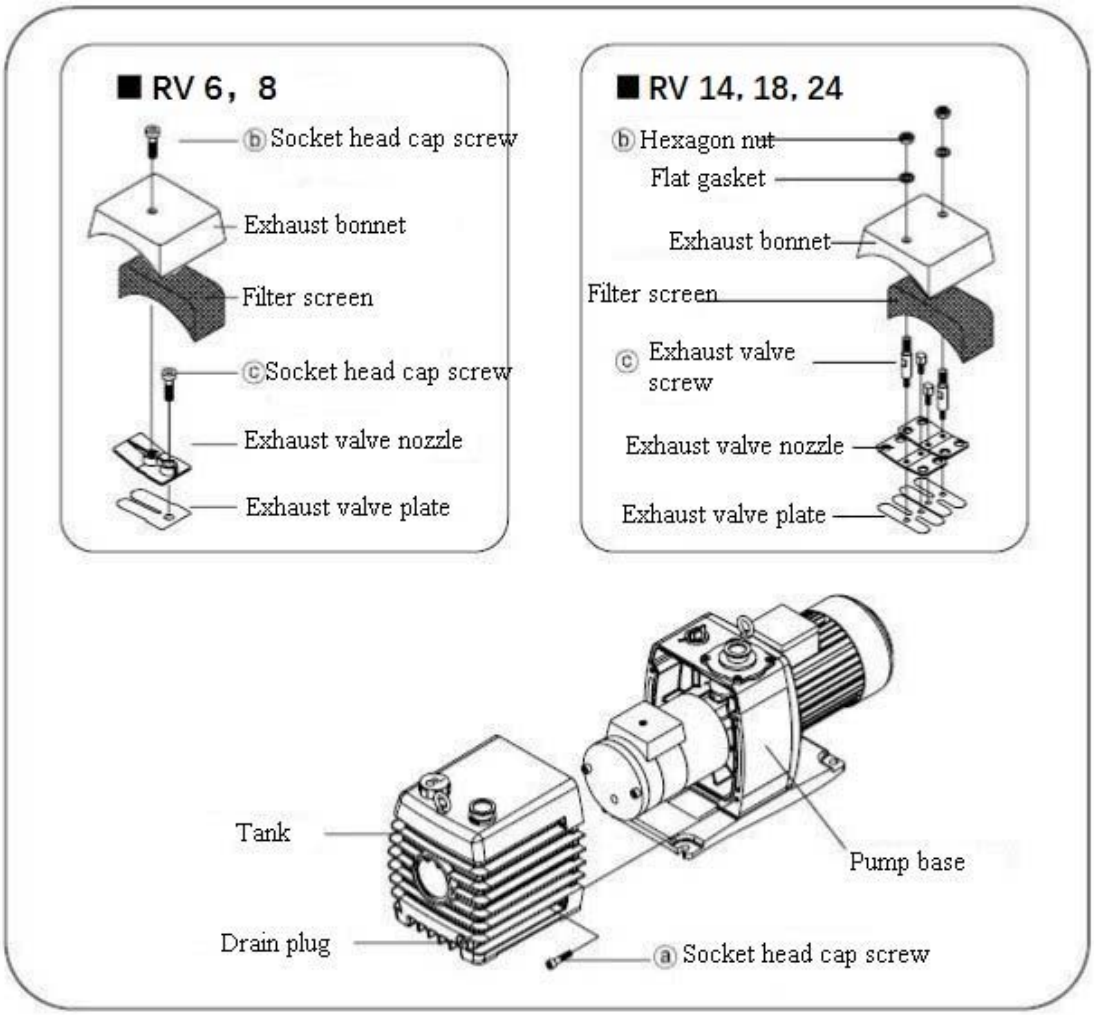
b. Unscrew the bolt that fixes the tank and the pump base together; and separate the tank. (Refer to the diagram below).

c. Unscrew the bolts and nuts ⓑ that fixes the exhaust bonnet.

d. Remove the exhaust bonnet and clean the filter screen.

e. Unscrew the set bolt of the exhaust valve nozzle and check the exhaust valve nozzle and exhaust valve plate.

□ Assemble according to the appropriate sequence.



□ Assemble according to the appropriate sequence.

6.5 Inspection of Anti-Return Valve

■ Anti-return valve is designed to prevent oil or oil mist from flowing back into the system when the pump suddenly stops.

□ If the anti-return valve is damaged, the exhaust speed may be reduced, and the pump performance (i.e. final vacuum) may also be reduced. If there is a problem with the pump performance but the pump core assembly is good, please check the anti-return valve.

6.5.1 RV6, RV8, RV14, RV18, RV24

Remove the anti-return valve as shown below. (Refer to the diagram below)

a. Unscrew four bolts at the inlet port, and remove the inlet port and O-ring.

b. Remove the valve plate at the upper of the piston.

c. Remove the spring clip that fixes the anti-suction system.

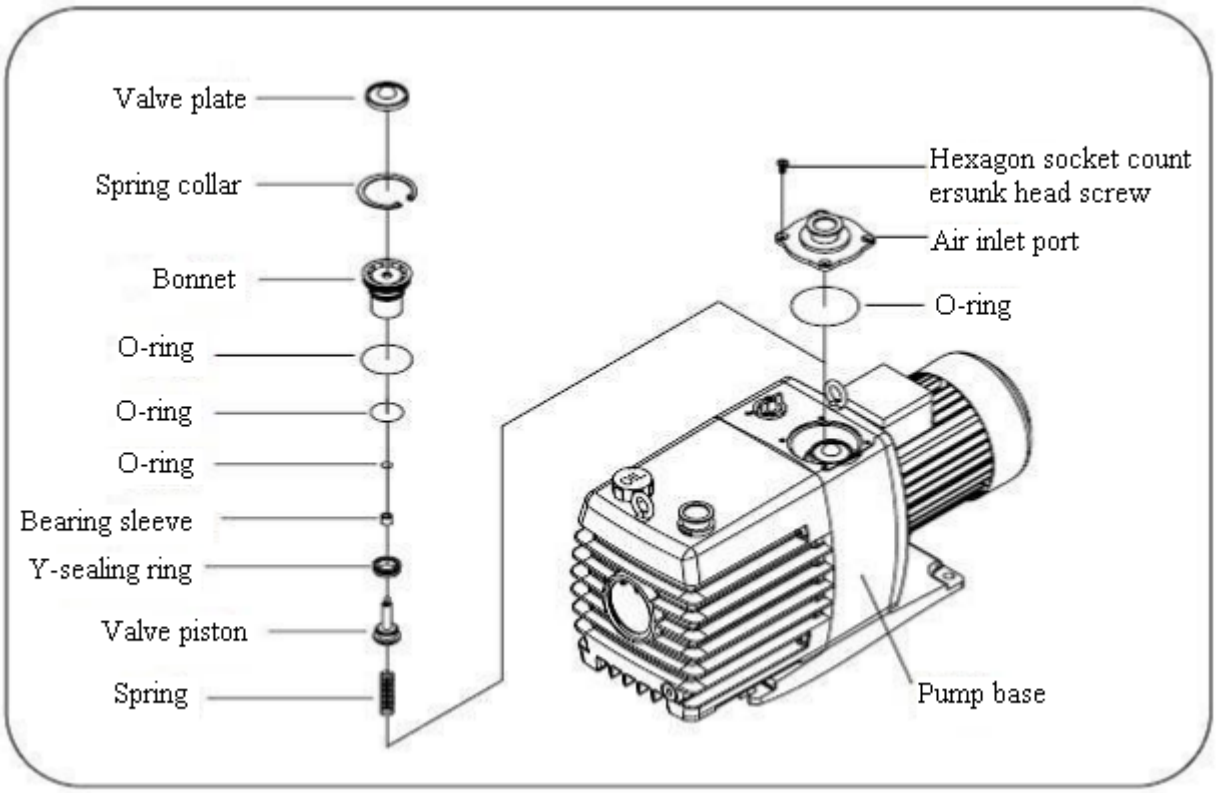
d. Remove the valve system by gradually pulling out the valve piston.

e. Remove the valve piston and O-ring from the bonnet.

f. Remove U-ring from valve piston.

□ Don't try to separate the shaft bushing in the bonnet that is fixed with the adhesive.

g. Remove the spring.



※The specified parts shall be used only for replacement of old parts to ensure normal performance of pump.

7. Troubleshooting Instruction

Fault	Cause	Troubleshooting Method	Remark
Difficult to start up pump	1. Pump is blocked	1. Need to be disassembled, repaired and cleaned	
	2. Oil viscosity of vacuum pump is too high	2. Keep the room temperature above 10℃ and confirm to use the recommended oil of vacuum pump	
	3. Oil pump is worn out or blocked by impurities	3. Clean the oil pump. Replace the component if worn out.	
	4. Motor voltage is incorrect	4. Use appropriate voltage or replace the motor	
	6. Wiring is not good	6. Check and repair the wiring	
	7. Motor problem	7. Replace with new motor	
Unable to reach the limit pressure	1. Air ballast valve is open	1. Close Air ballast valve	
	2. The inlet pipe is connected to the exhaust port	2. Connect the inlet pipe to the Air inlet port	
	3.Air inlet pipe is too narrow.	3. Replace large-diameter inlet pipe	
	4. Vacuum system leakage occurs.	4. Repair the system leakage	
	5. Fault of anti-return valve occurs.	5. Repair anti-return valve	
	6. Oil is misused	6. Use the specified vacuum pump oil	
	7. Oil is contaminated or vacuum pump oil is not enough	7. Change or fill oil	
	8. Oil way is clogged	8. Remove the pump core assembly and clean the oil way	
	9. Shaft of oil seal is damaged	9. Replace oil seal	
	10. Rotary vane is not installed correctly	10. Remove the pump core assembly and reassemble it correctly	
	11. Vacuometer is damaged	11. Replace or repair vacuometer	
	12. Exhaust valve plate is damaged	12. Replace exhaust valve plate	

Fault	Cause	Troubleshooting Method	Remark
The pumping speed is slow	1. Diameter of the inlet/outlet pipeline is too small or too long.	1. Choose the proper pipe	
	2.Vacuum pump oil is contaminated	2. Replace vacuum pump oil	
	3. Anti-return valve is damaged	3. Repair anti-return valve	
	4. Filter screen at inlet port is blocked.	4. Clean filter screen at inlet port	
	5. Oil is misused	5. Use the specified vacuum pump oil	
	6. Vacuum system leakage occurs	6. Repair leakage of vacuum system	
	7. The pumping speed is too slow	7. Select pump with proper pumping speed	
Exhaust Air is leaked from pump	1. O-ring at exhaust port is damaged	1. Replace with new O-ring	
	2. Scratch occurs on the sealing surface of Air outlet port	2. Grind the sealing surface of Air outlet port with sandpaper. Replace with new outlet port in case of serious scratch.	
Pump temperature is too high	1. Shortage of oil	1. Fill oil	
	2. Blockage of oil way	2. Clean the pump and replace with new oil for vacuum pump	
	3. Problem of oil pump	3. Replace with new rotary vane for oil pump	
	4. Ambient temperature > 40℃	4. Reduce ambient temperature or use the cooling device	
	5. Poor ventilation	5. Pay attention to cooling of air flow of fan	
	6. Too high temperature of working Air	6. Adjust workflow or install the cooling system	
Too much fume from exhaust port	1.Too much oil is filled	1. Pour out some oil	
	2. Air ballast valve is open	2. Close Air ballast	
	3. Exhaust valve plate is damaged	3. Replace with new exhaust valve plate	
	4. Vacuum system is leaked	4. Find out the leaked point and deal with it	
The vacuum system restores to the atmospheric state when the pump stops.	1.Anti-suction valve is damaged	1. Check anti-suction valve and repair it if damaged	
	2. Vacuum system or pipeline is leaked	2. Check the system or pipeline. Repair it if leaked	

Fault	Cause	Troubleshooting Method	Remark
Oil consumption of vacuum pump is too fast	1. The sealing ring of drain plug is damaged	1. Replace with new sealing ring	
	2. Oil seal is damaged or improperly assembled	2. Replace the oil seal to ensure no clogging in the oil seal way	
	3. The sealing sleeve of oil seal shaft is damaged or corroded	3. Replace new sealing sleeve for oil seal shaft	
	4. Leakage occurs at inlet/outlet	4. Repair defective parts or replace with new ones	
	5. Oil is leaked between tank and pump body	5. Replace seal ring	
Oil is leaked to vacuum pipeline or system	1. Oil returns into vacuum pipeline	1. Clean the pump and replace with the recommended oil for vacuum pump	
	2. Oil vapor pressure is improper.	2. Clean the pump and replace with the recommended oil for vacuum pump	
	3. Oil returns when pump stops suddenly	3. Check the anti-return valve and repair it when necessary.	
	4. Defect occurs on the sealing surface of anti-return valve plate	4. Replace with new anti-return valve plate	
	5. Corrosion or defect occurs on the sealing surface of inlet port and anti-return valve plate	5. Check the sealing surface of Air inlet port and anti-return valve plate. Replace the sealing surface if any defect occurs.	
Vacuum pump oil is darkened or turbid.	1. Vacuum pump oil is contaminated	1. Replace with new oil	
	2. Oil is misused	2. Use specified vacuum pump oil	
	3. Vacuum pump oil is not enough	3. Fill oil	
The operating sound is abnormal	1. Leakage occurs in the system	1. Repair the leaked part	
	2. Coupling is damaged	2. Replace the coupling	
	3. Exhaust valve is damaged	3. Repair exhaust valve	
	4. Vacuum pump oil is not enough	4. Fill oil	
	5. Rotary vane is damaged	5. Replace rotary vane	

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