

# VSV Series Operating Manual

Single-Stage Oil-sealed Rotary Vane Vacuum Pump



## Contents

1. Use information.....	1
2. Attention .....	1
3. Description .....	4
3.1 Principle of Operation.....	5
3.2 Principle of Gas Ballast .....	5
4. Technical Parameters .....	5
5. Transport and Storage .....	6
6. Installation and Connection.....	7
6.1 Installation Dimensions.....	7
6.2 Connection To System .....	7
6.3 Power Supply and Motor Rotary Direction .....	8
7. Initial Start and Operation .....	9
7.1 Start .....	9
7.2 Operation .....	10
8. Inspection and Maintenance .....	10
8.1 Inspection .....	11
8.2 Maintenance .....	11
9. Troubleshooting .....	13
10. Warranty .....	15
11. Accessories .....	15
11.1 VSV-20/20P Exploded View .....	16
11.2 VSV-20/20P Spare Parts List.....	17
11.3 VSV-22/28 Exploded View .....	18
11.4 VSV-22/28 Spare Parts List .....	19
11.5 VSV-40/65 Exploded View .....	20
11.6 VSV-40/65 Spare Parts List .....	21
11.7 VSV-100 Exploded View .....	22
11.8 VSV-100 Spare Parts List .....	23
11.9 VSV-160/200 Exploded View .....	24
11.10 VSV-160/200 Spare Parts List .....	25
11.11 VSV-300 Exploded View .....	26
11.12 VSV-300 Spare Parts List .....	27

## 1. Use information

Dear distinguished customers, thanks for your trust on our vacuum pumps of high reliability (Hereinafter referred to as "the pump"). Please check carefully whether the product received is the same as you ordered and the accessories, spare parts, operating manual are attached as well. Please also check if there's any damage occurred during the transportation. If needed, contact your local distributor or VALUE sales team for super services that we are committed to providing.

In order to prolong its stable performance, please read the operating manual carefully before installation, operation, repair and maintenance of the pump, which could help you to fully understand the safety instruction as well as its technical data and operating procedure.

### **Warning**

The terms must be strictly obeyed, for there will be the possibility to endanger the personal safety.

### **Notice**

Terms need to be paid extra special attention to, in order to avoid any damage on 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 cover of junction box is installed before running.



This warning label indicates high temperature while running the pump, do not touch the pump.

### **Notice**

Please read the operating manual carefully and follow the operating procedure. We reserve the right to modify the design and technical data of the pump without notice which might lead to discrepancies in the operating manual. Add vacuum oil as requested before starting the new pump.

## 2. Attention

In order to ensure the personal safety, please read the operating manual carefully before installation, operation, repair and maintenance.

### **Warning**

According to the technical norm and wiring regulations for electrical equipment, power supply must be in line with the product marking and electrical connection must be carried out by a skilled electrician.

**! Warning**

In order to prevent electrical hazard or suddenly running of the pump which might result in casualties, disconnect the power supply while checking or repairing the pump.

**! Warning**

Before starting the pump, the motor must be effectively grounded and properly connected with rated motor protection switch.

**! Warning**

VSV series vacuum pumps are strictly forbidden to pump dusty, active toxic, corrosive, flammable and explosive gas.

**! Warning**

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

**! Warning**

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

**! Notice**

The pump must be operated at ambient temperature between 10-40°C.

**! Notice**

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

**! Notice**

Due to the fact that oil will get people into the danger of slip, please check whether the pump leaks or not.

**! Notice**

Solid particles are not allowed to enter into the inner of the pump.

**! Notice**

Running without oil or wrong motor direction may lead to pump failure.

**! Notice**

The intake port of the pump can not be connected to the overpressure device, and please ensure the size of the exhaust passage with absolute pressure no more than 1.35 bar (relative pressure is no more than 0.35 bar).

**! Notice**

While handling waste oil and other parts, please comply with the relevant environmental protection laws and regulations.

**! Notice**

While pumping condensable gases, please use the pump attached with gas ballast.

**! Notice**

While pump a small amount of dust and condensable gases, the pump needs to install corresponding accessories. Otherwise, it will cause pump failure or sharp dropping of performance.

### 3. Description

The vacuum pump is an oil sealed single-stage rotary vane pump, and is a basic vacuum obtain equipment, and can be used to pump inactive gas within the scope of low vacuum and a small amount of non-condensable gas. This pump is specially suitable for packaging machinery, freeze drying, vacuum transfer, medical technical, vacuum melting, analytical instrument, laboratory and etc., could also be used as the backing pump for roots pump. The pump has reasonable structure design, adopting the oil circulating air-cooled structure, run without failure for extended periods of time, with high displacement speed, excellent ultimate vacuum, low noise, no oil spray, no oil leak, convenient maintenance.

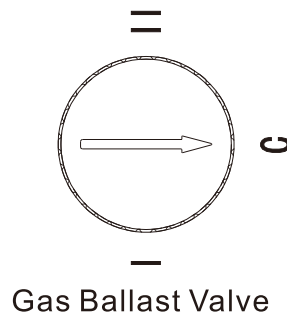


Fig.1

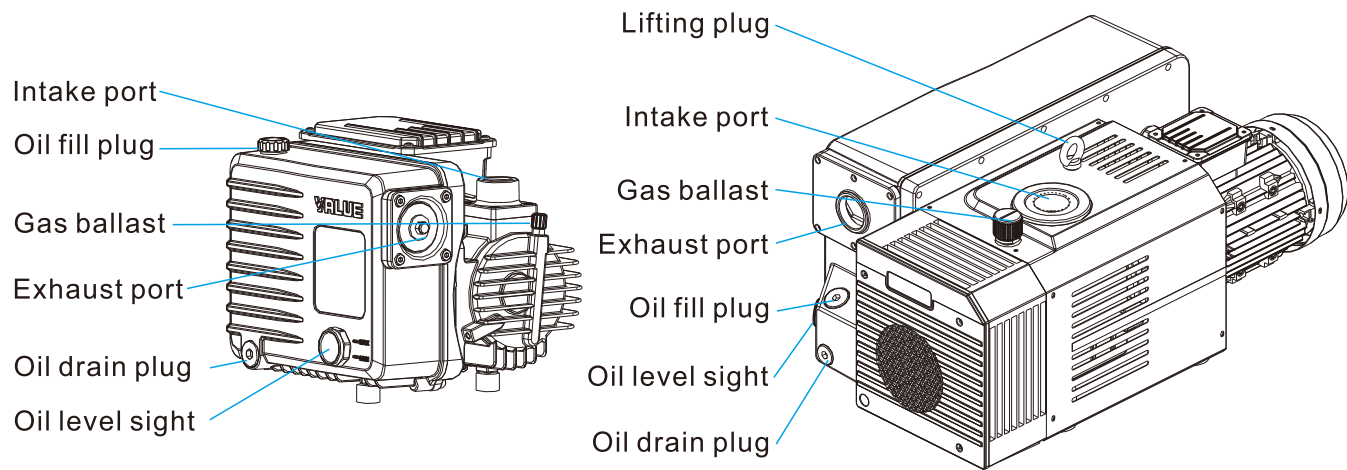


Fig.2

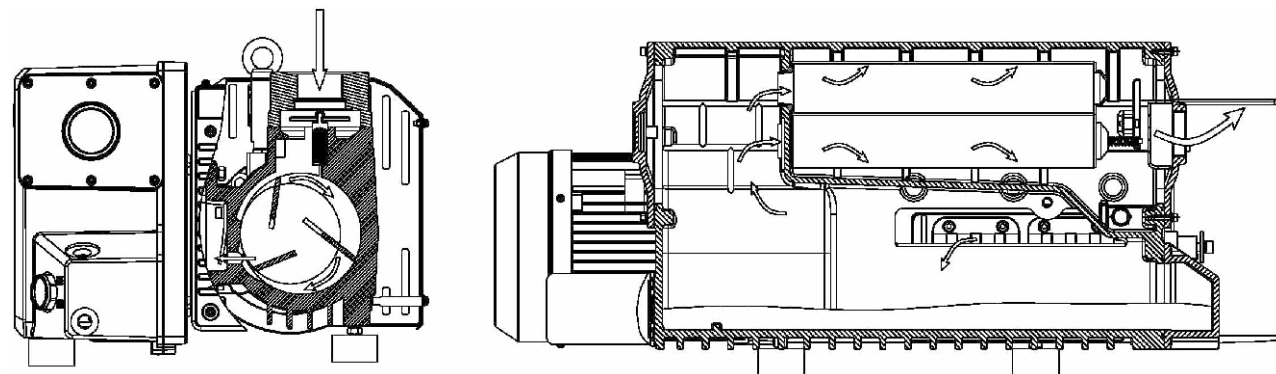


Fig.3

### 3.1 Principle of Operation

Refer to Fig.3, the rotor, mounted eccentrically in the pump cylinder, has three vanes which divide the pump chamber into several different chambers. When the pump rotor which is driven by the motor rotates, chambers will have periodical change accordingly. The gas is inhaled from the intake port, getting through filter, and anti-suck back valve into the pump chamber, and then enters into the sealed chambers formed by vane and rotor. After suction and compression, the gas comes out from the exhaust valve, getting through the oil mist filter, and finally goes out of the oil casing. Completing continued work cycle from suction, compression and exhaust, the pump achieves the vacuum of the system.

### 3.2 Principle of Gas Ballast

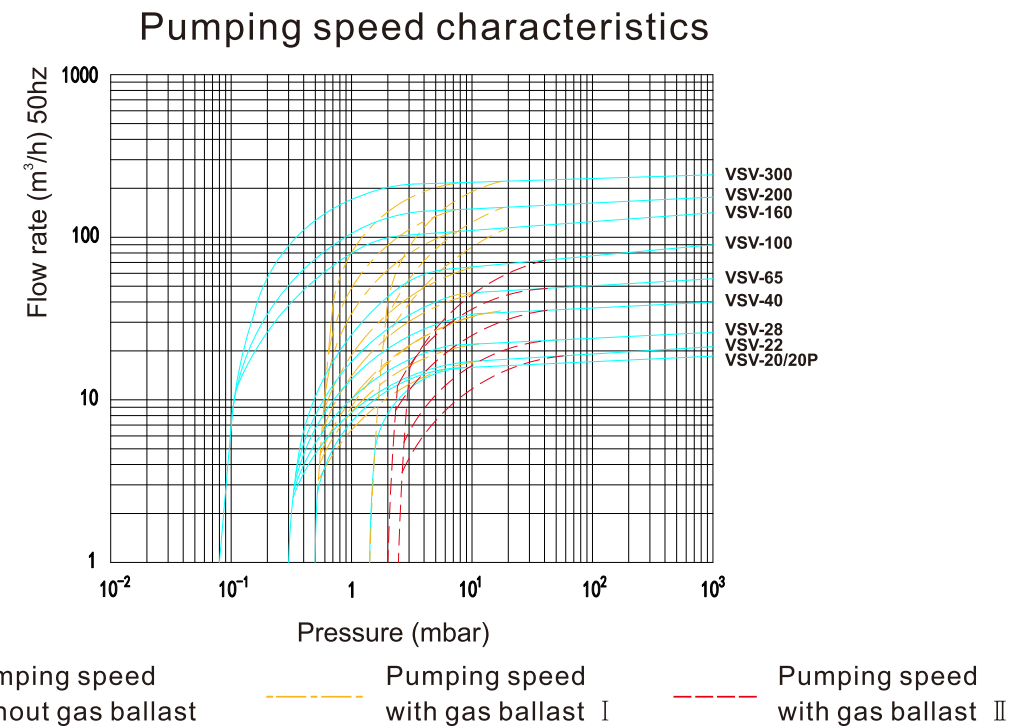
Controlled gas (generally dry room temperature air) gets through gas ballast hole, and enters into the compression chamber, then mixes with pumped vapor during the gas compression process. When the mixed gases are compressed reaching the exhausting pressure, if the vapor's partial pressure keep the lower level under the saturated vapor pressure, the vapor will not be condensable. Open the exhaust valve at this time, the vapor and other gases will be pumped out. The more vapor contained with the pumped gases, the more dried gases will be needed. ( See fig1 Gas Ballast valve )

### 4. Technical Parameters

		Unit	VSV-20	VSV-20P	VSV-22	VSV-28	VSV-40	VSV-65	VSV-100	VSV-160	VSV-200	VSV-300	
Pumping speed	50Hz	m <sup>3</sup> /h	20	22	28	40	55	100	160	200	245		
	60Hz		24	26	33	48	65	120	190	240	300		
Ultimate pressure without gas ballast	mbar	≤ 0.3						≤ 8 x 10 <sup>-2</sup>					
Ultimate pressure with gas ballast I	mbar	≤ 1	≤ 2	≤ 0.8			≤ 0.5	≤ 0.8	≤ 0.5				
Ultimate pressure with gas ballast II	mbar	≤ 2.5			≤ 2		≤ 3	≤ 1.5					
Allowing water vapor pressure	Gas ballast I	mbar	15						30				
	Gas ballast II	mbar	30						50				
Noise (Lw)	50Hz	dB	≤ 65	≤ 61	≤ 63	≤ 65	≤ 65	≤ 74		≤ 77			
Power supply			Single/3-ph		Single/3-ph	3-ph	3-ph	3-ph	3-ph	3-ph	3-ph	3-ph	
Power rating	Kw		0.75	1.1	1.3	1.5	2.2/3.0	5.5		7.5			
Motor speed(50/60Hz)	rpm		2880/3440		1440/1720								
Ambient temperature	°C		10~40										
Oil capacity	l		0.45	1	2.5			5~7		7~9			
Protection class			IP54										
Intake and Exhaust DN			G1/2" G3/4"/-		G3/4"	G1 1/4"			G2				
Weight	Kg		19.5	30	39.2	42.5	72	164		215			
Dimension(L*W*H)	mm		317x249x219		496x268x248	555x304x268	555x311x268	703x406x286	930x533x436		1035x540x434		

Table 1





**Fig.4**

## 5. Transport and Store

### ! Warning

Only the pump stops operating and the power is cut off, could the pump removes.

### ! Warning

Make sure the lifting plug screws tight before lifting the pump except VSV-20P.

### ! Notice

Check the packaging to see if there is any transport damage.

### ! Notice

Any negligence will lead to the pump's damage during transport, please be careful to move the pump. In order to avoid the oil spill, the pump fully filled with oil should be moved horizontally.

### ! Notice

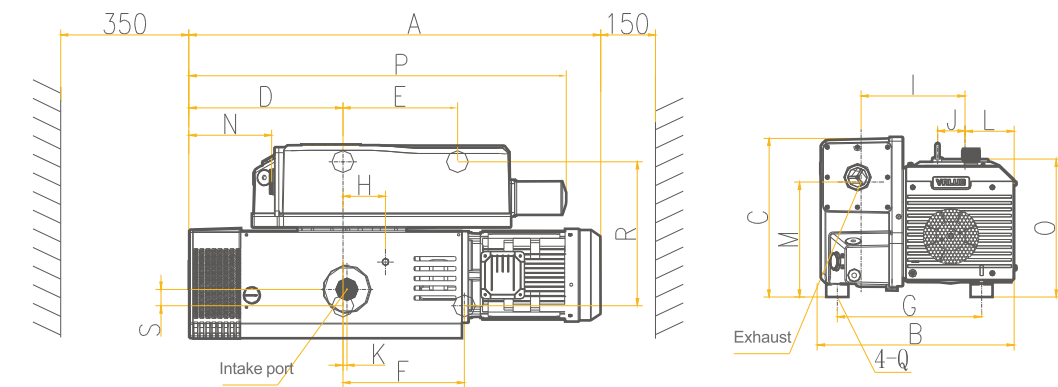
Please deal with the packing materials according to the environmental protection laws and regulations.

### ! Notice

Before pump's long time storage, please let the pump be at the state of dispatch, and with oil cleared off, and be storage at dried room temperature environment.

## 6. Installation and Connection

### 6.1 Installation Dimensions



Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Intake port	Exhaust port
VSV-20-20P	318	249	219	75.5	140	110.5	131	/	127.5	/	14	72	157	21	184	299	M8	122.3	5.3	G1/2" G3/4"	/
VSV-22/28	496	268	248	112	220	300	190	108	146	25	20	80	182	27	204	392	M6	194	35	G3/4"	G3/4"
VSV-40	555	304	268	149	215	200	235	58	179	51	5	72	203	33	252	464	M8	235	33	G1" 1/4"	G1" 1/4"
VSV-65	555	311	268	149	215	200	254	58	189	51	5	72	203	33	252	464	M8	242	33	G1" 1/4"	G1" 1/4"
VSV-100	703	406	286	165	225	225	320	131	226	42	27	91	220	61	280	578	M10	258	41	G1" 1/4"	G1" 1/4"
VSV-160/200	932	533	412	263	252	305	394	113	298	66	32	135	305	134	382	918	M10	394	45	G2"	G2"
VSV-300	1035	540	434	326	313	332	394	159	284	75	11	135	314	132	377	966	M10	394	45	G2"	G2"

**Fig.5**

### 6.2 Connection To System

### ! Warning

The pump is strictly forbidden to operate in the explosive hazard and flammable area to avoid causing explosion or fire.

### ! Warning

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

### ! Warning

The exhaust pressure should not be higher than the absolute pressure 1.35 bar , (Relative pressure 0.35bar) , and not be lower than atmospheric pressure.

**! Notice**

When choosing the pump installation site, please consider the followings: convenient installing, maintenance and disassembly, good ventilation; convenient for electrical connecting.

**! Notice**

When connect the pump to vacuum system, please place the pump feet horizontally, or connect it by bolts.

**! Notice**

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 within horizontal 10°.

**! Notice**

Between vacuum pump and vacuum system, the connecting passage should be as short as possible, and the passage drift diameter is same as intake port's.

**! Notice**

Suction flange could be connected with vacuum hose and ordinary vacuum pipe, and while connecting, pipeline should not make any pressure on the suction flange.

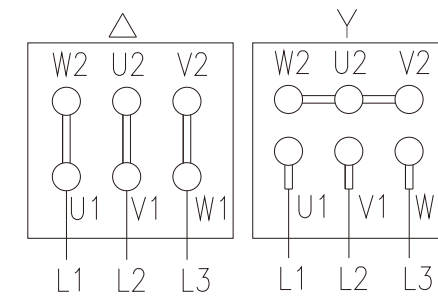
**! Notice**

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 block of exhaust pipe. If the exhaust line has an upward slope, a condensate trap must be installed. Check the leak between the trap and pipe, and the trap connected to flange. Vacuum-tight connection of the pump is essential so that the pump could attain the ultimate vacuum.

**6.3 Power Supply and Motor Rotary Direction**

**! Warning**

Make sure the power supply is the same with the required power supply. Electrical connection operation must only be carried out in accordance with electrical equipment technical standard and connection regulation by electrician with license. For three-phase motor, please open the junction box cover, connect the pump according to Fig.6, the pump is supplied without any accessories of electrical connection. The Value set on the motor protection switch must correspond to the current rating stated on the nameplate of the motor.



**Fig.6 3-phase motor connection**

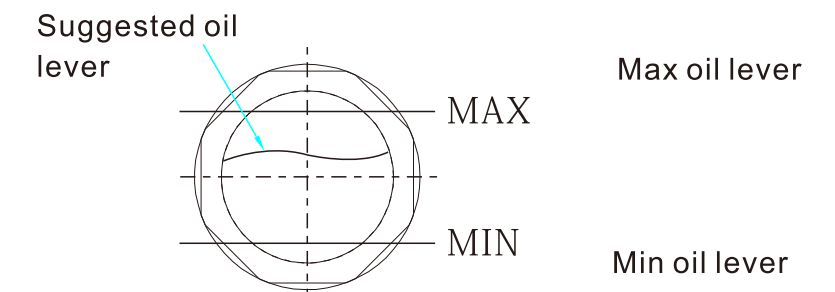
The pump with three-phase motor direction: Check whether the motor rotary direction is same as an arrow symbol on the motor. Please cut off the power immediately and interchange two phases of the connection (any 2 from L1, L2, L3) if the motor rotary direction is against the arrow symbol.

**7. Initial Start and Operation**

**7.1 Start**

**! Warning**

The exhaust line must be unblocked. On no account may the pump be operated with a blocked exhaust line.



**Fig.7**

**! Warning**

The oil level should be visible between the MAX to Min mark. If the oil is too much or not enough, the performance of the pump will decrease, even get failed. The pump must be stopped before filling oil.

**! Notice**

The operating ambient temperature is 10-40°C, and humidity should be less than 85%.

## 7.2 Operation

**! Notice**

During the running and termination in one hour, the pump surface temperature will be very high. Do not touch the motor and avoid scald.

### Pumping non-condensable gases

While pumping non-condensable gases, the gas ballast valve knob should be shut down (Fig.1 the knob point at C). If open the gas ballast, the ultimate pressure will rise (loss of vacuum).

### Pumping condensable gases and vapor

When the vacuum system contains a small amount of condensable gas, open the gas ballast valve (refer to Fig 1. gas ballast valve arrow I or II ), and the pump should run at least half an hour, it can pump a condensable 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, condensable gas may be dissolved in the oil of the pump. The oil may be emulsified and deteriorate, which leads to performance of pump decreasing, and also corrodes the pump module. When the pump's oil level is higher during the operating, this means that there is condensable gas in the vacuum system.

Do not stop the pump immediately when finishing pumping gas, and make sure the pump could go on operating after the gas ballast is open and intake port is closed, and until the condensable gases are completely separated from the oil.

## 8. Inspection and Maintenance

**! Warning**

All the checking and maintenance must be operated according to all the safety rules, and all the work should be finished by trained people.

**! Warning**

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

**! Warning**

In the case of hazardous substances make sure 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.

## 8.1 Inspection

Inspection	Period	Remarks
Oil level	Everyday	8.2.1
Pump's noise	Everyday	8.2.2
First oil change	After operating for 150 hours	8.2.3
Change oil mist filter	Operating for 1500~3000 hours or emerging oil fog	8.2.4
Regular checking floating ball components	Six months	8.2.5
Change gas ballast filter cartridge	After operating for 500~1500 or obstructed	8.2.6
Check anti-suckback oil valve	Six months or loss of vacuum	8.2.7
Clean intake filter	Six months	8.2.7
Change oil filter	After operating 500~1500 hours or changing oil	8.2.8
Clean fan cover	Six months	8.2.9
Check connecting wires	Six months	
Drain oil period	Operating for 1500~3000 hours or six months	

## 8.2. Maintenance

### 8.2.1 Check the Oil level

- (1) During the operation the oil level of pump must always be visible between the Max and Min mark (refer to Fig.7). Add oil if the oil level is lower than Min mark and discharge oil (refer to Fig.2) if the oil level is higher than Max mark.
- (2) Normally the oil is clear and transparent. If the oil darkens, it should be changed.

### 8.2.2 Check the pump's noise

The noise should be continuous and stable, without any abnormal noise. If there is any abnormal noise, refer to Table 2 Troubleshooting

### 8.2.3 Oil change

- (1) Change the oil after the pump stop working and cooling, avoiding scald.
- (2) Remove the oil drain plug (Fig.2), and let the used oil drain into a suitable receptacle. When the flow of oil stops, screw the oil drain plug back in, briefly start the pump (10second) and switch it off. It can remove the residual oil from the pump chamber. Remove the oil-drain plug again and drain off the remaining oil. Screw the oil-drain plug back in ( check the O ring and replace it if necessary ). Remove the oil filling plug back in (Fig.2) , and fill new oil. The pump oil shall be specified or provided by the manufacturer.
- (3) After changing the oil, please put the used oil into regulated container to deal with according to related environmental regulations.

### 8.2.4 Regular checking changing oil mist filter

- (1) If there is oil fog coming out from exhaust port during operation, the safety valve of oil mist filter must be opened or the filter is failed, and it need to be replaced.
- (2) Only the pump stopped operating and cooled, could the oil mist filter be replaced.
- (3) Open the cover of exhaust port, take out the oil mist filter, and check the O ring and replace it if needed.

### 8.2.5 Regular checking floating ball components

Please check the floating ball components together with oil mist filter, firstly pull up the floating ball components pole, then pull up the floating ball components, check whether the floating ball components rubber is damaged, cleaning, and clear in time.

### 8.2.6 Regular checking changing gas ballast filter cartridge

Regularly remove the gas ballast rubber cap, observe if there is much dust inside the filter cartridge, use a wrench or other useful tool to take the filter cartridge out.

### 8.2.7 Regular checking intake filter and anti-suckback oil valve

Regularly take down the intake port, use compressed air to clear filter, keep cleaning; and check out whether the seal position of anti-suckback valve is clean, any damage or hardening and height as requested.

### 8.2.8 Regularly check and replace of oil filter

Drain off the oil in the oil filter, screw out the oil filter for a new one, then coat some oil on the seal surface of the filter, finally turn on by hand.

### 8.2.9 Regularly check fan cover and motor fan

Please regularly remove and clean the fan cover and motor fan, and then clean them by compressed air. Finally reinstall them tightly before pump operating.

## 9. Troubleshooting

Fault	Possible reason	Remedy
Pump can not start	1. Wiring is malfunctioning.	1. Check and repair wiring.
	2. Operation voltage is abnormal.	2. Make sure the voltage is within rated voltage's ±10%.
	3. Motor is malfunctioning	3. Replace the motor.
	4. Overload protector start up.	4. Check the environment temperature or pumped gases temperature.
	5. Oil temperature is below 10°C	5. Improve the environment temperature.
	6. Pump is jammed.	6. Repair the pump.
	7. Out of operating for long.	7. Repair the pump.
	8. Oil is too viscous.	8. Change the oil.
	9. Exhasut filter or exhaust line is clogged.	9. Replace the filter or clean the exhaust line.
	10. Pump inner parts are damaged.	10. Repair the pump.
Pump can not reach ultimate pressure.	1. Vacuum system configuration is unreasonable.	1. Reselect suitable pumps.
	2. Vacuum system leak	2. Check the system.
	3. Measuring technique or gauge is unsuitable.	3. Use correct measuring technique and gauge. Measure the pressure directly at pump's intake port.
	4. Poor lubrication	
	4.1 Oil filter is obstructed.	4.1 Change the oil filter.
	4.2 Oil is unsuitable.	4.2 Change the oil.
	4.3 Oil channel is obstructed.	4.3 Clean the channel.
	4.4 Oil is insufficient.	4.4 Add the oil to the level as requested.
5. Anti-suckback oil valve is malfunctioning.	5. Repair anti-suckback oil valve.	
6. Intake line is dirty.	6. Clean vacuum lines.	
7. Floating ball components return oil valve is malfunctioning.	7. Repair floating ball components return oil valve	
Pumping speed is too low.	1. Intake port line is clogged.	1. Clean the intake port line.
	2. Connecting lines are too narrow or too long.	2. Use adequately wide and short connecting lines.
	3. Exhaust line is clogged.	3. Keep exhaust port line unobstructed.
	4. Oil mist filter is clogged.	4. Change the oil mist filter.
	5. Anti-suckback oil valve is malfunctioning.	5. Repair anti-suckback oil valve.
Noise is abnormal.	1. Operation voltage is abnormal.	1.1 Check the power supply, switches and wiring connection. 1.2 Make sure the voltage is within rated voltage's ±10%.
	2. Foreign matters entering into the the pump.	2. Repair the pump.
	3. The oil lever of the pump is too low.	3. Add the oil to the level as requested.
	4. The pump inner parts are damaged.	4. Disassembly and replace the parts.



Fault	Possible reason	Remedy
Pump gets hotter than usually observed.	1. Poor ventilation.	1. Improve ventilation environment.
	2. The fan is damaged.	2. Change the fan.
	3. Pumped gas temperature is too high.	3. Add cold trap at intake port.
	4. Poor lubrication	
	4.1 The oil filter or exhaust line is clogged.	4.1 Replace oil filter or Clean the exhaust line.
	4.2 Oil is unsuitable.	4.2 Change the oil.
	4.3 Oil channel is obstructed.	4.3 Clean the channel.
	4.4 Oil is insufficient.	4.4 Add the oil to the level as requested.
	5. The condensator is dirty.	5. Clean the condensator.
Oil in the intake line or in vacuum vessel.	6. Ambient temperature is too high.	6. Reduce ambient temperature.
	1. Oil comes from the vacuum system.	1. Check the vacuum system.
	2. Anti-suckback valve spring is obstructed.	2. Replace anti-suckback valve spring.
	3. Anti-suckback valve plate is obstructed.	3. Replace anti-suckback valve plate.
After switching off pump under vacuum, pressure in system rises too fast.	4. Oil level is high.	4. Drain the excess oil.
	1. Vacuum system leak.	1. Check the system.
Too much oil in the exhaust port.	2. Anti-suckback oil valve is malfunctioning.	2. Repair anti-suckback oil valve.
	1. Too much oil in the pump.	1. Drain some oil.
	2. Continuous operation under high pressure in the intake port	2. Shorten exhaust time ASAP.
Sealing surface leak	3. Oil mist filter is obstructed.	3. Replace oil mist filter.
	1. The seal is damaged.	1. Replace new seal.
	2. Seal ring is damaged	2. Replace new seal ring.

**Table 2**

## 10. Warranty

VSV series vacuum pumps have a one year guarantee from the buying date. Parts will be offered free of charge in the period of guarantee 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 operating environment.
- (3) Malfunction of spare parts damage.(refer to table 3,4,5,6)
- (4) Malfunction by non-normal operation or error use which is identified by our technical engineers.
- (5) Warranty doesn't include wearing parts.
- (6) If the pump is sent back to our company for maintenance, please inform in advance whether the pump is contaminated or not, or if harmful substances is contained. If the pump is contaminated, please point out which kind of pollutants. If you don't state the pollution in advance, we will return the pump according to the sending address.

## 11. Accessories

To ensure the stability of the pump, please use the accessories we provided. Please offer the pump item number and code of spare parts while purchasing. Below is the diagram for optional accessories, if you have any other request, please contact us.

What we provide as accessories is as following:

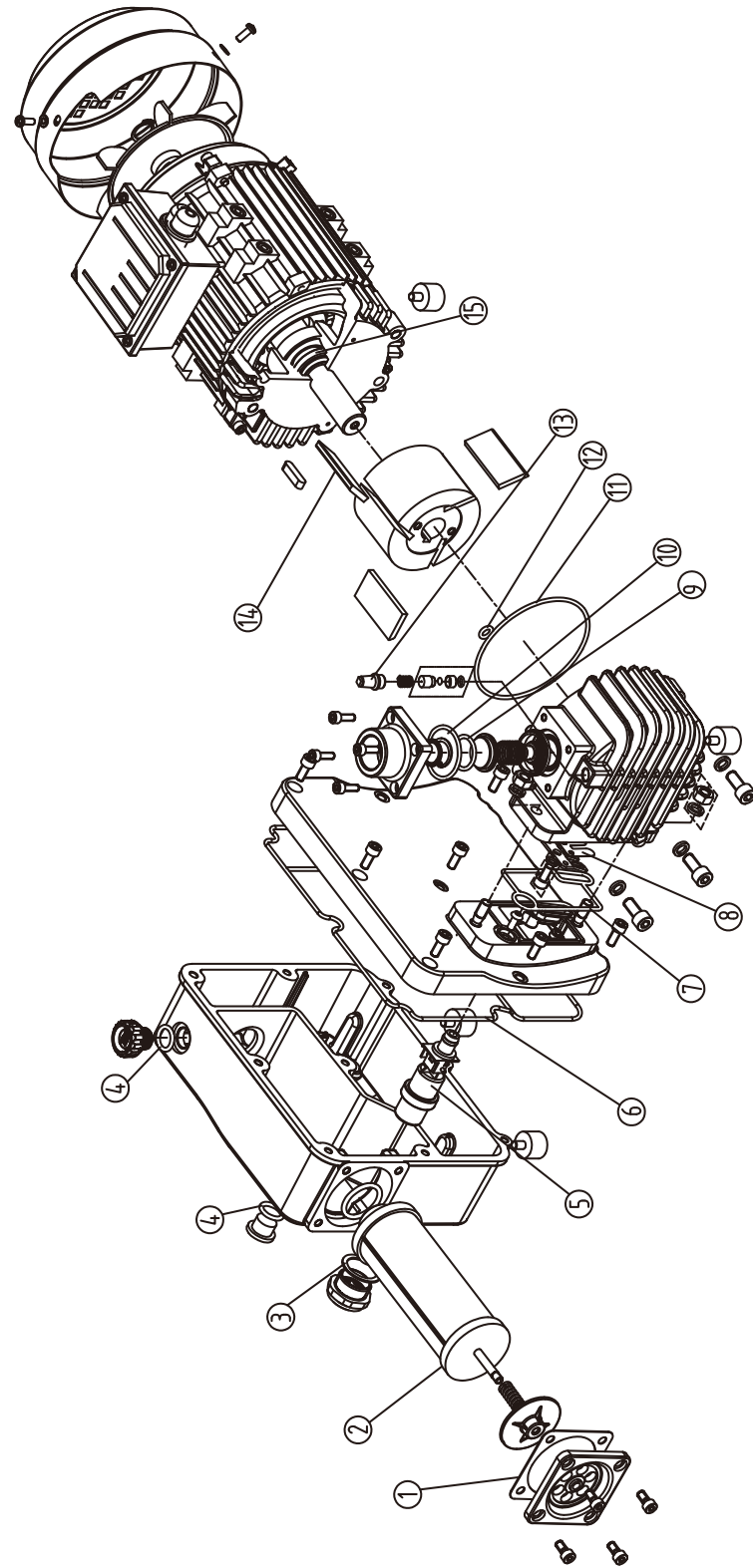
1. Spare parts (see spare parts list)
2. Other type of intake port /exhaust port
3. Dust filter

### Correct Disposal of this product:

This marking indicates that this product should not be disposed with other household wastes. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please use the return and collection systems or contact the retailer where the product was purchased. They can take this product for environmental safe recycling.



### 11.1 VSV-20/20P Exploded View



**Fig.8**

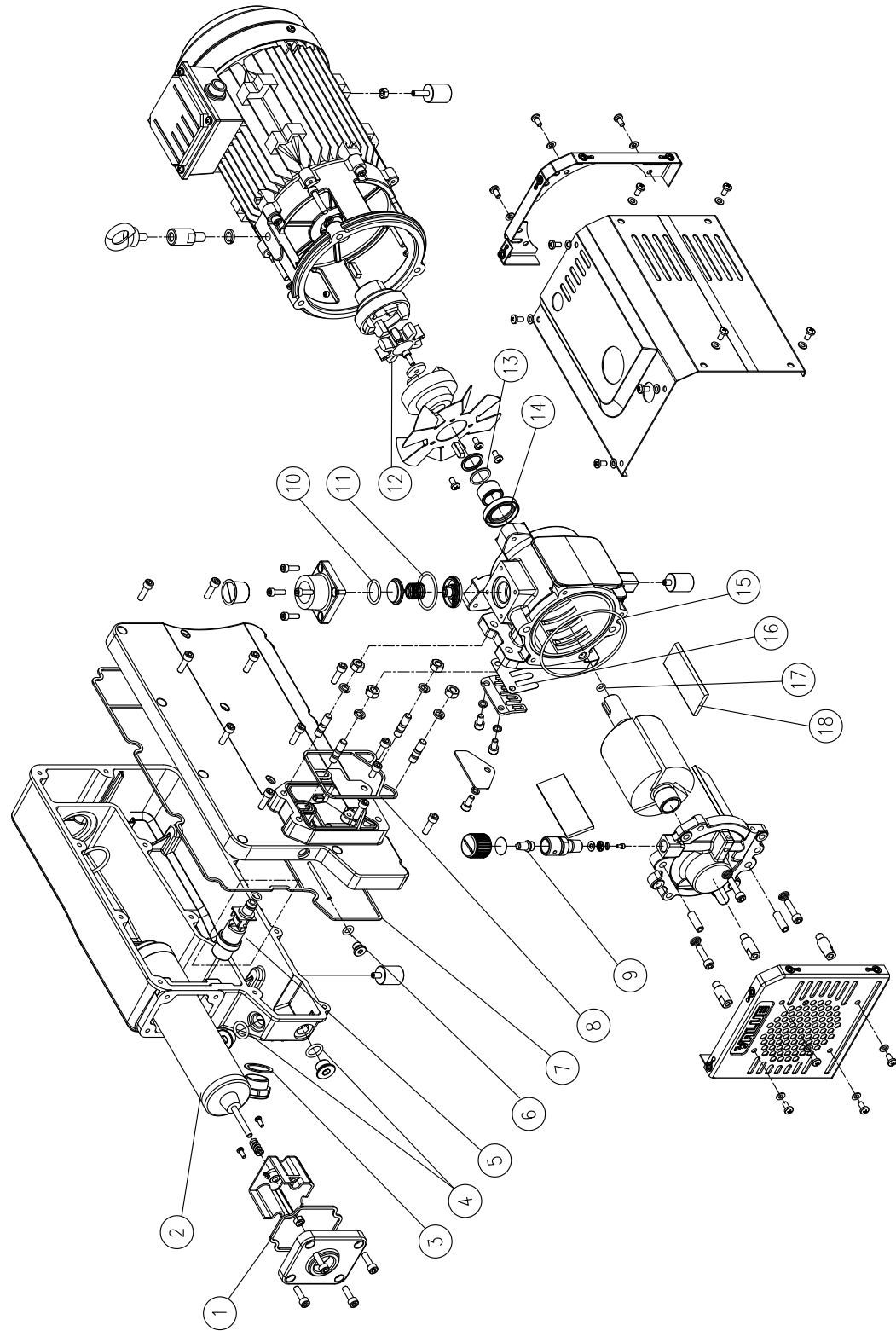
### 11.2 VSV-20/20P Spare Parts List

NO.	Item	Material	Code	Qty
1	Oil case pad	8092	320211011	1
2	Oil mist filter		320750612	1
3	O-ring	FKM	320190211	1
4	O-ring	FKM	300310081	2
5	Floating ball		120003002	1
6	O-ring	FKM	300310158	1
7	O-ring	FKM	300310157	1
8	Exhaust valve		320240422	1
9	O-ring	FKM	300310123	1
10	O-ring	FKM	300310220	1
11	O-ring	FKM	300310219	1
12	O-ring	FKM	300310218	1
13	Gas ballast cartridge		321240111	1
14	Vane		320101413	3
15	Seal	FKM	300282001	1

**Table 3**

REMARK: 1) Please refer to the exploding drawing for the relationships of each spare part.  
 2) We reserve the right to modify the design and specified date including operating manual of the pump without notice.

### 11.3 VSV-22/28 Exploded View



**Fig.9**

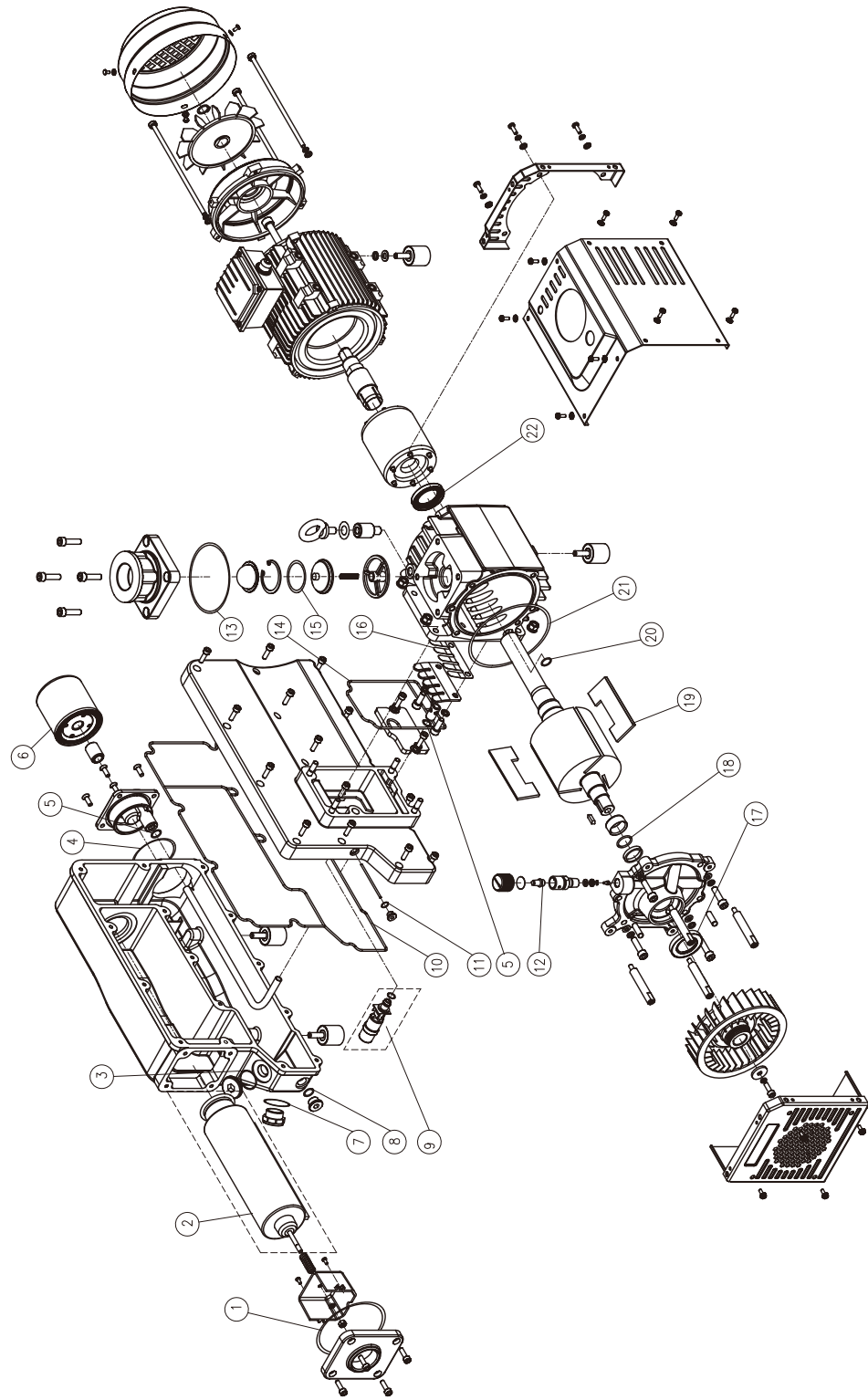
### 11.4 VSV-22/28 Spare Parts List

NO.	Item	Material	Code	Qty
1	O-ring	FKM	300310249	1
2	Oil mist filter		320750621	1
3	Sight glass pad	FKM	320190211	1
4	O-ring	FKM	300310081	2
5	Floating ball	FKM	120003002	1
6	O-ring	FKM	300310204	1
7	O-ring	FKM	300310245	1
8	O-ring	FKM	300310246	1
9	Cartridge		321240111	1
10	O-ring		300310123	1
11	O-ring	FKM	300310220	1
12	Coupling		320050101	1
13	O-ring	FKM	300310143	1
14	Seal	FKM	300281403	1
15	O-ring	FKM	300310250	1
16	Exhaust valve		320240451	1
17	O-ring	FKM	300310247	1
18	Vane		320101451	3

**Table 4**

REMARK: 1) Please refer to the exploding drawing for the relationships of each spare part.  
 2) We reserve the right to modify the design and specified date including operating manual of the pump without notice.

### 11.5 VSV-40/65 Exploded View



**Fig.10**

### 11.6 VSV-40/65 Spare Parts List

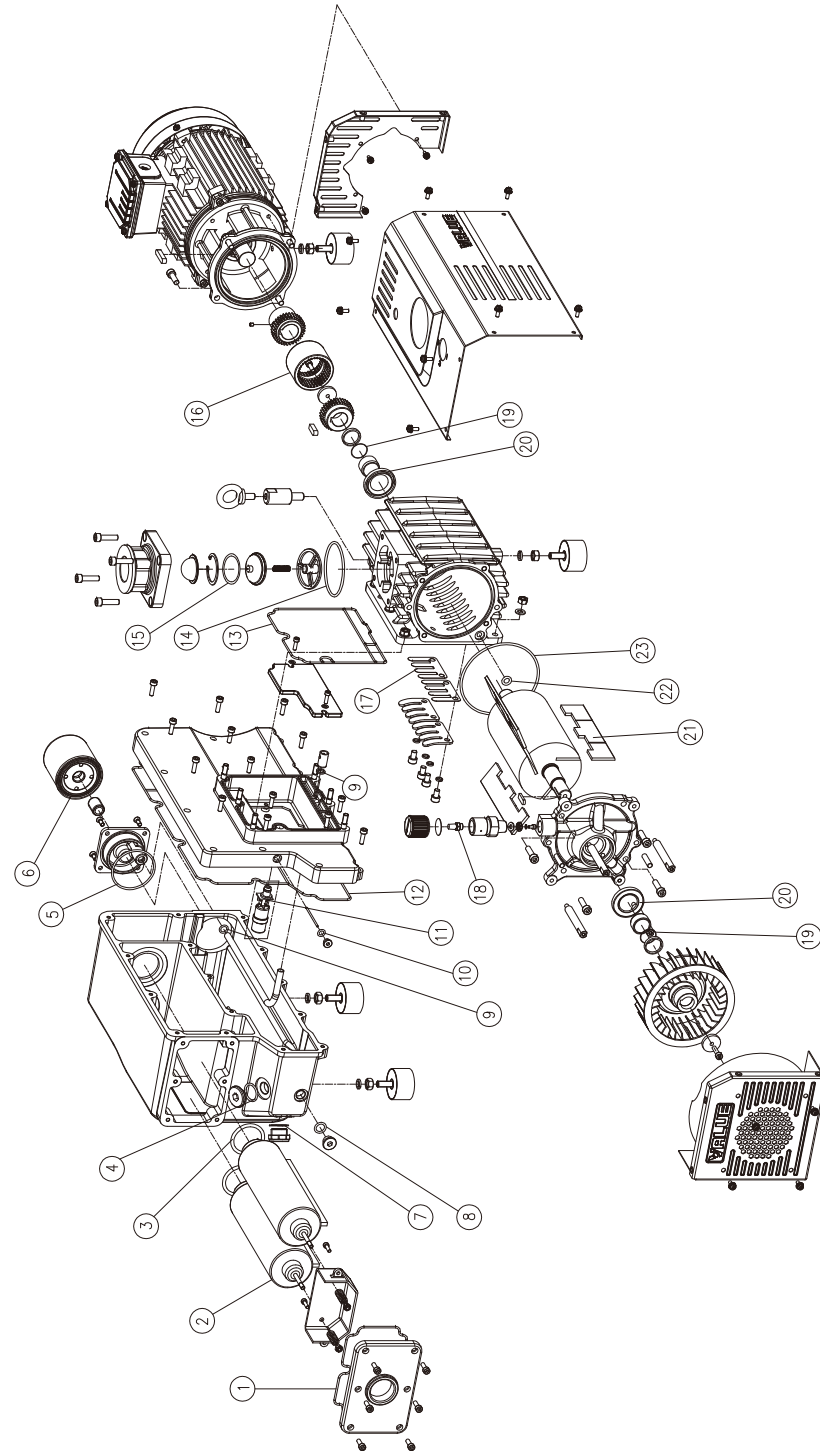
NO.	Item	Material	Code	Qty
1	O-ring	FKM	300310225	1
2	Oil mist filter		320750601	1
	O-ring	FKM	300310127	1
3	O-ring	FKM	300310197	1
4	O-ring	FKM	300310212	1
5	O-ring	FKM	300310188	2
6	Oil filter		320750421	1
7	Oil glass pad	FKM	320190211	1
8	O-ring	FKM	300310081	1
9	Floating ball		120003001	1
10	O-ring	FKM	300310224	1
11	O-ring	NBR	300310204	1
12	Gas ballast filter		321240111	1
13	O-ring	FKM	300310215	1
14	O-ring	FKM	300310222	1
15	O-ring	FKM	300310328	1
16	Exhaust valve		320240431	1
17	VSV-40 Seal	FKM	300280403	1
	VSV-60 Seal	FKM	300281902	1
18	O-ring	FKM	300310227	1
19	VSV-40 pump rotary vane		320101424	3
	VSV-65 pump rotary vane		320101402	3
20	O-ring	FKM	300310210	1
21	VSV-40 O-ring	FKM	300310223	1
	VSV-65 O-ring	FKM	300310214	1
22	Seal	FKM	300280504	1

**Table 5**

REMARK: 1) Please refer to the exploding drawing for the relationships of each spare part.  
 2) We reserve the right to modify the design and specified date including operating manual of the pump without notice.



### 11.7 VSV-100 Exploded View



**Fig.11**

### 11.8 VSV-100 Spare Parts List

NO.	Item	Material	Code	Qty
1	O-ring	FKM	300310228	1
2	Oil mist filter		320750601	2
3	O-ring	FKM	300310127	2
4	O-ring	FKM	300310197	1
5	O-ring	FKM	300310212	1
6	Oil filter		320750421	1
7	O-ring	FKM	320190211	1
8	O-ring	FKM	300310081	1
9	O-ring	FKM	300310188	2
10	O-ring	NBR	300310204	1
11	Floating ball		120003001	1
12	O-ring	FKM	300310156	1
13	O-ring	FKM	300310226	1
14	O-ring	FKM	300310215	1
15	O-ring	FKM	300310328	1
16	Connecting cover		320040512	1
17	Exhaust valve		320240411	2
18	Cartridge		321240131	1
19	O-ring	FKM	300310227	2
20	Seal	FKM	300281902	2
21	Vane		320101402	3
22	O-ring	FKM	300310210	1
23	O-ring	FKM	300310214	1

**Table 6**

REMARK: 1) Please refer to the exploding drawing for the relationships of each spare part.  
 2) We reserve the right to modify the design and specified date including operating manual of the pump without notice.

### 11.9 VSV-160/200 Exploded View

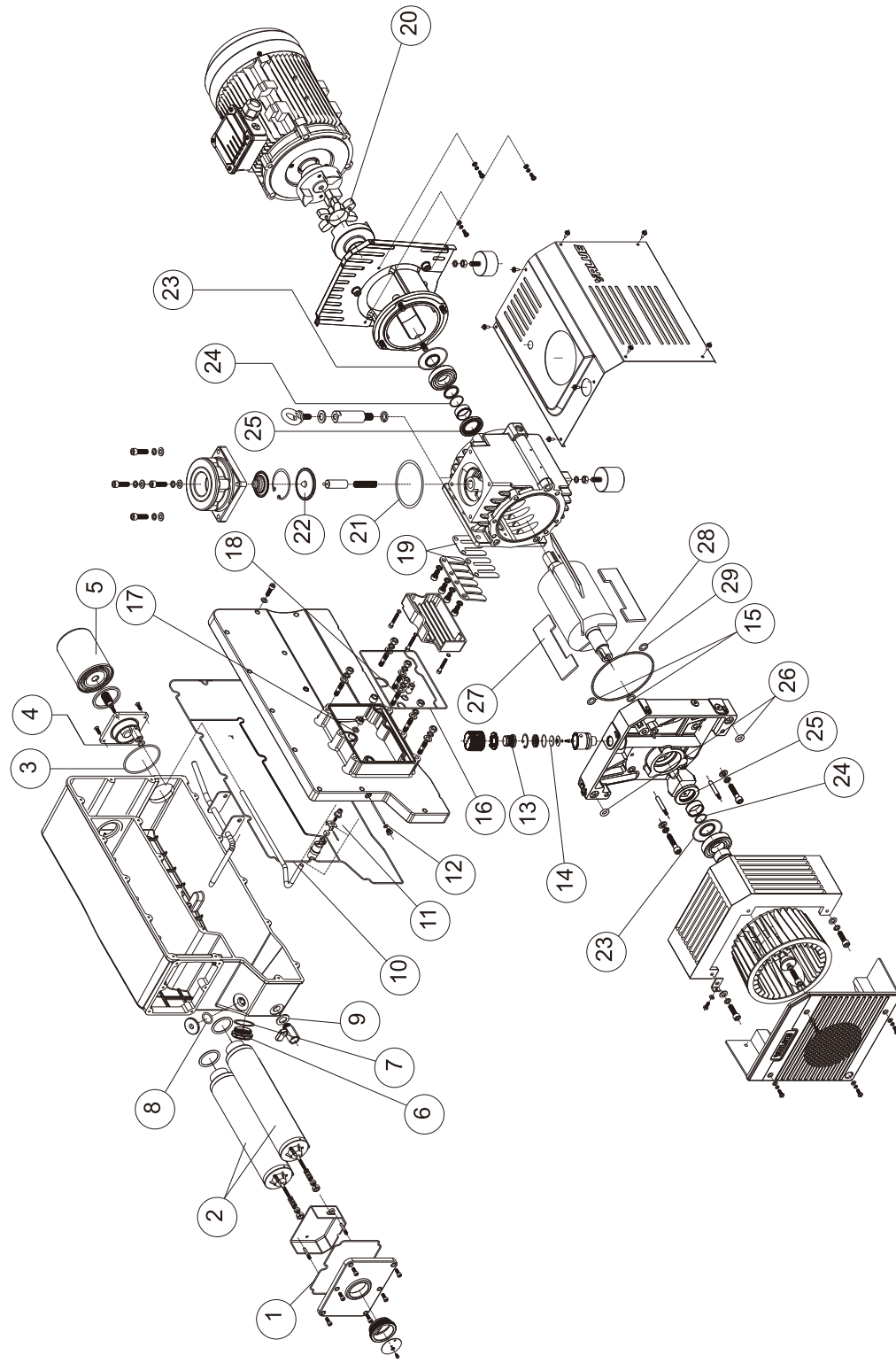


Fig.12

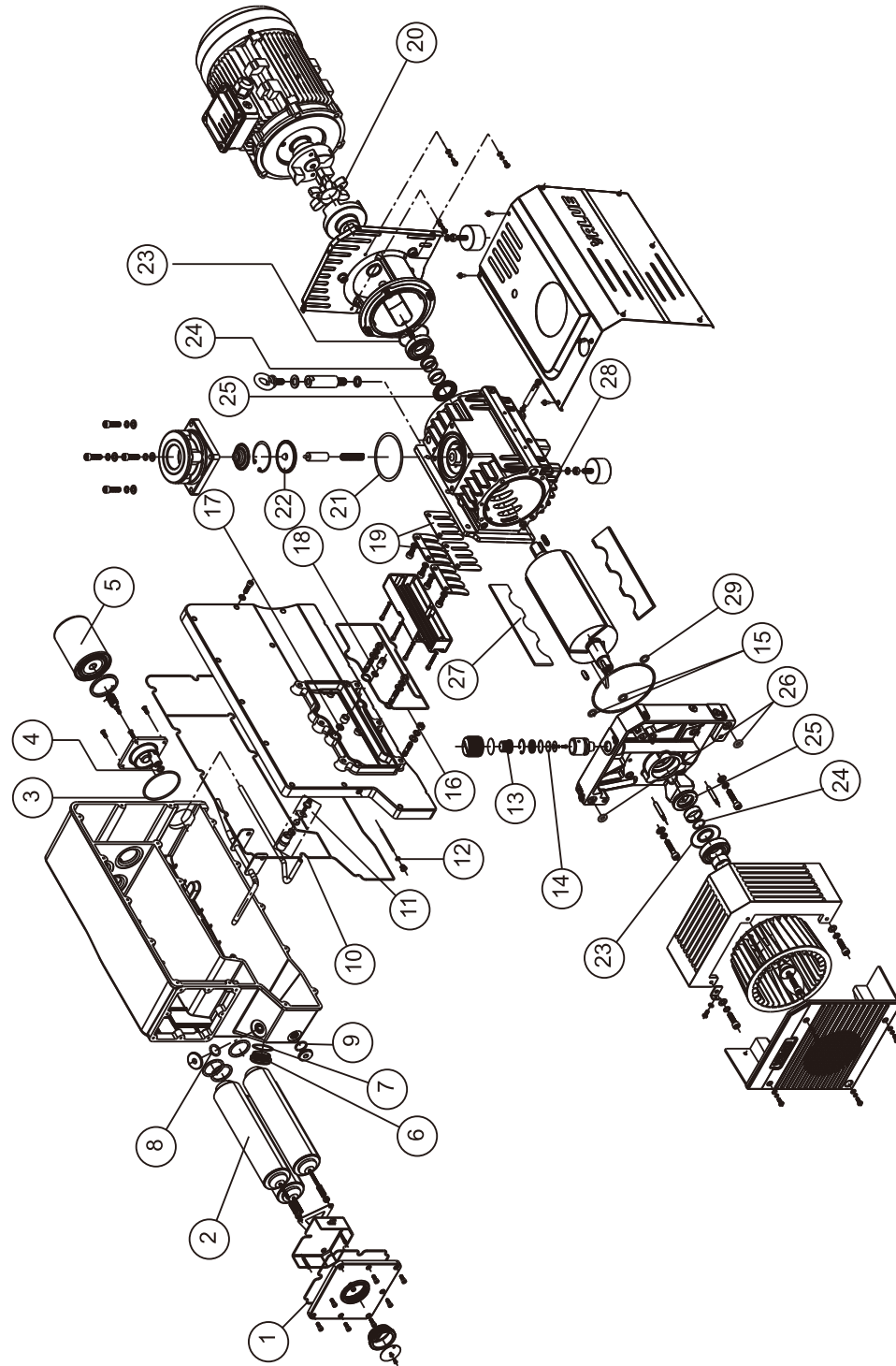
### 11.10 VSV-160/200 Spare Parts List

NO.	Item	Material	Code	Qty
1	O-ring	FKM	300310240	1
2	Oil mist filter		320750404	2
3	O-ring	FKM	300310212	1
4	O-ring	FKM	300310188	1
5	Oil filter		320750501	1
6	Sight glass		320170313	1
7	Sight glass pad	FKM	320190213	1
8	O-ring	FKM	300310195	1
9	Drain valve assembly	PTFE	322400111	1
10	O-ring	FKM	300310241	1
11	Floating ball		120003001	1
12	O-ring	FKM	300310204	1
13	Cartridge		312000101	1
14	Seal pad		320200401	1
15	O-ring	FKM	300310206	2
16	O-ring	FKM	300310242	1
17	O-ring	FKM	321260201	1
18	O-ring	FKM	300310188	1
19	Exhaust valve		320240441	2
20	Coupling		321220101	1
21	O-ring	FKM	300310190	1
22	Anti-suck plate	FKM	320510301	1
23	O-ring	FKM	300310191	1
24	O-ring	FKM	300310192	2
25	Seal	FKM	300281504	2
26	O-ring	FKM	300310205	2
27	Vane		320101441	3
28	O-ring	FKM	300310194	1
29	O-ring	FKM	300310207	1

Table 7

REMARK: 1) Please refer to the exploding drawing for the relationships of each spare part.  
 2) We reserve the right to modify the design and specified date including operating manual of the pump without notice.

### 11.11 VSV-300 Exploded View



**Fig.13**

### 11.12 VSV-300 Spare Parts List

NO.	Item	Material	Code	Qty
1	O-ring	FKM	300310271	1
2	Oil mist filter		320750404	3
3	O-ring	FKM	300310212	1
4	O-ring	FKM	300310188	1
5	Oil filter		320750501	1
6	Sight glass		320170313	1
7	Sight glass pad	FKM	320190213	1
8	O-ring	FKM	300310195	1
9	O-ring	FKM	300310197	1
10	O-ring	FKM	300310269	1
11	Floating ball		120030001	1
12	O-ring	FKM	300310204	1
13	Cartridge		312000101	1
14	Seal pad		320200401	1
15	O-ring	FKM	300310206	2
16	O-ring	FKM	300310270	1
17	O-ring	FKM	321260201	1
18	O-ring	FKM	300310188	1
19	Exhaust valve		320240402	2
20	Coupling		320050401	1
21	O-ring	FKM	300310190	1
22	Anti-suck plate	FKM	320510301	1
23	O-ring	FKM	300310191	1
24	O-ring	FKM	300310192	2
25	Seal	FKM	300281504	2
26	O-ring	FKM	300310205	2
27	Vane		320101306	3
28	O-ring	FKM	300310194	1
29	O-ring		300310207	1

**Table 8**

REMARK: 1) Please refer to the exploding drawing for the relationships of each spare part.  
 2) We reserve the right to modify the design and specified date including operating manual of the pump without notice.

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