



Double – Stage Rotary Vane Pump

OPERATING MANUAL

(Please read the operating manual carefully before using)



ARV SERIES

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 safely, specification as well as operating procedure of the vacuum pump.

II Safety indication

Only operate vacuum pump is 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.

! Attentions

The pump must be operated at ambient temperature 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.

! Attentions

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

Industrial vacuum pumps shall not be suitable for pumping of toxic, corrosive, flammable explosive gas.

! Warning

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

! Attentions

If the pumped medium contains a small amount of dust, condensable 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 frost

! Attentions

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

1 Description

Industrial 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

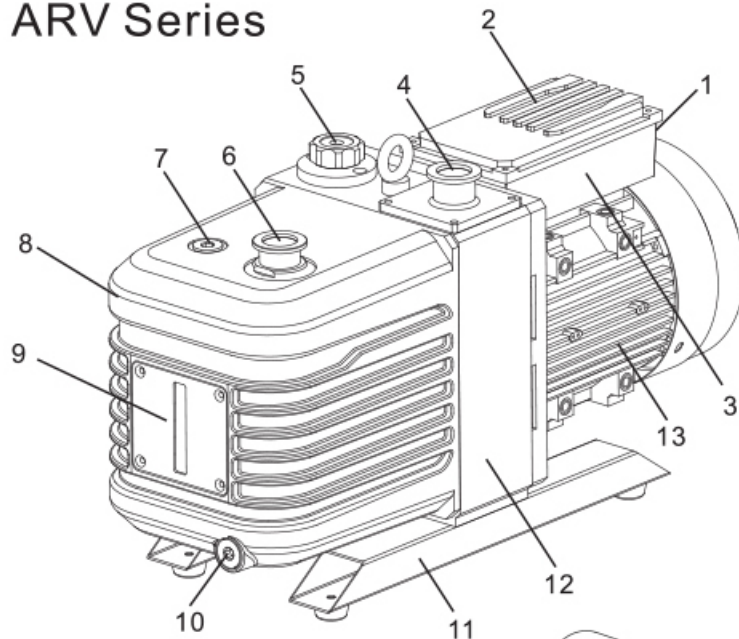
Industrial vacuum pump is the basic equipment in vacuum application field, especially in researching, teaching, medical field, vacuum coating.

Industrial 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

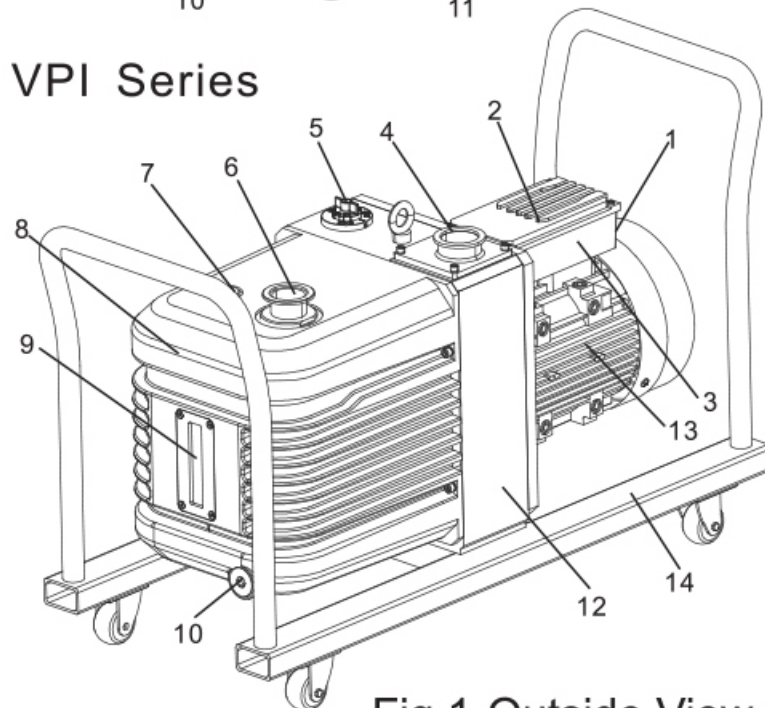
The vacuum pump is double-stage direct coupled rotary-vane vacuum pump; the advantages of this pump are high reliability, low noise and high ultimate vacuum. This pump had a whole body structure, forced lubrication and hydraulic control system. At the same time, a different permeability designed gas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

ARV Series



1. outlet
2. Junction box cover
3. Junction box
4. Intake port
5. Gas ballast
6. Exhaust port
7. Oil fill plug
8. Oil housing
9. Sight glass
10. Oil drain plug
11. Pump feet
12. Trestle
13. Motor
14. Trolley

VPI Series



Optional

15. Vacuum gauge
16. Three four-way air inlets

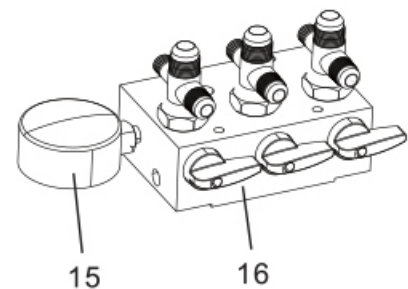


Fig.1 Outside View drawing

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.

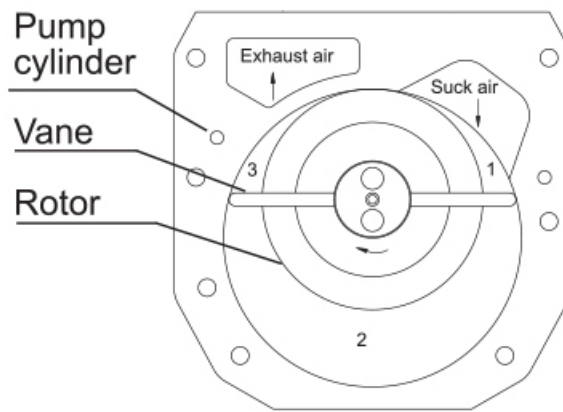


Fig.2 Functional diagram

1.3 Pump technical specification

1.3.1 Technical Specification:

ARV Series

Model		ARV-4	ARV-8	ARV-16	ARV-24
Flow Rate m ³ /h (L/s)	50Hz	4 (1.1)	8 (2.2)	16 (4.4)	24 (6.7)
	60Hz	4.8 (1.3)	9.6 (2.7)	19.2 (5.3)	28.8 (8.0)
Ultimate partial Pressure gas ballast close		4x10 ² Pa	4x10 ² Pa	4x10 ² Pa	4x10 ² Pa
Ultimate total Pressure gas ballast close		4x10 ¹ Pa	4x10 ¹ Pa	4x10 ¹ Pa	4x10 ¹ Pa
Ultimate total Pressure gas ballast open		10	10	8x10 ¹ Pa	8x10 ¹ Pa
Power supply		single/3-phase	single/3-phase	single/3-phase	single/3-phase
Rated Power		0.75kw/0.55kw	0.75kw/0.55kw	1.1kw/0.75kw	1.1kw/0.75kw
Inlet and Exhaust port		KF 25	KF 25	KF 25	KF 25/40
Oil Capacity		0.6-1L	0.6-1L	0.9-1.5L	1.2-2.0L
Motor Speed (rpm)	50Hz	1440	1440	1440	1440
	60Hz	1720	1720	1720	1720
Operation Temp .		5-40°C	5-40°C	5-40°C	5-40°C
Noise Level(dB)		≤56	≤56	≤58	≤58
Dimensions		460x145x257mm	460x145x257mm	460x145x280 mm	560x192x320 mm
Weight		23 kg	25 kg	30 kg	35 kg

ARV Series

Model		ARV-30	ARV-50	ARV-70	ARV-90
Flow Rate m ³ /h (L/s)	50Hz	30(8.3)	50(13.9)	70(19.4)	90(25)
	60Hz	36(10)	60(16.7)	84(23.3)	108(30)
Ultimate partial Pressure gas ballast close		4x10 ² Pa	4x10 ² Pa	4x10 ² Pa	4x10 ² Pa
Ultimate total Pressure gas ballast close		4x10 ¹ Pa	4x10 ¹ Pa	4x10 ¹ Pa	4x10 ¹ Pa
Ultimate total Pressure gas ballast open		8x10 ¹ Pa	8x10 ¹ Pa	8x10 ¹ Pa	8x10 ¹ Pa
Power supply		single/3-phase	3-phase	3-phase	3-phase
Rated Power		1.1kw	1.5kw	2.2kw	3kw
Inlet and Exhaust port		KF 25/40	KF 40	KF 40	KF 40
Oil Capacity		1.2-2.0L	3.0-4.5L	3.0-4.5L	3.0-4.5L
Motor Speed (rpm)	50Hz	1440	1440	1440	1440
	60Hz	1720	1720	1720	1720
Operation Temp.		5-40°C	5-40°C	5-40°C	5-40°C
Noise Level(dB)		≤60	≤62	≤62	≤65
Dimensions		560x192x320 mm	720x260x460 mm	720x260x460 mm	720x260x460 mm
Weight		38 kg	60 kg	65 kg	70 kg

VPI Series

Model		VPI2014	VPI2024
Flow Rate m ³ /h (CFM)	50Hz	20(12)	36(20)
	60Hz	24(14)	43(24)
Ultimate partial Pressure gas ballast close		4x10 ² Pa	4x10 ² Pa
Ultimate total Pressure gas ballast close		4x10 ¹ Pa	4x10 ¹ Pa
Ultimate total Pressure gas ballast open		8x10 ¹ Pa	8x10 ¹ Pa
Power supply		single/3-phase	Single/3-phase
Rated Power		0.75kw/0.55kw	1.1kw
Inlet and Exhaust port		1/4"SAE&3/8"SAE&5/8"SAE	1/4"SAE&3/8"SAE&5/8"SAE
Oil Capacity		0.9-1.5L	1.2-2.0L
Motor Speed (rpm)	50Hz	1440	1440
	60Hz	1720	1720
Operation Temp.		5-40°C	5-40°C
Noise Level(dB)		≤58	≤58
Weight		23 kg	43 kg

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 slip 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

Industrial vacuum 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 cacuum 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.

Attentions

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 recommended to use company's high vacuum oil (viscosity:68). 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 recommended level is better. Excessive or insufficient oil will decrease the pump performance or even cause malfunction of the pump.

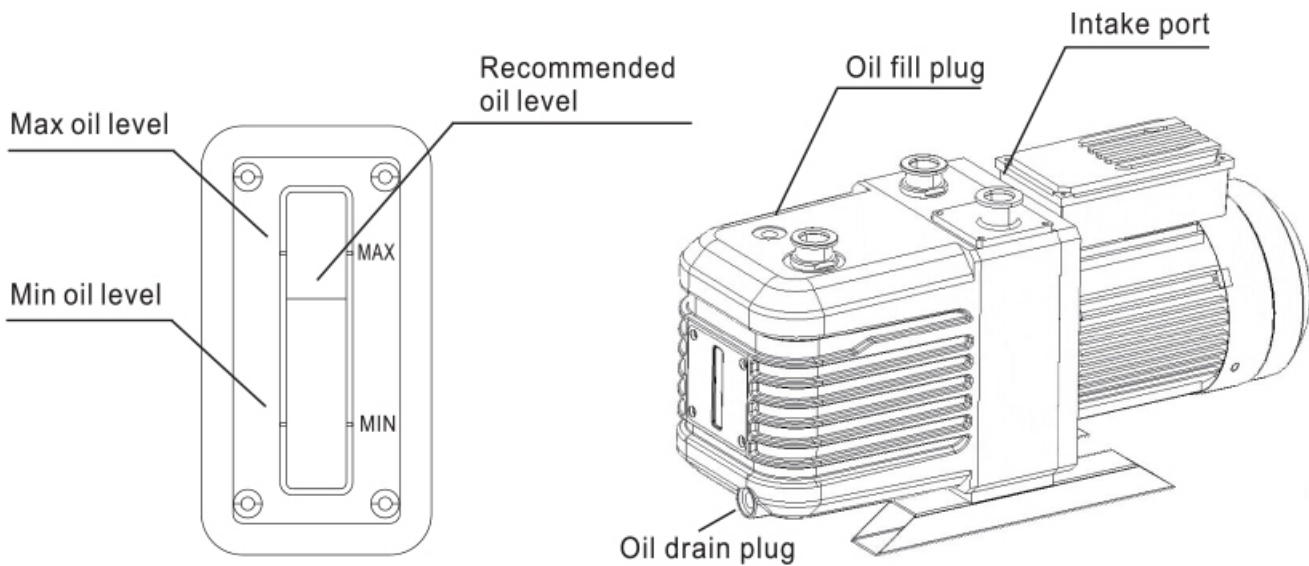


Fig.3 Add oil diagram

! Attentions

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 electrical 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, over load 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.4. 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 nameplate of the motor.

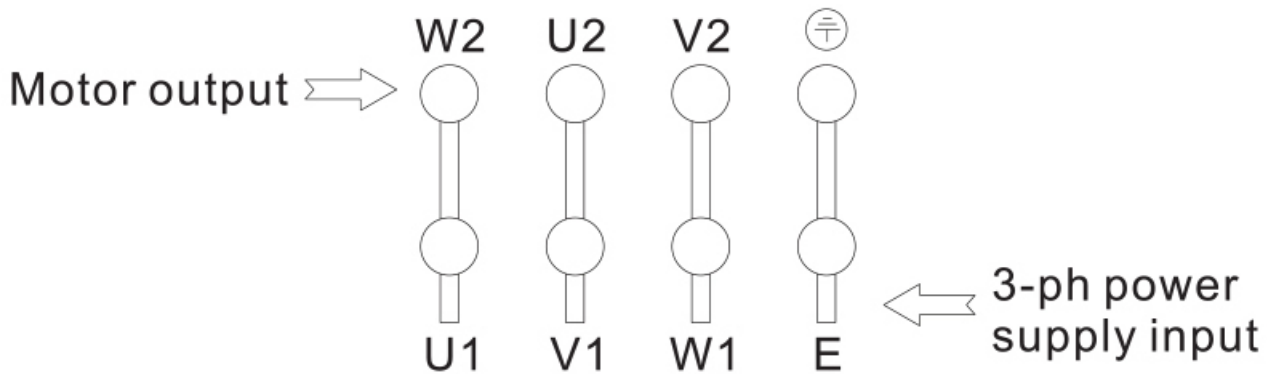


Fig.4 Three-phase motor connection

3.2.2 Pump with three-phase motor direction

Check whether the motor rotate direction is name 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.

! Attentions

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.5 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)

Gas ballast valve
knob arrow

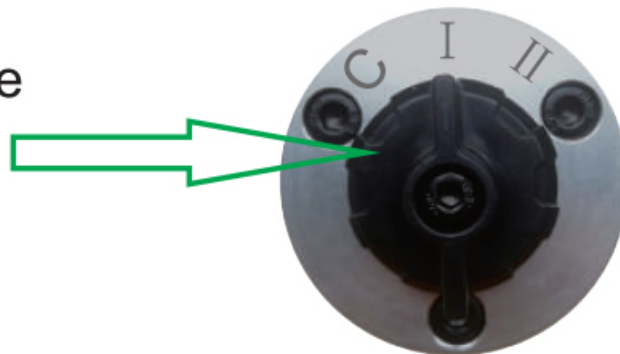


Fig.5 Gas ballast valve knob

5.2.2 Vacuum system with condensable gases

- When the vacuum system contains a small amount of condensable gas, open the gas ballast valve (refer to Fig.5 gas ballast valve arrow I or II), it can pump a small amount of 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. 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 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.

Attentions

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

5.3.2 Putting the pump out of operation

- 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.3). Add oil if the oil level is lower than Main 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.

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.

Warning

We can only guarantee that the pump operates as specified by the technical data by using 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 drawing 5
2	Oil level	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 nosie 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

6.6 Trouble shooting

Fault	Possible reason	Solution
Pump can not be started	<ol style="list-style-type: none"> 1.Out of electrical 2.Operation voltages is abnormal 3.Motor is malfunctioning 4.Overload protector start up 5.Oil temperature is below 10℃ 6.Pump is jammed 7.Out of operation for long,liquid and organic solvents result rust of the pump body 8.Pump inner accessories are damaged 	<ol style="list-style-type: none"> 1.Check the connection of power supply,switch 2.Voltage wave within $\pm 10\%$ 3.Replace the motor 4.Press the overload protector 5.Heat the pump and pump oil 6.Repair the pump 7.Repair the pump 8.Repair the pump
Pump can not reach to the maximum pressure	<ol style="list-style-type: none"> 1.Pump is too small 2.Vacuum system leak 3.Measuring technique or gauge is unsuitable 4.Vacuum gauge not correct 5.Oil level is too low 6.Oil is unsuitable or deteriorated 7.Lubricate seal oil channel inside pump blocked 8.Intake line is dirty 9.Exhaust valve is malfunctioning 	<ol style="list-style-type: none"> 1.Replace the pump 2.Check the leakage 3.Use correct measuring technique and gauge.Measure the pressure directly at pump's intake port 4.Choose suitable vacuum gauge 5.Add oil 6.Change oil 7.Clean oil channel 8.Clean the vacuum lines 9.Repair the valve
Pumping speed is too low	<ol style="list-style-type: none"> 1.Intake port channel is clogged 2.Connecting lines are too narrow or too long 3.Exhaust port channel is clogged unsuitable 4.Exhaust filter is clogged 	<ol style="list-style-type: none"> 1.Clean the intake port channel 2.Use adequately wide and short connecting lines 3.Keep the exhaust port channel free 4.Clean or change the exhaust filter
Abnormal voice	<ol style="list-style-type: none"> 1.Abnormal input power supply 2.Motor is malfunction 3.Foreign bod into the pump 4.Oil level is too low 5.Coupling element is worn 6.Pump inner accessories are damaged 	<ol style="list-style-type: none"> 1.Check the connection of power supply,switch 2.Voltage wave within $\pm 10\%$ 3.Clean the pump body 4.Add oil 5.Install new coupling element 6.Repair or change the accessories
Higher temperature than normal	<ol style="list-style-type: none"> 1.Continuous operation under high pressure in the intake port 2.Oil level is too low 3.Process gas is too hot 4.Cooling air supply is obstructed 5.Pump fan is malfunction 6.Oil cycle is obstructed 7.Ambient temperature is too high 	<ol style="list-style-type: none"> 1.Shorten exhaust time as far as possible 2.Add oil 3.Set pump up correctly 4.Set pump up correctly 5.Change the pump fan 6.Clean and repair the oil lines and channels 7.Reduce the ambient temperature
Oil in the intake line or in vacuum vessel	<ol style="list-style-type: none"> 1.Oil comes from the vacuum system 2.Anti-suckback valve spring is obstructed 3.Anti-suckback valve board is obstructed 4.Oil level is too high 	<ol style="list-style-type: none"> 1.Check the vacuum system 2.Change the anti-suckback valve spring 3.Change the anti-suckback valve board 4.Drain the excess oil
After switching the pump, pressure in system rises too fast	<ol style="list-style-type: none"> 1.System has a leak 2.Anti-suckback valve is malfunctioning 	<ol style="list-style-type: none"> 1.Check the vacuum system 2.Repair the anti-suckback valve
Too much oil in the exhaust port	<ol style="list-style-type: none"> 1.Too much oil in the pump 2.Continuous operation under high pressure in the intake port 	<ol style="list-style-type: none"> 1.Drain some oil 2.Shorten exhaust time as far as possible
Oil seal leak	<ol style="list-style-type: none"> 1.Oil seal broken 2.Seal ring was deformed 	<ol style="list-style-type: none"> 1.Replace new oil seal 2.Replace new seal ring

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/KF40) 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

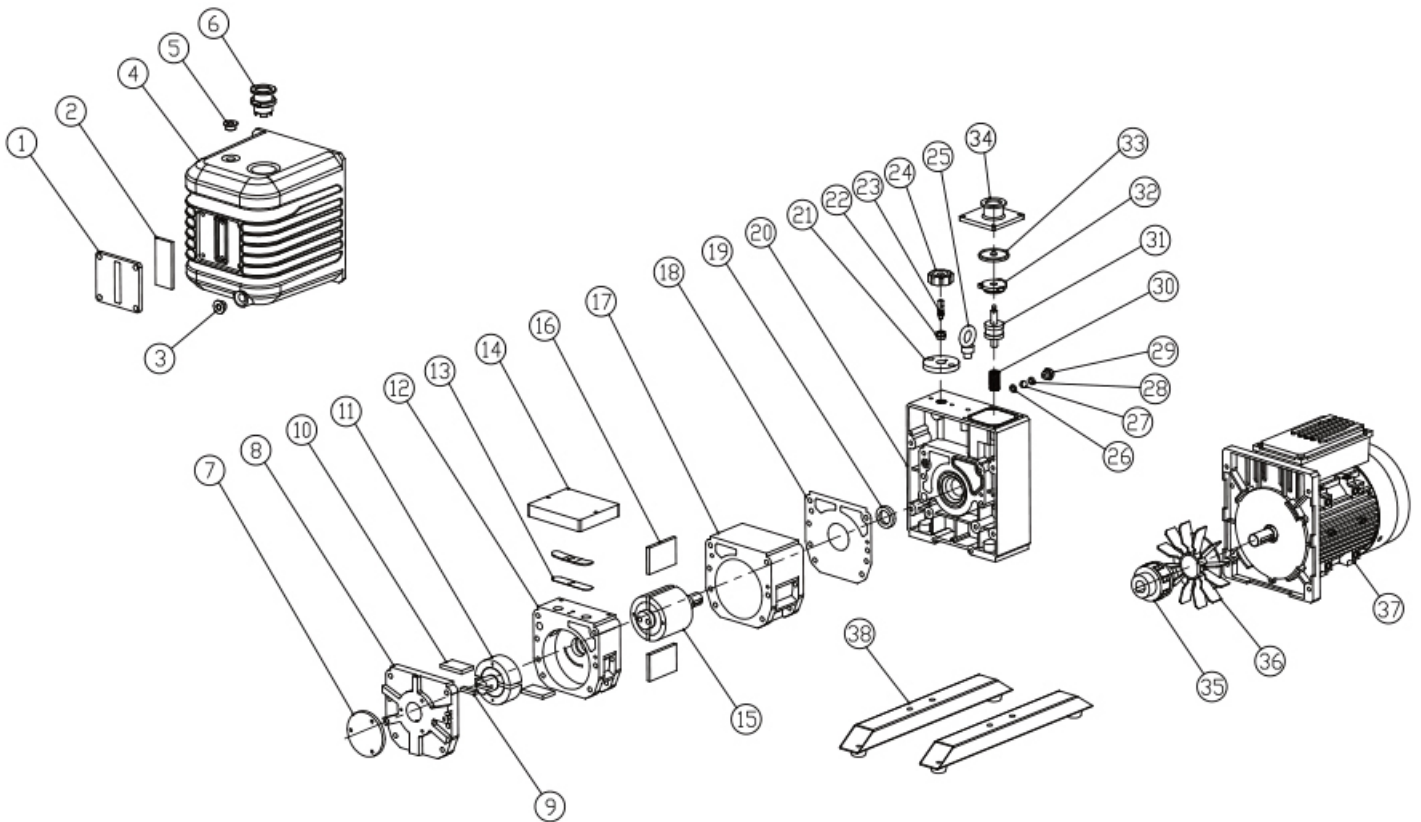
- Other in/exhaust interface
- Dust filter
- Oil mist filter

Remarks: All accessories are optional parts, any other requests about accessories, please contact us.

8. Warranty

- Industrial 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 of artificial factor
 - 2) Malfunction under special usage
 - 3) Malfunction of damageable spare parts
 - 4) Malfunction by non-normal operation or error use which is identified by our technical engineer.

9. Technical Drawing



- | | | |
|---------------------|------------------------------|------------------------------|
| 1.WASHER | 15.PUMP FRONT ROTOR | 26.WASHER |
| 2.SIGHT GLASS | 16.FRONT ROTARY VANE | 27.GAS BALLAST BALL |
| 3.OIL DRAIN VALVE | 17.PUMP FRONT STATOR | 28.GAS BALLAST FILTER SCREEN |
| 4.HOUSING | 18.SEAL | 29.GAS BALLAST JOINT |
| 5.OIL DRAIN SCREW | 19.BEARING | 30.SPRING |
| 6.OUTLET PORT | 20.TRESTLE | 31.COMPRESSION ROD |
| 7.WASHER | 21.GAS BALLAST PLATE | 32.WASHER |
| 8.PUMP BACK COVER | 22.GAS BALLAST VALVE ELEMENT | 33.ANTI-SUCKBACK VALVE |
| 9.ROTARY VANE | 23.GAS BALLAST VALVE ELEMENT | 34.INLET FITTING |
| 10.BACK ROTARY VANE | 24.KNOB | 35.BEARING |
| 11.PUMP BACK ROTOR | 25.HANGING RINGS | 36.FAN |
| 12.PUMP BACK STATOR | | 37.MOTOR |
| 13.VALVE PLATE | | 38.BASE |
| 14.ANTI-FOG VOVER | | |



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