



## ***High Reliable Vacuum Pump***

**Vacuum Pump**

**Operating Instructions**



**[WWW.420PMUK.COM](http://WWW.420PMUK.COM)**

The high quality vacuum pump, which has high reliable, high ultimate vacuum and low noise, is regarded as the highest honor by the **VALUE**.

Creating value for the customers is our core idea; satisfy customers' requirements is our research base; with this commitment to innovation, quality, and service, VALUE design a high reliable vacuum pump called "VRD" for the customers all around the world.

New "VRD" series vacuum pump design was a huge project. At very beginning, we positioned the product. more than 1200 questionnaire surveys has been sent to the market; then we communicated with customers whom from 30 different countries, discussed the advantages and disadvantages of the products in the market right now; furthermore, we combined the requests for the terminal customers, and finally decided to design a high reliable vacuum pump with high ultimate vacuum and low noise. From the conception to screening to the final decision, more than 10 schemes has been researched and discussed. The ABB Group (Switzerland)'s manufacturing experts, the Valeo (France)'s quality management experts, the Shell (England)'s lubricating oil experts, and our company's vacuum technology manufacturing experts jointed development completes.

In order to make sure the "VRD" series pump can achieve high quality, our company imported OKUMA vertical machining center (Japan), WENZEL 3D measuring machine (Germany) to build a constant temperature and humidity assembly shop. At the same time, lean production mode was introduced to ensure the process, measurement and assembly were perfect accuracy.

"VRD" series vacuum pump had a whole body structure, forced lubrication and hydraulic control system. The pump oil (special ordered from SHELL) could make sure the vacuum pump chamber with extremely high precision and good lubrication performance. The oil seal and the fluorine rubber sealing ring were imported to insure the high sealability and longer life. The NSK bearing made in Japan and the SANDVIK exhaust valve made in Swiss can guarantee 10 billion times operating life.

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# Forward

## I Use information

- Thanks for trusting and using our products, we will try our best to supply you with good products and service.
- Please check the product received is same as you ordered and also the accessories, operating manual are attached. Please check the product if there is any damage during transportation. Contact with local distributor if the above problem is found.
- Please read the operating manual carefully before operating and use the pump according to the product operating procedures.
- We reserve the right to modify the design and specified data including operating manual without notice.
- Add vacuum oil before starting up for the first time.

### ! Warning

In order to prolong the usage of the vacuum pump, please read the operating manual carefully before installation, operation, repair and maintenance, which can help you to fully understand the safety, specification as well as operation procedure of the vacuum pump.

## II Safety indication

Only operate VRD vacuum pump in a proper way according to operating manual can ensure the safety and efficient operation of the pump. In order to enable you to fully understand the operating manual and the content of warning, we list following safety indications.

### ! Warning

Indicates procedures that must be strictly observed to prevent hazards to persons.

### ! Attentions

Indicates procedures that must be strictly observed to prevent damage or destruction of the pump.



This warning label indicates the possibility of electrical shock. Disconnect the pump from the power supply in the process of electrical connection, repair and maintenance. Make sure the proper cover of junction box before running.



This warning label indicates when opening the pump, do not touch the pump, until it has cooled.

## III Attentions

### ! Attentions

Before the connection, please check the power supply is the same with the required power supply.

### ! Warning

Electrical connection work must only be carried out by a skilled electrician in accordance with the electrical equipment technical standard and connection regulation.

### ! Warning

Do not place obstacles which will influence the ventilation around the motor in order to avoid scald or fire.

### ! Warning

The products must be grounded and the motor circuit must be equipped with a suitable rated motor protection switch before starting up.

### ! Warning

The pump must be operated at ambient temperatures between 5-40°C.

### ! Warning

The exhaust line must be unblocked before operating. Make sure that the gas flow from the exhaust port is not blocked or restricted in any way.

### ! Warning

Check the oil level before running. Do not operate the pump without oil or short of oil. Otherwise it will result in the pump failure.

### ! Warning

When opening the pump, do not touch the pump, until it has cooled.

### ! Warning

VRD series vacuum pumps shall not suitable for pumping of toxic, corrosive, flammable and explosive gas.

### ! Warning

VRD series pumps are strictly prohibited to operate in the explosion hazard and flammable area in case of explosion or fire.

### ! Attentions

If the medium pumped contains a small amount of dust, condemnable gases, some corresponding accessory should at all events be installed. Otherwise, it will cause pump failure or deduction of performance.

## ! Warning

Disconnect the power supply during the repair and maintenance, in order to prevent electrical hazard.

## IV Reception and storage

### IV-1 Reception

Please do following inspections when you received the product:

- Whether the product is same as you ordered.
- Whether the accessories (including the first time use vacuum oil, accessories) are same as contract.
- Whether there are any damages during transportation.

If any questions, please contact with your local distributor or our sales department.

### IV-2 Operating and storage environment

In order to achieve stable, reliable operation, following requirements should be satisfied during storage and operation:

- Working ambient temperature/humidity: 5—40°C. Below 85%RH
- Storage and Operating altitude < 1000m
- Storage and operating environment:
  - 1) No corrosive, flammable and explosive gases.
  - 2) The pump must be stored in a room with good ventilation.
  - 3) Avoid direct sunlight.
  - 4) Far away from heat source.
  - 5) No dust
  - 6) No dust

## ! Attentions

Do not invert the pump or subject the pump to any impact. Otherwise, the pump may be damaged.

## 1 Description

VRD series vacuum pump is a high speed, motor direct drive, oil-sealed rotary vane vacuum pump. The pump adopts integrated cylinder structure, inner oil pump design, automatic anti-suckback valve design, oil pressure control system and adjustable gas ballast valve design.

The pumps are designed with rational structure, safety and reliability. It has high flow rate, high ultimate pressure and low noise level. The pumps are free of oil leakage and easy for maintenance. It is a highly reliable vacuum pump proved by global customers.

### 1.1 Purposes and scope

The VRD series vacuum pump is the basic equipment in vacuum application field, especially in researching, teaching, medical field, vacuum coating .

The VRD series vacuum pump can be used as the main pump for the low/medium vacuum system; also this kind of pump could be used as the backing pump for roots pump, diffusion pump, molecular pump and other ultra-high vacuum system.

## 1.2 Structure and principle

The VRD series is double-stage direct coupled rotary-vane vacuum pump; the advantages of this pump are high reliability, low noise and high ultimate vacuum. This pump had a whole body structure, forced lubrication and hydraulic control system. At the same time, a different permeability designed gas valves made the pump maintain a high reliability in different using environment.

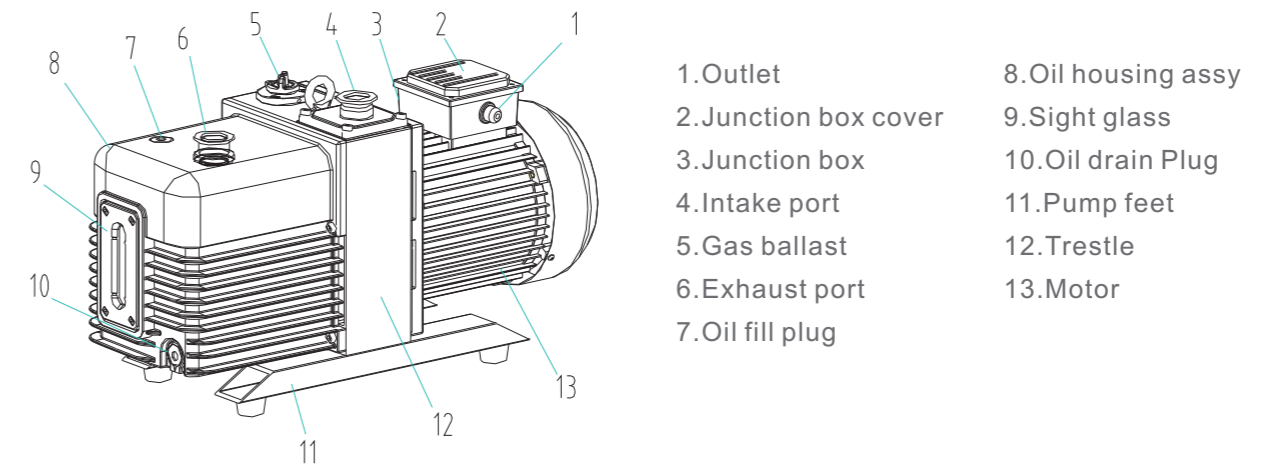


Fig.1 Outside view drawing

Refer to Fig. 2 for functional diagram:

The rotor, mounted eccentrically in the pump cylinder, has two vanes which divide the pump chamber into two different changeable compartments. When the pump rotor which was driven by the motor clockwise rotated, chamber 1 will suck air from small to big, and chamber 2 will complete the transmission of air, then chamber 3 will compress and exhaust air from big to small, and complete a work cycle from suction-compress-exhaust finally, achieve the vacuum of the system.

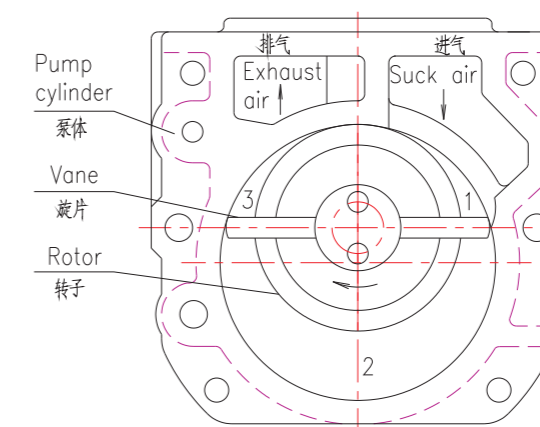


Fig.2 Functional diagram

## 1.3 Pump technical specification

### 1.3.1 Technical Specification:

Model		VRD-4	VRD-8	VRD-16	VRD-24	VRD-30	VRD-48	VRD-65
Displacement speed m <sup>3</sup> /h(L/s)	50Hz	4(1.1)	8(2.2)	16(4.4)	24(6.6)	30(8.3)	48(13.3)	65(18)
	60Hz	4.8(1.3)	9.6(2.6)	19.2(5.2)	28.8(7.9)	36(9.9)	57.6(16)	78(21.6)
Ultimate partial pressure without gas ballast(Pa)		$5 \times 10^{-2}$	$5 \times 10^{-2}$	$4 \times 10^{-2}$	$4 \times 10^{-2}$	$4 \times 10^{-2}$	$4 \times 10^{-2}$	$4 \times 10^{-2}$
Ultimate total pressure without gas ballast(Pa)		$5 \times 10^{-1}$	$5 \times 10^{-1}$	$4 \times 10^{-1}$	$4 \times 10^{-1}$	$4 \times 10^{-1}$	$4 \times 10^{-1}$	$4 \times 10^{-1}$
Ultimate total pressure with gas ballast (Pa)		3	3	$8 \times 10^{-1}$	$8 \times 10^{-1}$	$8 \times 10^{-1}$	$8 \times 10^{-1}$	$8 \times 10^{-1}$
Power Supply		Single/3-ph	Single/3-ph	Single/3-ph	Single/3-ph	Single/3-ph	3-ph	3-ph
Power rating (KW)		0.4/0.37	0.4/0.37	0.75/0.55	1.1/0.75	1.1	1.5	2.2
Intake and exhaust DN (mm)		KF16/25	KF16/25	KF25	KF25/40	KF25/40	KF40	KF40
Oil Capacity (L)		0.6~1	0.6~1	0.9~1.5	1.3~2.0	1.3~2.0	3.3~4.5	3.3~4.5
Motor speed (rpm)	50Hz	1440	1440	1440	1440	1440	1440	1440
	60Hz	1720	1720	1720	1720	1720	1720	1720
Ambient temperature		5-40°C	5-40°C	5-40°C	5-40°C	5-40°C	5-40°C	5-40°C
Noise level (dB)		≤56	≤56	≤58	≤58	≤58	≤62	≤62
Weight (kg)		19	21	30	35	43	62	65

Chart 1 Technical specification

### 1.3.2 Pumping speed characteristic

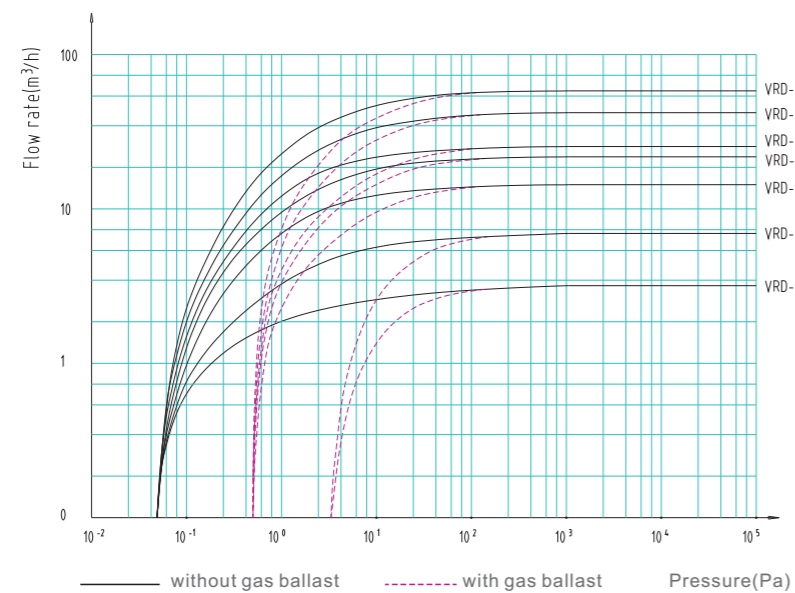
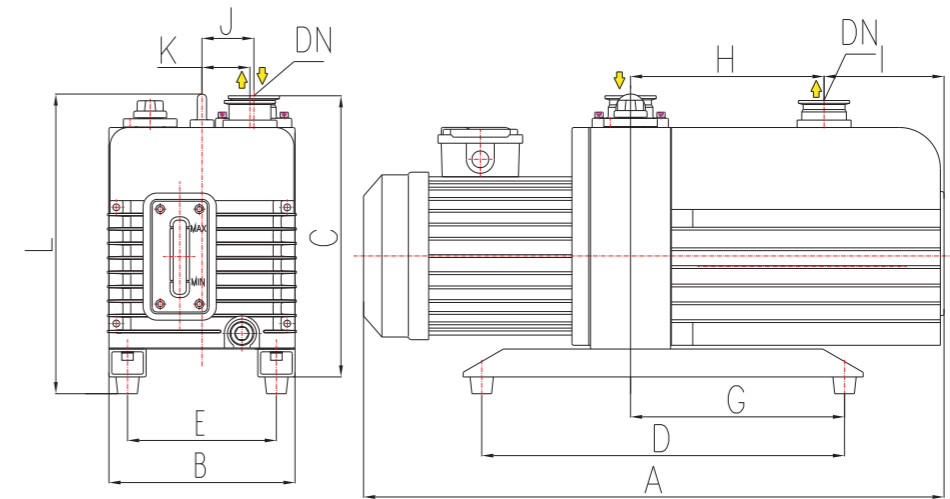


Fig.3 pumping speed characteristic

## 1.4 Dimension



The dimension for VRD series pump												
TYPE	A	B	C	D	E	G	H	I	J	K	L	DN
VRD-4	460	144	207	240	120	126	154	45	45	34	230	KF16/25
VRD-8	460	144	207	240	120	126	154	45	45	34	230	KF16/25
VRD-16	520	188	272	320	148	160	165	69	59	38	295	KF25
VRD-24	560	188	272	320	148	160	185	82	59	47	295	KF25/40
VRD-30	560	188	272	320	148	160	185	82	59	47	295	KF25/40
VRD-48	730	234	358	396	190	200	223	157	69	55	390	KF40
VRD-65	730	234	358	396	190	200	223	157	69	55	390	KF40

Fig. 4 pump dimension

## 2 Installation

### 2.1 Transportation

Any negligence will cause pump damage. Take care during transportation.

#### ! Warning

Pump must only be moved when stopped and supply switched off.

#### ! Warning

Check the pump for the presence of any oil leakage, Since there exists the danger that someone may slip on spilt oil.

#### ! Warning

When lifting the pump you must make use of the hook provided on the pump.

### 2.2 Installation site

When choosing the pump installation site, please consider the followings:

- Suitable for installing, maintenance and disassembly.
- Good ventilation.
- Convenient for electrical connecting.

### ! Warning

VRD series pumps are strictly prohibited to operate in the explosion hazard and flammable area in case of explosion or fire.

### ! Warning

Do not place obstacles which will influence the ventilation around the motor in order to avoid scald and fire.

## 2.3 Installation

When connect the pump to vacuum system, please place the pump horizontally (11/ Fig. 1), or you can unload the rubber feet (11/ Fig. 1), connect it by feet-hole screw.

### ! Attention

Oblique installation may result in pump's vibration, high noise or even damage. The pump should be set up on a flat and firm surface.

## 2.4 Adding oil

Open the oil fill plug (7/ Fig. 1), add the oil according to the technical data. Add oil to recommended oil level for the first time.

It is VPO series recommended to use **VALUE** company's high speed vacuum oil. It may cause unstable performance of vacuum pump and influence the vacuum pump lifespan if using other vacuum oil. During the operation, the oil level of the pump must always be visible between the Max to Min mark. Oil at **VALUE** recommended level is better. Excessive or insufficient oil will decrease the pump performance or even cause malfunction of the pump.

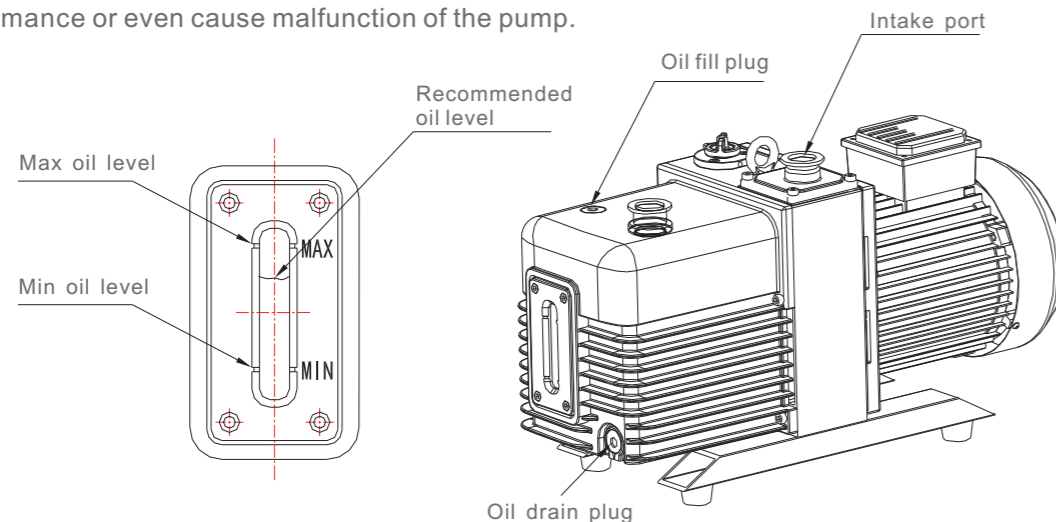


Fig. 5 Add oil diagram

### ! Warning

The pump must be switched off and exhaust must be unblocked before topping up any oil.

## 2.5 Working ambient temperature

Pump's working ambient temperature: 5~40°C, humidity < 85%

## 2.6 Low temperature start up

For single-phase power source, the minimum starting temperature is 10°C, For three-phase power source, the minimum starting temperature is 5°C.

## 3 Electrical connections

### ! Warning

Before the connection, please check the power supply is the same with the required power supply.

### ! Warning

Electrical connection work must only be carried out by a skilled electrician in accordance with the electrical equipment technical standard and connection regulation. Wrong connection may lead to safety accident.

## 3.1 Pump with single phase motor

With single phase design, power supply cable, switch, overload protector are all connected. The direction of rotation need not be checked as it is fixed. The pump can be directly connected by means of the connection cable and plug to the single phase power supply. The motor is protected against overloading by a thermal overload protector.

### ! Warning

If the thermal overload protector shuts off the pump, if you want pump continue to work, you should button and than switch on. The plug should be disconnected from the power supply before starting with any work on the pump.

## 3.2 Pump with three-phase motor

### 3.2.1 Pump with three-phase motor electrical connection

When connecting three-phase motor pump, please open the junction box cover (2/ Fig. 1) connect the pump according to Fig. 6. The pump is supplied without any accessories of electrical connection. You must connect the pump using an appropriately rated cable and a suitably rated motor protection switch. The value set on the motor protection switch must correspond to the current rating stated on the name-plate of the motor.

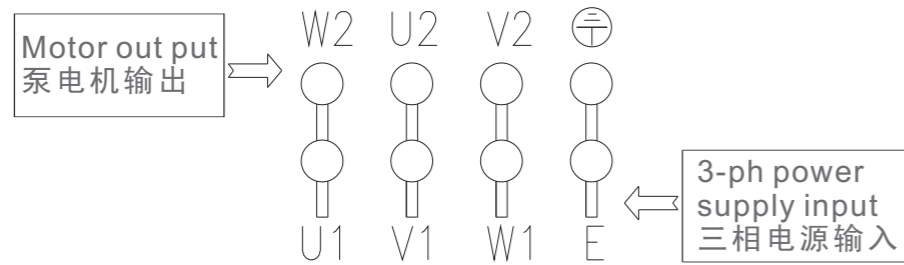


Fig.6 Three-phase motor connection

### 3.2.2 Pump with three-phase motor direction

Check whether the motor rotate direction is same as motor arrowhead. Please cut off the power immediately and interchange two phases of the connection (any 2 from W1, U1, V1) if the motor rotate direction is not same as the motor.

### 3.2.3 Motor direction test

Open the inlet port (4/ Fig.1), exhaust port (6/Fig.1), Put a slip of paper 50mm top of the exhaust port, switch on/off the motor immediately to see the direction of the slip of paper. If the slip of paper upward away from the exhaust port, then the motor direction is correct. The direction arrow on the motor is the pump's direction.

#### ! Attention

If the pump runs for too long in the wrong direction, it may cause the damage of pump parts.

## 4. Vacuum system connection

Connection between pump and vacuum system is international standard flange, it's easy to operate.

### 4.1 Requests for vacuum system connection

- Between vacuum pump and vacuum system, the connecting lines should be as short as possible.
- Make sure the DN of connecting line between vacuum pump and vacuum system should be same as intake port. Check the inlet port filter regularly and keep its cleanness.
- Make sure the DN of exhaust fitting should be same as intake port. The exhaust line should preferably be installed with a downward slope so as to prevent condensate from flowing back into the pump and contaminating the oil. Please periodically drain the condensed oil in the exhaust pipe for avoiding of exhaust pipe block. If the exhaust line has an upward slope, a condensate trap must at all events be installed.
- Leak check of the connection between pipe and flange. Vacuum-tight connection of the pump is essential so that the pump can attain the ultimate vacuum .

#### ! Warning

On no account may the pump be operated with a blocked or constricted exhaust line. Make sure before start-up that the exhaust lines are not obstructed by deposits.

## 5 Operating

### 5.1 Before operating

- The exhaust line must be unblocked. On no account may the pump be operated with a blocked exhaust line.
- The oil capacity in the housing should be suitable.
- Running direction of the motor as requested.
- Well grounded for the motor.
- Check the power supply and ensures it matches the specifications on the pump.

### 5.2 Operating

#### 5.2.1 Vacuum system without condensable gases

In the presence of permanent gases, the gas ballast valve knob (5/Fig.1) should be switched off (as Fig.7 gas ballast valve knob arrow C below). It may cause the rise of ultimate pressure (decrease of ultimate pressure) if open the gas ballast valve (5/Fig.1).

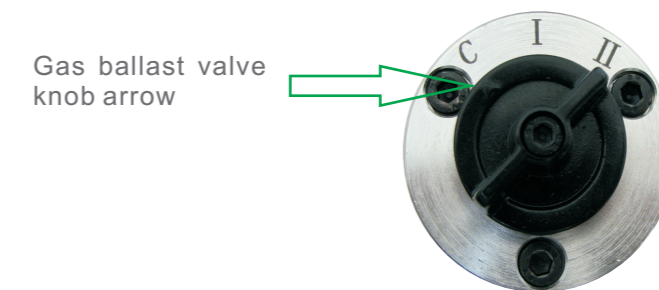


Fig. 7 Gas ballast valve knob

#### 5.2.2 Vacuum system with condemnable gases

- When the vacuum system contains a small amount of condemnable gas, open the gas ballast valve (refer to Fig 7. gas ballast valve arrow I or II) , It can pump a small amount of condemnable gas effectively. Close the gas ballast valve when the vacuum system pressure reduced to a certain value.
- If the pump is operated in low temperature, condemnable gas may be dissolved in the oil of the pump. This impairs the properties of the oil and there is the risk of corrosion within the pump. For this reason the pump must not be switched off immediately after termination of the process. The pump must remain on with the gas ballast valve open and the intake line sealed until all gases which were dissolved in the oil has been removed. We strongly recommend that VRD pump be left running for about 30 minutes after termination of the process.

#### ! Warning

During the operation and termination after one hour, the pump surface temperature will be very high. Do not touch the motor and pump in case of scald.

#### ! Attention

We recommend operation of the pump with gas ballast valve open if pumping a small amount of condemnable gases.

## 5.3 Switching off

### 5.3.1 Switching off the pump normally

Finish pumping under normal circumstances, the pump can be switched off directly. The air intakes can be switched off automatically by the inner anti-suckback valve, thereby keep the cleanness of the system .

### 5.3.1 Switching off the pump normally

- If the pump was stopped using for a long time, please cover the inlet and exhaust port, in case of the dust may pollute the pump.
- Gas will be dissolved in the pump oil when putting the pump out of operation for long, It is recommended to let the pump continue to operate for 30 minutes with the intake line ( 4/ Fig. 1) closed and the gas ballast valve ( 5/ Fig. 1) open. The pump can resume normal use after the pump be degassed.

## 6 Maintenance

### ! Warning

Disconnect the power supply before repairing. It's forbidden to connect the power supply during repairing. Otherwise, the risk of injury may occur.

### ! Warning

Pump temperature is very high when the pump just stopped. Do all the checking when the pump is cooled down to avoid the scald.

## 6.1 Oil checking

Please use clean and appropriate oil to ensure the pump performance and life. Arrange for the frequency of changing oil as your different operation situation. Check the oil regularly.

### 6.1.1 Checking the oil level

During the operation the oil level of the pump must always be visible between the Max to Min mark (refer to Fig.5). Add oil if the oil level is lower than Min mark and discharge oil if the oil level is higher than Max mark. Liquid height at recommended level is the best.

### 6.1.2 Checking the oil quality

Normally the oil is clear and transparent. If the oil darkens, it should be changed.

### 5.3.1 Switching off the pump normally

- If the pump was stopped using for a long time, please cover the inlet and exhaust port, in case of the dust may pollute the pump.
- Gas will be dissolved in the pump oil when putting the pump out of operation for long, It is recommended to let the pump continue to operate for 30 minutes with the intake line ( 4/ Fig. 1) closed and the gas ballast valve ( 5/ Fig. 1) open. The pump can resume normal use after the pump be degassed.

## 6.2 Oil change

- Change the oil in time if the oil contains mass liquid, organic solvents or corrosive gases.
- Change the oil if the pressure declines as time by.
- Oil should be changed after the first 100 operating hours for the first usage.
- Add oil if the pump is operated under hyper-3000pa higher pressure for long time.
- It is recommended to change the oil every 2000 operating hours.

### ! Warning

If there is the danger that the operating agent may present a hazard in any way due to decomposition of the oil, or because of the media which have been pumped, you must determine the kind of hazard and ensure that all necessary safety precautions are taken.

### ! Warning

In the case of hazardous substances determine the kind of hazard first and observe the applicable safety regulations. If the potential hazard still persists, the pump must be decontaminated before starting with any maintenance work.

### ! Warning

Never exchange the oil while the pump temperature is still high. Exchange the oil when the pump cooled down to lower than 50°C. You must wear suitable protective clothing.

### ! Attention

We can only guarantee that the pump operates as specified by the technical data by using **VALUE** VPO series high vacuum pump oil.

## 6.3 Oil change procedure

- Remove the oil drain plug (10/ Fig. 1) and let the used oil drain into a suitable receptacle. When the flow of oil stops, screw the oil drain plug back in, briefly switch on the pump(max. 10s) and switch it off. Remove the oil-drain plug again and drain off the remaining oil. It can remove the residual oil from the pump chamber.
- Screw the oil-drain plug back in (check the O ring and replace it if necessary)
- Remove the oil filling plug back in (7/ Fig. 1), and fill fresh oil. (Please refer 2.4 adding oil)

### ! Warning

Always carry out the oil change when the pump is switched off and cooled down.

## 6.4 Cleaning the dirt trap

During the process of dirt trap, some dust, grease will be adsorbed and piled up, which resulting the reduction of the pumping speed, and even obstructive. At the meantime, dirt entering into the pump body chamber and results heavy wear and tear. Clean the dirt trap regularly as your different operate situation. If cleaning is needed, Remove the dirt trap and clean with a cleaning agent, blow it out with compressed air and then re-install. Replace the defective dirt trap if necessary.



## 6.5 Routine checking

	Inspection	Testing	Period	Remarks
1	Oil level	Eyeballing oil level	Every Three Days	Add oil if the oil level is low Refer to Section 2.4 drawing5
2	Oil color	Eyeballing the oil color in the oil sight level	Every Three Days	Normally the oil is clear and transparent . If the oil darkens , it should be changed . Refer to section 6.3
3	Pump noise	Whether the noise is normal	Every three days	Refer to 6.6 if the noise level is abnormal
4	Pump vibration	Whether there is any abnormal vibration	Every Three Days	Check whether any pump feet , feet screws loosen
5	Pump temperature	Temperature measuring meter	Every one week	Check the fan of the pump and motor for deposits and clean as required .
6	Seal & O ring	Eyeballing	Every one month	Change it as required
7	Dirt trap	Check whether any foreign matter enters	Every one month	Clean the dirt trap and blow it out with compressed air

Table 2 Routine Checking

## 6.6 Trouble shooting

Fault	Possible reason	Solution
Pump can not be started	<ol style="list-style-type: none"> <li>1. Out of electrical</li> <li>2. Operation voltage is abnormal</li> <li>3. Motor is malfunctioning</li> <li>4. Overload protector start up</li> <li>5. Oil temperature is below 10°C</li> <li>6. Pump is jammed</li> <li>7. Out of operation for long , liquid and organic solvents result rust of the pump body</li> <li>8. Pump inner accessories are damaged</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the connection of power supply, switch</li> <li>2. Voltage wave within ±10%</li> <li>3. Replace the motor</li> <li>4. Press the overload protector</li> <li>5. Heat the pump and pump oil</li> <li>6. Repair the pump</li> <li>7. Repair the pump</li> <li>8. Repair the pump</li> </ol>
Pump can not reach to the maximum pressure	<ol style="list-style-type: none"> <li>1. Pump is too small</li> <li>2. Vacuum system leak</li> <li>3. Measuring technique or gauge is unsuitable</li> <li>4. Vacuum gauge not correct</li> <li>5. Oil level is too low</li> <li>6. Oil is unsuitable or deteriorated</li> <li>7. Lubricate seal oil channel inside pump blocked</li> <li>8. Intake line is dirty</li> <li>9. Exhaust valve is malfunctioning</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace the pump</li> <li>2. Check the leakage</li> <li>3. Use correct measuring technique and gauge. Measure the pressure directly at pump's intake port</li> <li>4. Chose suitable vacuum gauge.</li> <li>5. Add oil</li> <li>6. Change oil</li> <li>7. Clean oil channel</li> <li>8. Clean the vacuum lines.</li> <li>9. Repair the valve.</li> </ol>

Fault	Possible reason	Solution
Pumping speed is too low	<ol style="list-style-type: none"> <li>1. Intake port channel is clogged</li> <li>2. Connecting lines are too narrow or too narrow or too long</li> <li>3. Exhaust port channel is clogged unsuitable</li> <li>4. Exhaust filter is clogged</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean the intake port channel</li> <li>2. Use adequately wide and short connecting lines.</li> <li>3. Keep the exhaust port channel free</li> <li>4. Clean or change the exhaust filter</li> </ol>
Abnormal voice	<ol style="list-style-type: none"> <li>1. Abnormal input power supply</li> <li>2. Motor is malfunction</li> <li>3. Foreign body into the pump</li> <li>4. Oil level is too low</li> <li>5. Coupling element is worn</li> <li>6. Pump inner accessories are damaged.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the connection of power supply, switch</li> <li>2. Voltage wave within ±10%</li> <li>3. Clean the pump body</li> <li>4. Add oil</li> <li>5. Install new coupling element</li> <li>6. Repair or change the accessories</li> </ol>
Higher temperature than normal	<ol style="list-style-type: none"> <li>1. Continuous operation under high pressure in the intake port</li> <li>2. Oil level is too low</li> <li>3. Process gas is too hot</li> <li>4. Cooling air supply is obstructed</li> <li>5. Pump fan is malfunction</li> <li>6. Oil cycle is obstructed</li> <li>7. Ambient temperature is too high</li> </ol>	<ol style="list-style-type: none"> <li>1. Shorten exhaust time as far as possible</li> <li>2. Add oil</li> <li>3. Set pump up correctly.</li> <li>4. Set pump up correctly.</li> <li>5. Change the pump fan.</li> <li>6. Clean and repair the oil lines and channels</li> <li>7. Reduce the ambient temperature</li> </ol>
Oil in the intake line or in vacuum vessel	<ol style="list-style-type: none"> <li>1. Oil comes from the vacuum system</li> <li>2. Anti-suckback valve spring is obstructed</li> <li>3. Anti-suckback valve board is obstructed</li> <li>4. Oil level is too high</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the vacuum system</li> <li>2. Change the anti-suckback valve spring</li> <li>3. Change the anti-suckback valve board</li> <li>4. Drain the excess oil</li> </ol>
After switching the pump, pressure in system rises too fast	<ol style="list-style-type: none"> <li>1. System has a leak</li> <li>2. Anti-suckback valve is malfunctioning</li> </ol>	<ol style="list-style-type: none"> <li>1. Check the vacuum system</li> <li>2. Repair the anti-suckback valve</li> </ol>
Too much oil in the exhaust port	<ol style="list-style-type: none"> <li>1. Too much oil in the pump</li> <li>2. Continuous operation under high pressure in the intake port</li> </ol>	<ol style="list-style-type: none"> <li>1. Drain some oil</li> <li>2. Shorten exhaust time as far as possible</li> </ol>
Oil seal leak	<ol style="list-style-type: none"> <li>1. Oil seal broken</li> <li>2. Seal ring was deformed</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace new oil seal</li> <li>2. Replace new seal ring</li> </ol>

Table 3 Trouble shooting

## 7. Supplied Equipment

### 7.1 Standard equipment

Upon delivery, the small-flange connection ports of the pump are blanked off. Two flanges, two centering rings and two clamping rings each (KF16 / KF25/ KF 40) are supplied as standard equipment to connect the intake and discharge lines. One 25KF/40KF, centering ring is including a dirt trap sieve for the intake port.

#### 7.1.1 Pump with single-phase AC Motor

The pump is supplied with motor, switch, mains cable, plug.

#### 7.1.2 Pump with three-phase AC motor

The pump is supplied with motor and crane eye.

A switch, mains cable and plug are not part of the standard equipment.

## 7.2 Accessories

- Other in/exhaust interface
- Dust filter
- Oil mist filter

**Remarks: All accessories are optional parts, Any other requests about accessories, please contact us**

## 8. Warranty

- VRD series vacuum pump has a one year guarantee from the buying date.
- Our company will provide maintenance service free of charge in the period of guarantee provided on the normal use according to the operating manual.
- In case of following failures, repair fare is needed.
  - 1) Malfunction by nature disasters or artificial factor
  - 2) Malfunction under special usage.
  - 3) Malfunction of damage able spare parts (refer to table 4)
  - 4) Malfunction by non-normal operation or error use which is identified by our technical engineer

## 9. Spare parts

### 9.1 Exploded drawing

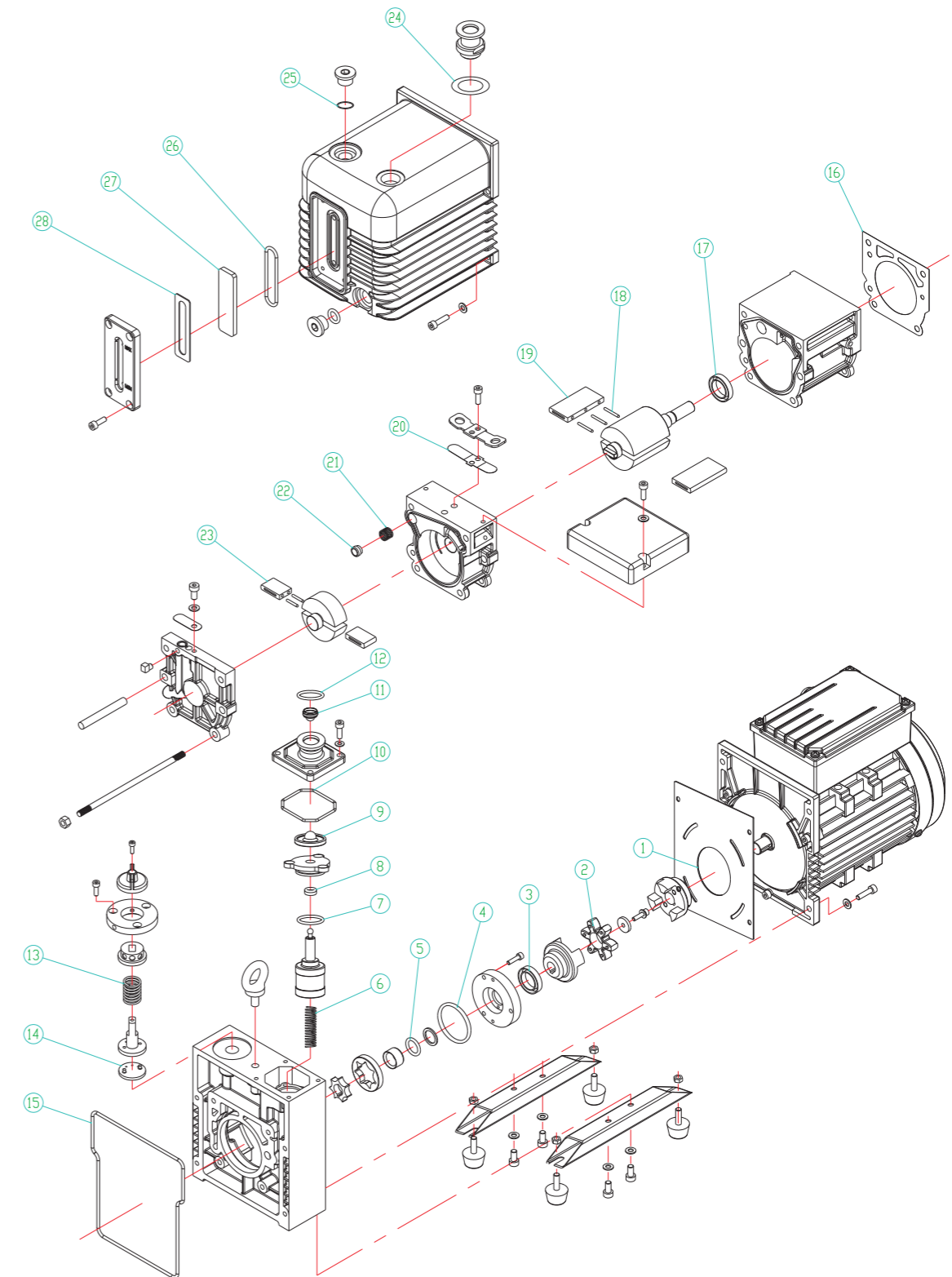


Fig.8 Exploded drawing

## 9.2 Spare parts list


NO.	Item	Item	Code.			Position	Qty
			VRD-4, 8	VRD-16, 24, 30	VRD-48, 65		
1	Washer	Cardboard		320220101	320220201	Motor	1
2	Spider	Rubber	320050201	320050101	320050301	Coupling	1
3	Seal	FKM	300281101	300281201	300280802	Oil pump cover	1
4	O ring	FKM	300310131	300310072	300310140	Front stator	1
5	O ring	FKM	300310121	300310083	300310143	Front rotor	1
6	Spring	SUS	320110203	320110204		Trestle	1
7	O ring	FKM	300310123	300310074		Anti-suckback cover	1
8	Seal	FKM	300280902			Anti-suckback cover	1
9	Valve	FKM	320510101		320530301	Anti-suckback piston	1
10	O ring	FKM	300310125	300310073	300310141	Intake port	1
11	Filter	SUS	320340202	320340102	320340301	Intake port	1
12	O ring	FKM	KF16:300310120	KF25:300310070	KF40:300310127	Intake/outlet port	2
13	Spring	SUS	320110302			Gas ballast	1
14	Washer	FKM	320230101			Gas ballast	1
15	O ring	FKM	300310080	300310079	300310142	Trestle	1
16	Gasket	Paper	320210201	320210101	320210301	Front stator	1
17	Seal	FKM	300281301	300280602	300281401	Front stator	1
18	Spring	SUS	320110104		320110103	Front/rear rotor	5
19	Vane	Resin board	VRD-4:320100901	VRD-16:320100101	VRD-48:320101001	Front rotor	2
			VRD-8:320100501	VRD-24:320100301	VRD-65:320101101	Front rotor	2
				VRD-30:320100401		Front rotor	2
20	Valve	SUS	320240201	320240101	320240301	Rear stator	1
21	Spring	SUS	310080301			Rear stator	1
22	Valve	FKM	311150103			Rear stator	1
23	Vane	Resin board	320100601	320100201	320101201	Rear rotor	2
24	washer	Paper	320200201	320200101	320200301	Outlet port	1
25	O ring	FKM	300310081			Oil-drain screw	2
26	O ring	FKM	320160201	320160101		Oil sight	1
27	Oil sight	Glass	320170201	320170101		Oil sight	1
28	washer	FKM	320190201	320190101		Oil sight	1

Chart 4 Spare parts list

1. Please refer to the exploding drawing for the relationships of each spare part.

★We reserve the right to modify the design and specified date including operating manual of the pump. Without notice.