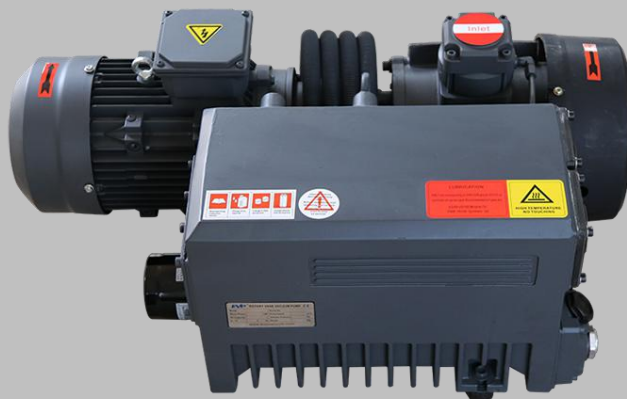
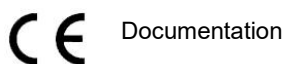




-- SV Series Rotary Vane Vacuum Pump

Operating instruction

English version of original operating instructions



It is imperative to read the operating instructions prior to commissioning!

This document as well as all documents included in the appendix is not subject to any update service!

Subject to technical changes.

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1. Important basic information

1.1 Statement

This operating instruction is a part of the technical documentation of the system, and are addressed to the person in charge of the plant, who is obliged to provide them to the staff responsible for the system's set-up, connection, operation and maintenance.

He must ensure that all information included in the operating instructions and the enclosed documents have been read and understood.

These operating instructions are the exclusive copyright of

SHANGHAI EVP VACUUM TECHNOLOGY CO., LTD

Add: No. 1295, New Jinqiao Road, Pudong New Area, Shanghai, China.

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Fax: 0086-21-5087-8169

Email: contact@evpvacuum.com

Or its legal successor .

Any company or person can not duplicate, transfer it to third party, or make illegal business use. Any operation on the pump should be in accordance with the instruction.

1.2 Warranty

Congratulations on your purchase of the vacuum pump with watchful observation of the field's requirements, innovation and steady development delivers modern vacuum and pressure solutions worldwide.

The purpose of this instruction is to introduce you the oil lubricated rotary vane vacuum pumps.

Here you will find the description of the operating principle and the pump components.

By means of this manual, you'll learn how to select the suitable pump type, according to the type of system the pump will have to be installed in. The manual will be helpful to meet customer's requirements and to avoid any unpleasant misunderstanding after the sale has been completed. When our vacuum pumps have to be installed in new applications or anytime there is a doubt on the good result of the installation, please ask for the technical advice of our vacuum experts.

1.3 NOTICE:

- Read carefully and understand this instruction manual before using vacuum pump.
- Forbid operating the vacuum pump without vacuum oil or lack of vacuum oil.
- Forbid entering the liquid or any other solid particle into vacuum pump
- Replace vacuum oil periodically.
- Operated by professional person.
- Replace the wearing parts periodically.

1.4 SAFETY :

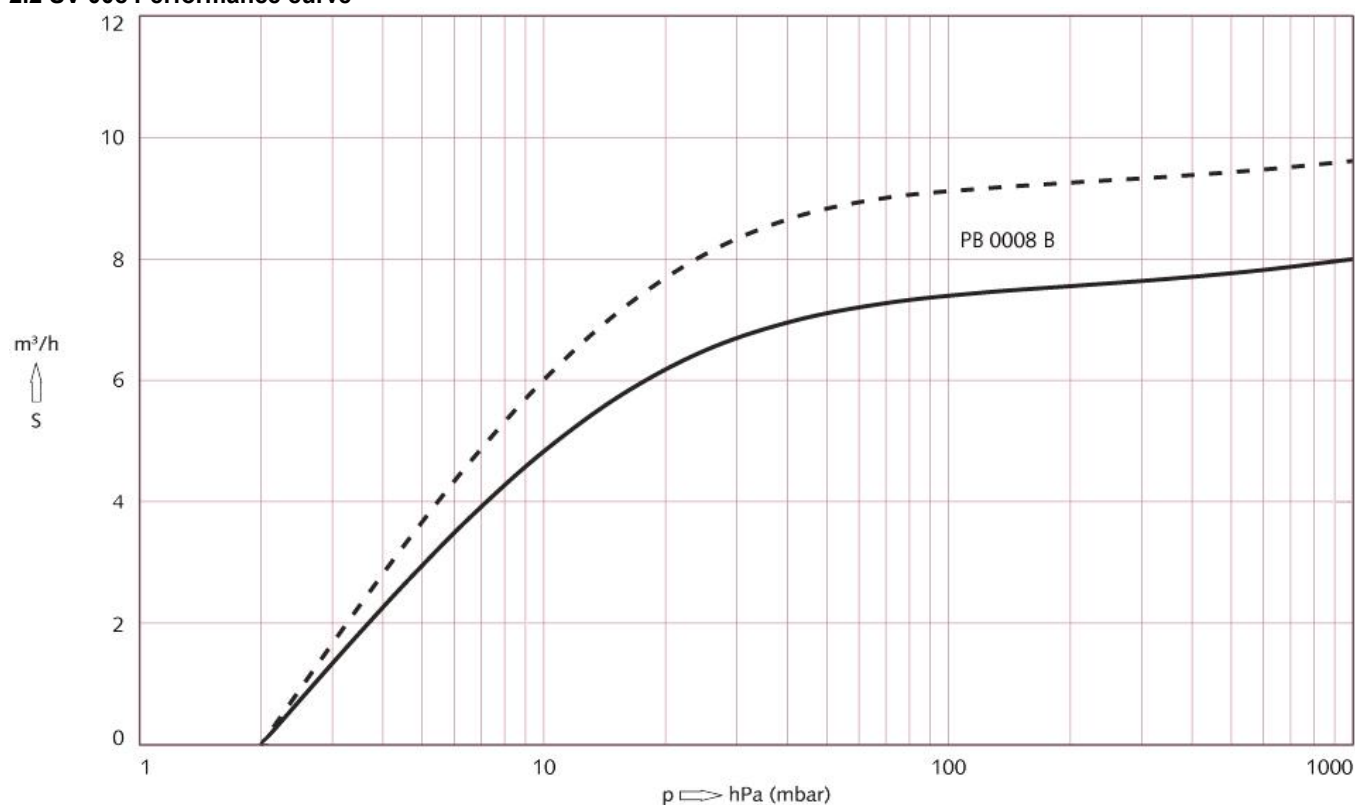
- This vacuum pump is produced according to the latest technical standards and safety specification. There will occur dangerous situation in improper installation and usage.
- This vacuum pump is used in low vacuum field. Suitable for pumping air and dry gas, not used to pump corrosive, toxic, explosive gas or transport the other object.

2. Performance specification

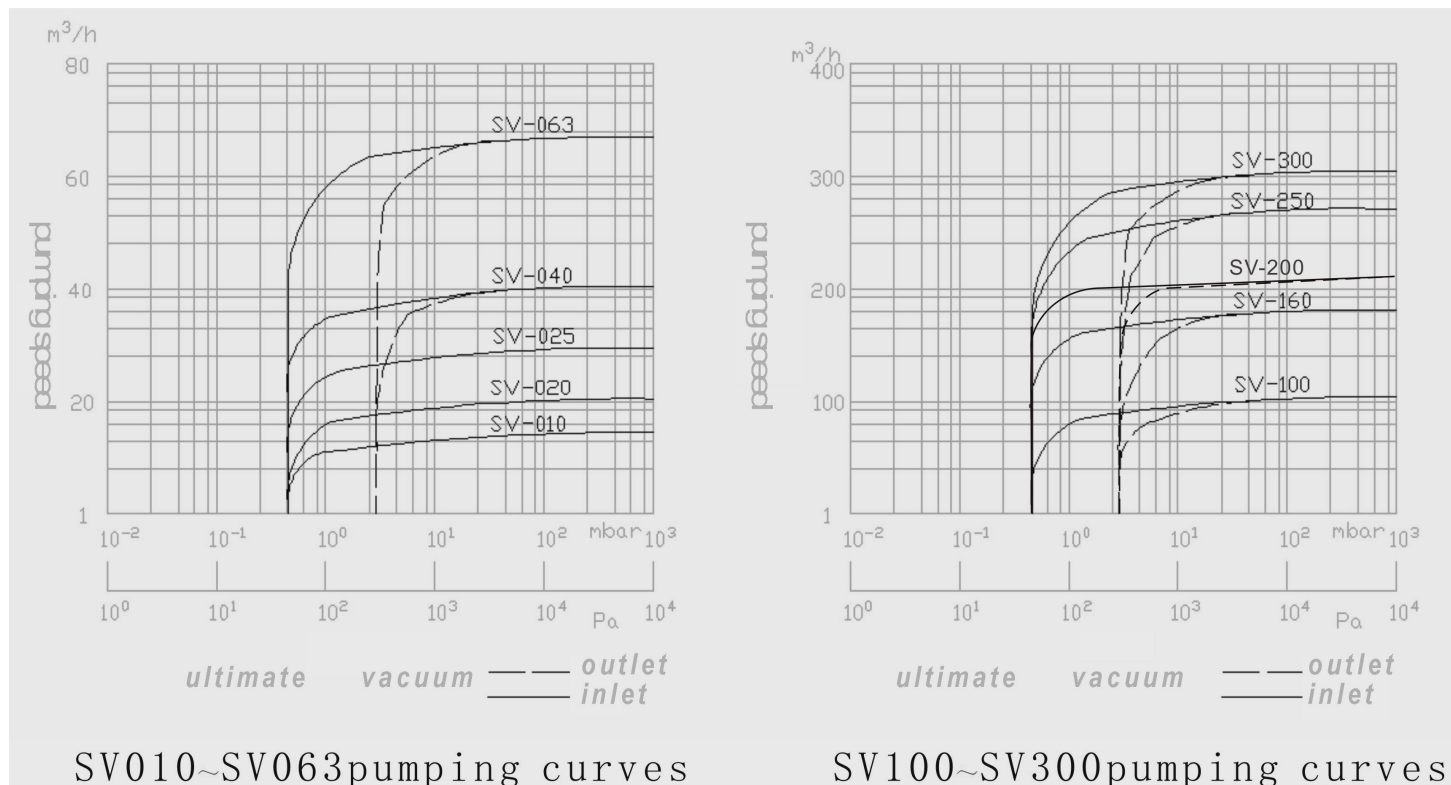
2.1 Technical data :

Model	Pump speed (m ³ /h)		Ultimate vacuum (Pa)	Motor Power (KW)	Inlet Diam (inch)	Rotary speed (rpm)	Oil Capacity (L)	G.W (kg)	Noise dB (A)	Dimensions (mm)
	50HZ	60HZ								
SV-008	8	9.6	150	0.55(1ph) 0.37(3ph)	G3/8	2800	0.25	11	68	340*210*205
SV-010	10	12	150	0.55(1ph) 0.37(3ph)	G1/2	2800	0.3	18	69	340*210*205
SV-016	16	19.2	150	0.75(3ph) 0.90(1ph)	G1/2	2800	0.3	18	69	340*210*205
SV-020	20	24	150	0.75(3ph) 0.90(1ph)	G1/2	2800	0.5	20	64	405*253*210
SV-025	25	30	150	0.75(3ph) 0.90(1ph)	G3/4	2800	0.5	20	64	405*253*210
SV-040	40	48	50	1.5	G1 1/4	1400	1.0	50	67	660*300*270
SV-063	63	75	50	2.2	G1 1/4	1400	2.0	83	68	695*420*295
SV-100	100	120	50	3.0	G1 1/4	1400	2.0	87	72	735*420*295
SV-160	160	192	50	4.0	G2	1400	4.5	152	74	805*520*410
SV-200	200	240	50	4.5	G2	1400	4.5	159	76	825*520*410
SV-250	250	300	50	5.5	G2	1400	7.0	230	76	1000*550*410
SV-300	300	360	50	7.5	G2	1400	7.0	236	76	1200*550*410
SV-630	630	750	10	15.0	DN100	960	35	620	75	1630*1300*980
SV-750	750	900	10	18.5	DN100	1150	35	640	76	1630*1300*980

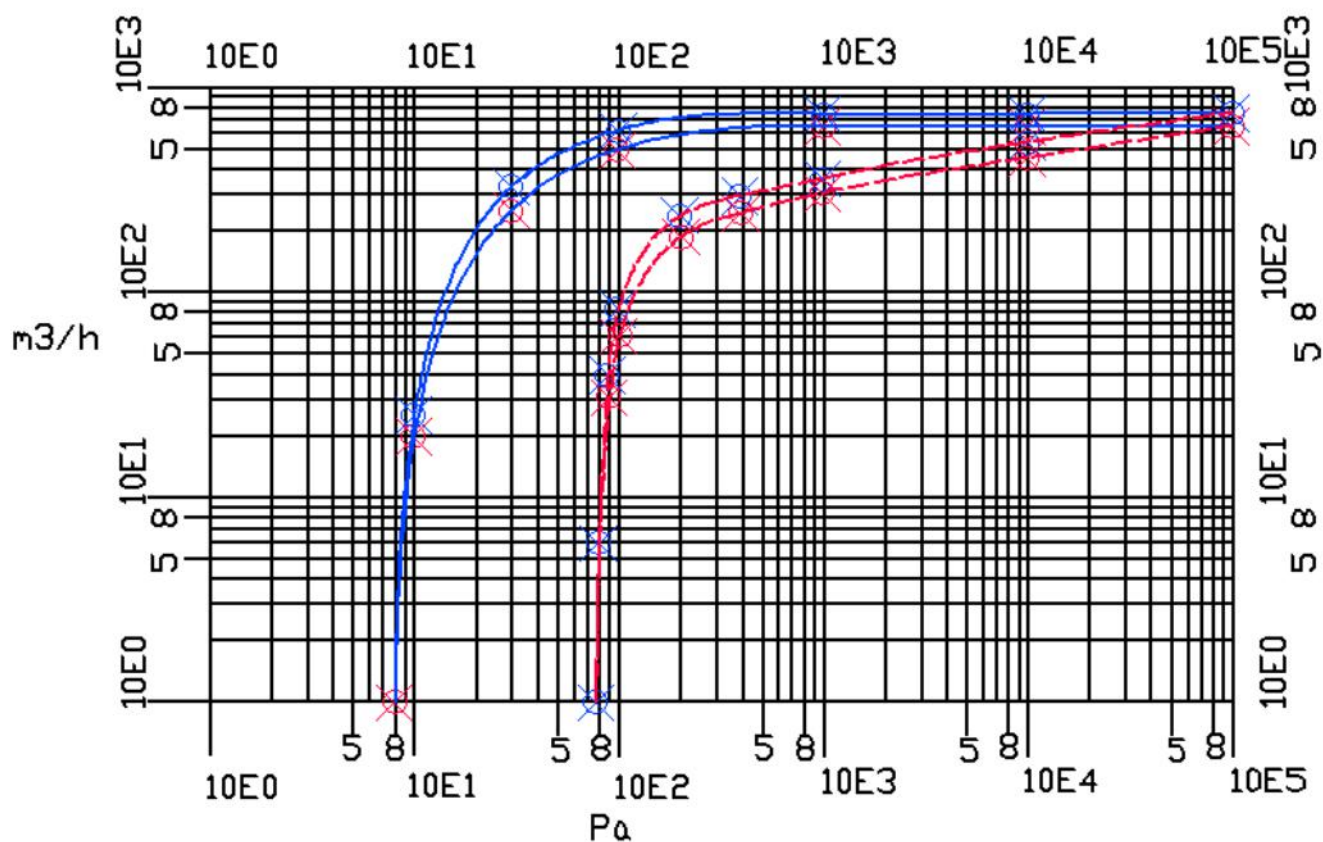
2.2 SV-008 Performance curve



2.2 SV010-SV-300 Performance curves



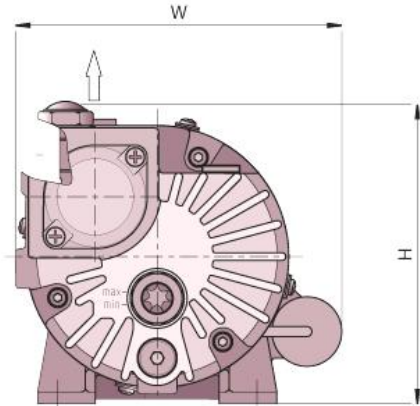
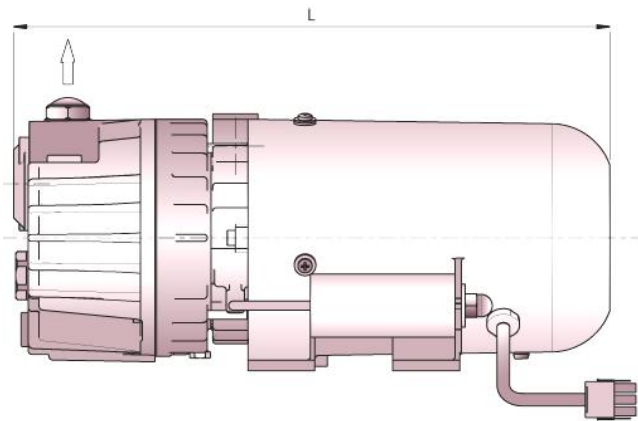
2.2 SV-630 ~ SV-750 performance curves (dotted line versions are tested when gas ballast valve is open)



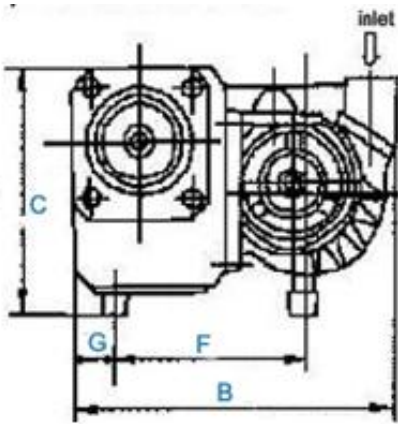
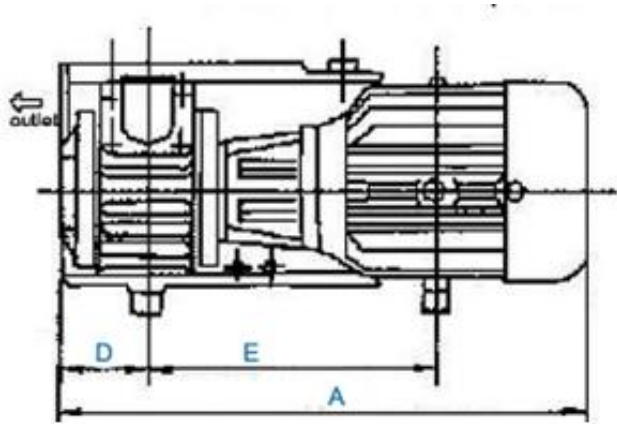
2.3 Installation size (Unit: mm)

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ROTARY VANE VACUUM PUMP OPERATING INSTRUCTION

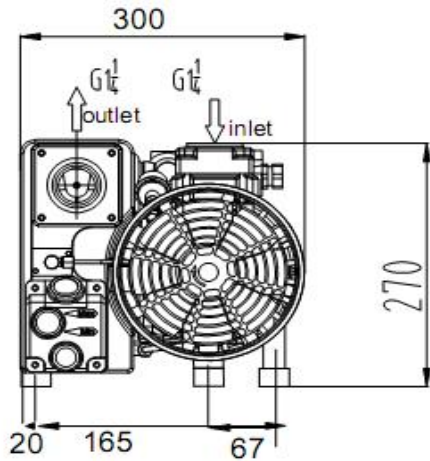
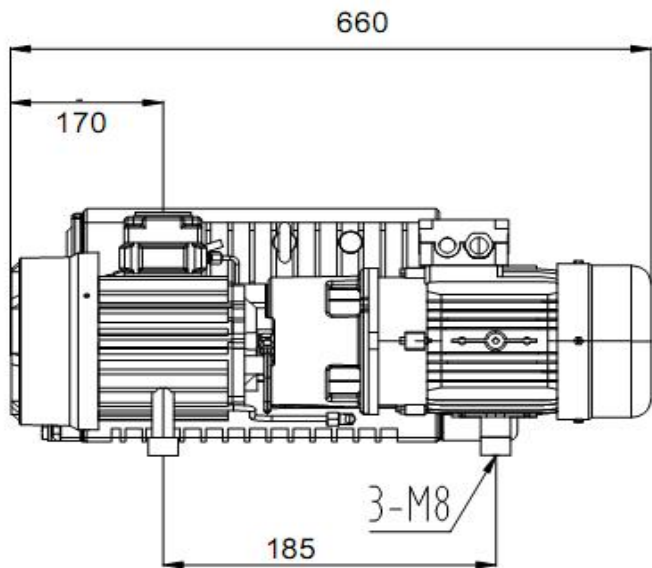


Model	L	W	H
SV008	455	235	210

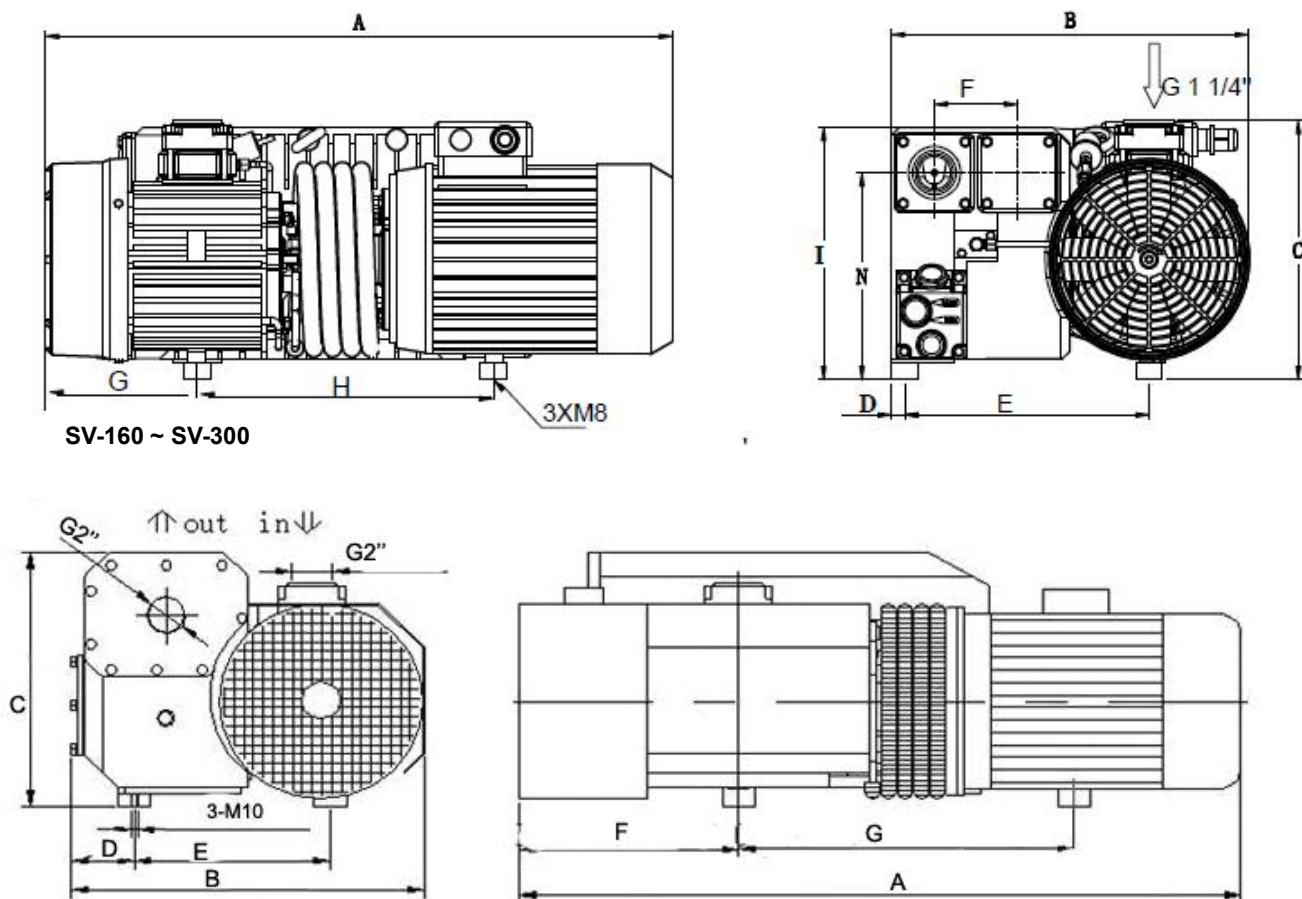


Model	A	B	C	D	E	F	G
SV010/016	340	210	205	150	100	128	90
SV020 short oil tank	405	235	210	60	210	130	25
SV020 long oil tank / SV025	455	235	210	110	210	130	25

SV-040

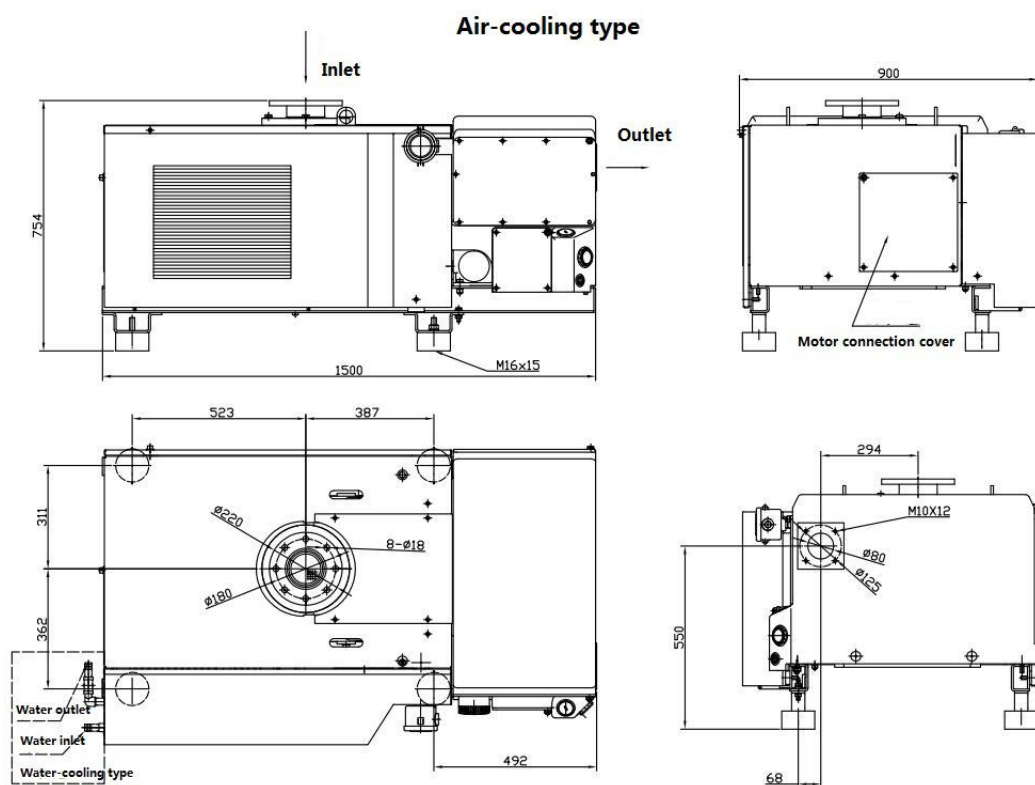


SV-063 ~ SV-100



Model	A	B	C	D	E	F	G	H	I
SV-063	695	420	295	20	285	93	165	297	285
SV-100	735	420	295	20	285	93	185	317	285

SV-630 ~ SV-750



3. Principle

3.1. Product Description

The vacuum pump is intended for the suction of air and other dry, non-aggressive ,non-toxic and non-explosive gases. Conveying media with a higher density than air leads to an increased thermal and mechanical load on the vacuum pump and is permissible only after prior consultation.

Permissible temperature range of the inlet gas: see "Oil", "Ambient temperature range"

In case the vacuum pump is equipped with a gas ballast

(optional) water vapor within the gas flow can be tolerated within certain limits. The conveyance of other vapors shall be agreed upon.

The vacuum pump is intended for the placement in a non-potentially explosive environment.

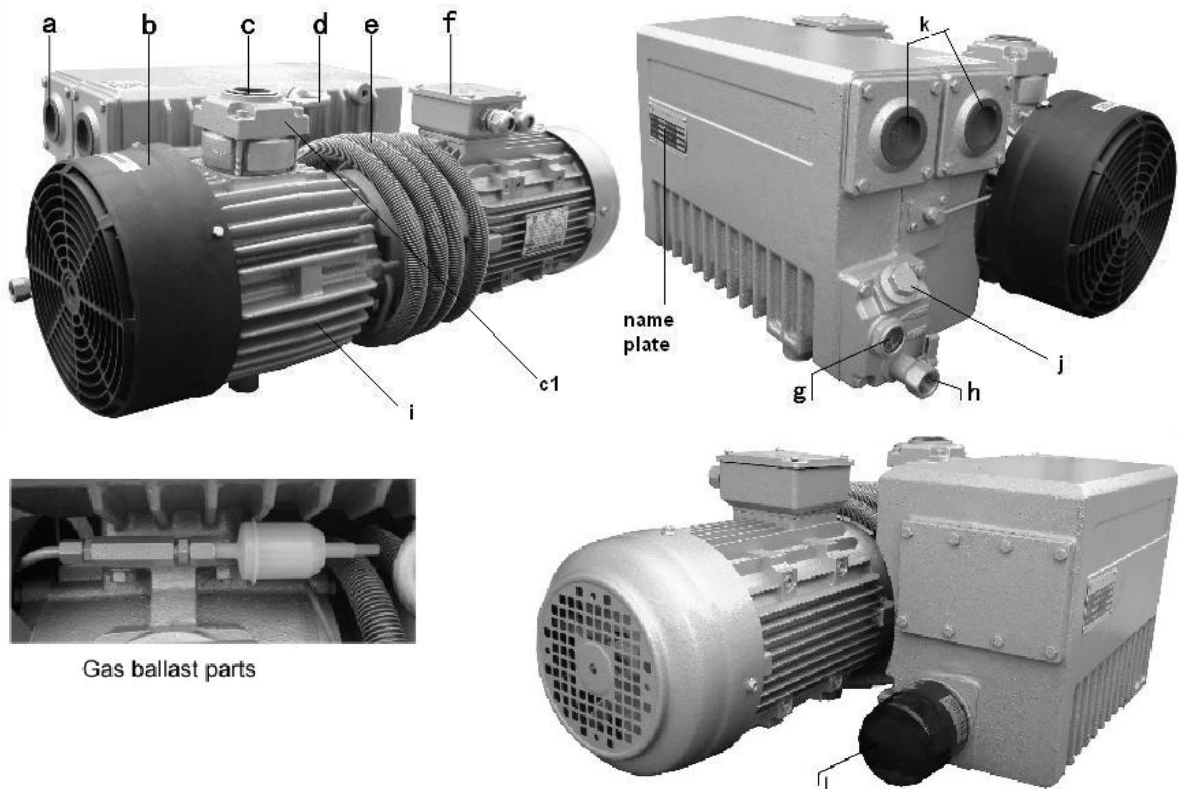
Version with float valve and oil return line; The vacuum pump is thermally suitable for continuous operation. Version with oil return valve;

The vacuum pump is thermally suitable for continuous operation.

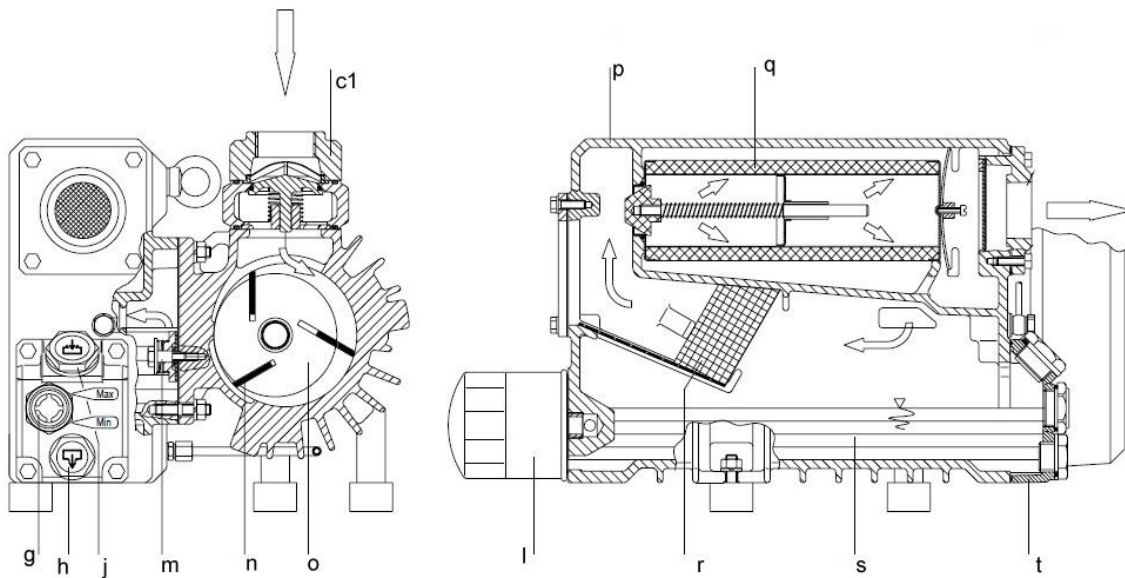
The vacuum pump is ultimate pressure proof.

3.2. Operating principle

illustration showing for SV model



a	Exhaust port	b	Axial flow fan cover	c	Inlet port	c1	Inlet flange
d	Eye bolt	e	Heat dissipation oil tube	f	Terminal	g	Oil sight glass
h	Oil drain plug	i	Cylinder	j	Oil fill plug	k	Gas discharge
l	Oil filter						



c1	Inlet flange	g	Oil sight glass	h	Oil drain plug	j	Oil fill plug	l	Oil filter
m	Exhaust valve	n	Rotary vane	o	Rotor	p	Oil mist separator	q	Exhaust filter
r	Demister	s	Oil sump	t	Service cover				

The vacuum pump works on the rotating vane principle.

A circular rotor is positioned concentrically on the shaft of the vacuum pump. The shaft of the vacuum pump is driven by the driving motor shaft by means of a flexible coupling.

The rotor rotates in a circular, fixed cylinder, the center-line of which is offset from the center-line of the rotor such that the rotor and the inner wall of the cylinder almost touch along a line. Vanes sliding in slots in the rotor, separate the space between the rotor and the cylinder into chambers. At any time gas is sucked in and at almost any time ejected. Therefore the vacuum pump works almost pulsation free.

In order to avoid the suction of solids, the vacuum pump is equipped with a screen in the suction connection.

In order to avoid reverse rotation after switching off, the vacuum pump is equipped with a Non-return valve.

Note: This valve shall not be used as a non-return valve or shut-off valve to the vacuum system and is not a reliable means to prevent suction of oil into the vacuum system while the vacuum pump is shut down.

In case the vacuum pump is equipped with a gas ballast (optional):

Through the gas ballast valve a small amount of ambient air is sucked into the pump chamber and compressed together with the process gas. This counteracts the accumulation of condensates from the process gas inside the vacuum pump.

The gas ballast line is equipped with a paper filter.

Gas ballast version with ball valve;

The gas ballast line can be closed partially or completely by

means of a ball valve.

In order to improve the operating characteristics the outlet of the pump chamber is equipped with a spring exhaust valve

3.3 Oil Circulation

The vacuum pump requires oil to seal the gaps, to lubricate the vanes and to carry away heat compression. The oil reservoir is located on the pressure side of the vacuum pump (high pressure) at the bottom of the bottom chamber of the oil separator.

The feed openings are located on the suction side of the vacuum pump (e. low pressure).

Forced by the pressure difference between pressure side and suction side oil is being drawn from the oil separator through the oil supply lines and injected on the suction side.

Together with the sucked gas the injected oil gets conveyed through the vacuum pump and ejected into the oil separator as oil mist. Oil that separates before the exhaust filters accumulates at the bottom of the bottom chamber of the oil separator.

Oil that is separated by the exhaust filters accumulates at the bottom of the upper chamber of the oil separator.

The flow resistance of the exhaust filters causes the inside of the exhaust filters (which is connected to the bottom chamber of the oil separator) to be on a higher pressure level than the outside of the exhaust filters (e. the upper chamber of the oil separator).

Because of the higher pressure in the bottom chamber it is not possible to let oil that drips off the exhaust filters simply flow down to the bottom chamber.

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Version with float valve and oil return line to the suction connection ;

Therefore the oil that accumulates in the upper chamber is sucked through the float valve and the oil return line to the suction connection. Version with oil return valve;

At continuous operation this would cause the entire supply of oil to accumulate at the bottom of the upper chamber, expel oil droplets through the gas discharge/pressure connection and let the pump run dry. Therefore the vacuum pump must be shut down at the latest after 10 hours of continuous operation, depending on the operating conditions even after a shorter period, for at least approx. 15 minutes .

After turning off the vacuum pump the pressure difference



CAUTION
During operation the surface of the vacuum pump may reach temperatures of more than 70°C.
Risk of burns!

between the inside and the outside of the exhaust filter collapses, hence the two chambers of the oil separator assume an equal pressure level, the oil return valve between the two chambers opens and the accumulated oil in the upper chamber can run down to the bottom chamber.

3.4 Cooling

The vacuum pump is cooled by

- radiation of heat from the surface of the vacuum pump incl. oil separator
- the air flow from the fan wheel of the drive motor
- the process gas
- the air flow from the fan wheel on the shaft of the vacuum pump.

4. Installation and Commissioning

4.1 Installation Prerequisites

4.2 Mounting Position and Space

- Make sure that the environment of the vacuum pump is not potentially explosive
- Make sure that the following ambient conditions will be complied with:
 - Ambient temperature: see "Oil"
 - Ambient pressure: atmospheric.
- Make sure that the environmental conditions comply with the protection class of the drive motor (according to the nameplate).
- If the pump is installed in a colder environment than allowed with the oil used.

ROTARY VANE VACUUM PUMP OPERATING INSTRUCTION

◆Fit the vacuum pump either with an oil sump heater (on request) or fit the vacuum pump with a temperature switch and control the vacuum pump in such a way that it will start automatically when the oil sump temperature drops below the allowed temperature.

- Make sure that the vacuum pump will be placed or mounted horizontally.
- Make sure that in order to warrant a sufficient cooling there will be a clearance of minimum 20 cm between the vacuum pump and nearby walls.
- Make sure that no heat sensitive parts (plastics, wood, cardboard, paper, electronics) will touch the surface of the vacuum pump.
- Make sure that the installation space or location is vented such that a sufficient cooling of the vacuum pump is warranted.
- Make sure that the vacuum pump will not be touched inadvertently during operation, provide a guard if appropriate.
- Make sure that the oil sight glass will remain easily accessible If the oil change is meant to be performed on location.
 - ◆Make sure that the drain port, the oil filter and the filling port will remain easily accessible
- Make sure that enough space will remain for the removal and the reinsertion of the exhaust filters.

4.3 Suction Connection



CAUTION
In case of non-compliance with the installation prerequisites, particularly in case of insufficient cooling:
Risk of damage or destruction of the vacuum pump and adjoining plant components!
Risk of injury!
The installation prerequisites must be complied with.



CAUTION
Any foreign objects or liquids entering into pump can destroy the pump.

In case the inlet gas can contain dust or other foreign solid particles;

- ◆ Make sure that a suitable filter is installed upstream the vacuum pump.
- Make sure that the suction line fits to the suction connection of the vacuum pump.

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- Make sure that the gas will be sucked through a vacuum-tight flexible hose or a pipe.

In case of using a pipe:

- ◆ Make sure that the pipe will cause no stress on the vacuum pump's connection, if necessary use bellows
- Make sure that the line size of the suction line over the entire length is at least as large as the suction connection of the vacuum pump.

In case of very long suction lines it is prudent to use larger line sizes in order to avoid a loss of efficiency.

If two or more vacuum pumps work on the same suction line, if the volume of the vacuum system is large enough to suck back oil or if the vacuum shall be maintained after switching off the vacuum pump:

- ◆ Provide a manual or automatic operated valve(= non-return valve) in the suction line (the standard non-return valve that is installed inside the suction connection is not meant to be used for this purpose!)

If the vacuum pump is planned to be used for the suction of gas that contains limited quantities of condensable vapor:

- ◆ Provide a shut-off valve, a drip-leg and a drain cock in the suction line, so that condensates can be drained from the suction line
- Make sure that the suction line does not contain foreign objects, e.g. welding scales.

4.4 Gas Discharge

The following guidelines for the discharge line do not apply if the aspirated air is discharged to the environment right at the vacuum pump.



CAUTION

**The discharged air contains small quantities of vacuum oil.
Staying in vacuum oil contaminated air bears a risk of damage to health.**

If air is discharged into rooms where persons stay, sufficient ventilation must be provided for.

- Make sure that the discharge line fits to the gas discharge of the vacuum pump .

In case of using a pipe:

- ◆ Make sure that the pipe will cause no stress on the vacuum pump's connection, if necessary use bellows.
- Make sure that the line size of the discharge line over the entire length is at least as large as the gas discharge of the vacuum pump
- Make sure that the discharge line either slopes away from the vacuum pump or provide a liquid or a drip leg with a drain cock, so that no liquids can back up into the vacuum pump

ROTARY VANE VACUUM PUMP OPERATING INSTRUCTION

4.5 Mounting

- Make sure that the Installation Prerequisites are complied with.
- Set down or mount the vacuum pump at its location.

4.6 Connecting Electrically



CAUTION

The connection schemes given below are typical. Depending on the specific order or for certain markets deviating connection schemes may apply.

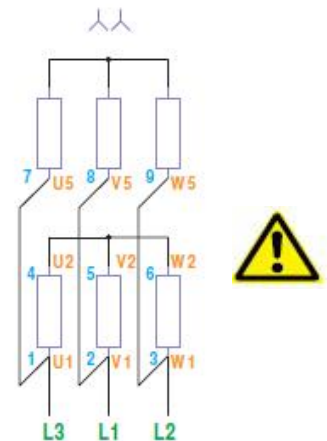
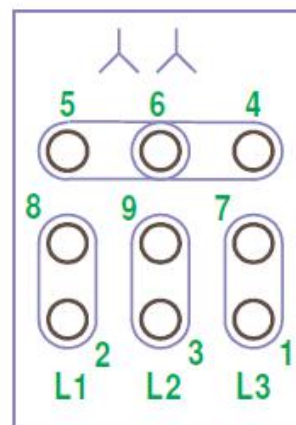
Risk of damage to the drive motor!

The inside of the terminal box shall be checked for drive motor connection instructions/schemes.

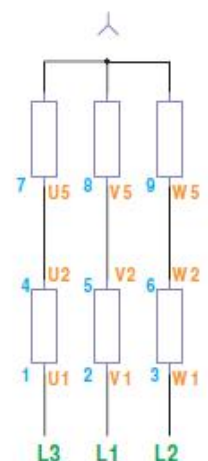
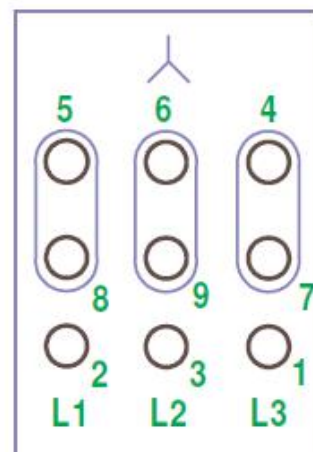
- Electrically connect the drive motor.
- Connect the protective earth conductor.

4.6.1 Connection Scheme Three-Phase Motor

Star-star connection (Low voltage)



Star connection (High voltage)



CAUTION

Operation in the wrong direction of rotation can destroy the vacuum pump in short time.

Prior to starting-up it must be made sure that the vacuum pump is operated in the proper direction.

- Determine the intended direction of rotation with the arrow.
- Watch the fan wheel of the drive motor and determine the direction of rotation just before the fan wheel stops.

If the rotation of the fan wheel must be changed:

- ◆ Switch any two of the drive motor wires in the terminal box

4.7 Connecting Lines/Pipes

In case the suction line is equipped with a shut-off valve:

- Connect the suction line
- Connect the discharge line

Installation without discharge line:

- ◆ Make sure that the gas discharge is open
- Make sure that all provided covers, guards, hoods etc. are mounted.
- Make sure that cooling air inlets and outlets are not covered or obstructed and that the cooling air flow is not affected adversely in any other way.

4.8 Filling Oil

**CAUTION**

The vacuum pump is shipped without oil.

Operation without oil will ruin the vacuum pump in short time. Prior to commissioning it must be made positively sure that oil is filled in.

Oil type: VF 100# vacuum oil

The application of the vacuum pump will definite the oil to be used.

- Remove the oil fill plug .
- Filling oil according to the values set in the table "Oil"

**CAUTION**

Before changing the oil type, compatibility shall be

CAUTION

During operation the surface of the vacuum pump may reach temperatures of more than 70 °C.

Risk of burns!

The vacuum pump shall be protected against contact during operation.

checked and, if necessary, the pump be flushed.

CAUTION

During operation the oil separator is filled with hot, pressurized oil mist.

Risk of injury from hot oil mist with open oil fill port.

Remove the oil fill plug only if the vacuum pump is stopped.

The vacuum pump must only be operated with the oil fill plug firmly inserted.

- Make sure that the level is on the upper third of the oil sight glass
- Make sure that the seal ring is inserted into the oil fill plug and undamaged, replace if necessary
- Firmly reinsert the oil fill plug.

NOTE: Starting the vacuum pump with cold oil is made easier when at this very moment the suction line is neither closed nor covered with a rubber mat.

- Switch on the vacuum pump

In case the suction line is equipped with a shut-off valve:

- ◆ Close the shut-off valve

In case the suction line is not equipped with a shut-off valve:

- ◆ Cover the suction connection with a piece of rubber mat.

- Let the vacuum pump run for a few minutes
- Shut down the vacuum pump and wait a few minutes
- Make sure that the level is on the upper third of the oil sight glass.

5. Operation Notes

5.1 Application

**CAUTION**

The vacuum pump is designed for operation under the conditions described below.

In case of disregard risk of damage or destruction of the vacuum pump and adjoining plant components!

Risk of injury!

The vacuum pump must only be operated under the conditions described below.

The vacuum pump is intended for air and other dry, non-aggressive, non-toxic and non-explosive gases.

Conveying media with a higher density than air leads to an increased thermal and mechanical load on the vacuum pump and is permissible only after prior consultation with Our factory.

CAUTION

The discharged air contains small quantities of vacuum oil. Staying in vacuum oil contaminated air bears a risk of damage to health.
If air is discharged into rooms where persons stay, sufficient ventilation must be provided for.

In case the vacuum pump is equipped with a gas ballast (optional) water vapor within the gas flow can be tolerated within certain limits.

The vacuum pump is intended for the placement in a non-potentially explosive environment.

Version with float valve and oil return line;

The vacuum pump is thermally suitable for continuous operation.

Version with oil return valve.

The vacuum pump is thermally suitable for continuous operation.

The vacuum pump shall be protected against contact during operation, it shall cool down prior to required contact or heat protection gloves shall be worn.

Aspiration of process gas over extended periods can be harmful.

The room into which the process gas is discharged must be sufficiently vented.

- Make sure that all provided covers, guards, hoods etc. remain mounted
- Make sure that protective devices will not be disabled.
- Make sure that cooling air inlets and outlets will not be covered or obstructed and that the cooling air flow will not be affected adversely in any other way.
- Make sure that the installation Prerequisites are complied with, particularly that a sufficient cooling will be ensured.

5.2 Oil Return

Only for version with oil return valve:

During operation oil accumulates at the bottom of the upper chamber of the upper chamber of the oil separator, which cannot flow down into the bottom chamber, as long as the vacuum pump runs.

At the latest after 10 hours of continuous operation, in case of high pressure difference between suction side and pressure side after a shorter period, the vacuum pump must be shut down for at least 15 minutes, so that the oil can run down from the upper chamber of the oil separator into the bottom chamber.

Note: This is a good time to check the temperature, the level and the color of the oil.

6. Maintenance**6.1 Maintenance Schedule**

Note: The maintenance intervals depend very much on the individual operating conditions. The intervals given below shall be considered as starting values which should be shortened or extended as appropriate. Particularly heavy duty operation, such like high dust loads in the environment or in the process gas, other contaminations or ingress of process material, can make it necessary to shorten the maintenance intervals significantly.

Monthly:

- Make sure that the vacuum pump is shut down and locked against inadvertent start up.
- Check the level and the color of the oil .
- Check the vacuum pump for oil leaks - in case of leaks have the vacuum pump repaired.
- Check the function of the exhaust filters .

In case an inlet air filter is installed:

- ◆ Check the inlet air filter, if necessary clean (with compressed air) or replace.

In case of operation in a dusty environment:

- ◆ Make sure that the housing is free from dust and dirt, clean if necessary.

Every 6 Months:

- Make sure that the vacuum pump is shut down and locked against inadvertent start up.
- Make sure that the housing is free from dust and dirt, clean if necessary.
- Clean the fan cowlings, fan wheels, ventilation protection screen and cooling fins

Yearly:

- Make sure that the vacuum pump is shut down and locked against inadvertent start up
- Replace the exhaust filters.

In case an inlet filter is installed:

- ◆ Clean (with compressed air) or replace the inlet air filter
- Check the inlet screen, clean if necessary.

Every 500 - 2000 Operating hours:

- Change the oil, replace the oil filter(s) and clean the float valve.
- Check the elasticity of the discharge valve (g,159). If it is no longer sufficiently elastic, replace it.

Every 16000 Operating hours, at the latest after 4 Years:

- Have a major overhaul on the vacuum pump (Busch service)

6.2 Checking the Oil**6.2.1 Checking the level**

- Make sure that the vacuum pump is shut down and locked against inadvertent start up
- Make sure that the oil has collected at the bottom of the oil separator

- Read the level on the sight glass.

If the oil level is below the required level:

- ◆ Top up oil

If the oil level is above the required level:

- ◆ Check the dilution with condensates.

Change the oil

If appropriate retrofit a gas ballast.

6.2.2 Topping up Oil

NOTE: Under normal conditions there should be no need to top up oil during the recommended oil change intervals. A significant level drop indicates a malfunction (see "Troubleshooting").

NOTE: During operation the exhaust filter gets saturated with oil. It is therefore normal that the oil level will drop slightly after replacement of the exhaust filter.

CAUTION

Filling oil through the suction connection/gas inlet will result in breakage of the vanes and destruction of the vacuum pump. Oil may be filled through the oil fill port only.

- Make sure that the vacuum pump is shut down and locked against inadvertent start up.
- Remove the oil fill plug.
- Top up oil until the level reaches the middle of the oil sight glass
- Make sure that the level is on the upper third of the oil sight glass.
- Make sure that the sealing seat on the oil fill plug (k,88) is undamaged ,if necessary replace the oil fill plug.
- Firmly reinsert the oil fill plug.

6.3 Checking the Color of the Oil

Note: The oil should be light, either transparent, a little foamy or a little tarnished. A milky discoloration that does not vanish after sedation of the oil indicates contamination with foreign material. Oil that is either contaminated with foreign material or burnt must be changed.

Oil Life

The oil life depends very much on the operating conditions. A clean and dry air stream and operating temperatures below 100°C are ideal.

Under these conditions the oil and the oil filter shall be changed every 2000 operating hours or after half a year.

Under very unfavorable operating conditions the oil life can be less than 500 operating hours. Extremely short life times indicate malfunctions or unsuitable operating conditions,

Though If there is no experience available with regard to the oil life under the prevailing operation conditions, it is recommended to have an oil analysis carried out every 500 operating hours and establish the change interval accordingly.

6.4 Oil and Oil Filter Change

6.4.1 Draining Used Oil

NOTE: After switching off the vacuum pump at normal operating temperature wait no more than 20 minutes before the oil is drained.

- Make sure that the vacuum pump is shut down and locked against inadvertent start up
- Make sure that the vacuum pump is vented to atmospheric pressure
- Put a drain tray underneath the oil drain port .
- Remove the oil drain plug .
- Drain the oil

When the oil stream dwindles:

- Close the oil drain plug.
- Switch the vacuum pump on for a few seconds
- Make sure that the vacuum pump is shut down and locked against inadvertent start up
- Remove the oil drain plug
- Make sure that the sealing seat on the oil drain plug is undamaged, if necessary replace the oil drain plug.
- Firmly reinsert the oil drain plug
- Dispose of the used oil in compliance with applicable regulations.

6.4.2 Flushing the vacuum pump

Make sure that all the used oil is drained

- Create 4,5 liters of flushing agent from 50 percent oil and 50 percent paraffin or diesel fuel/fuel oil
- Make sure that the oil drain plug is reinsert correctly
- Remove the oil fill plug
- Fill in the flushing agent
- Firmly reinsert the oil fill plug
- Close the suction line
- Run the vacuum pump for at least half an hour
- Drain the flushing agent and dispose of it in compliance with applicable regulations.

6.4.3 Cleaning of the float valve

- Make sure that all the entire used oil is drained
- Disconnect the oil return line
- In order to reach the float, loosen the 2 screws and remove its entire seat
- Loosen the screw and remove the float
- Check the O-ring and replace them if necessary
- Check the cleanness and the operation of the float. Clean it with compressed air, if necessary
- Reinsert the float in its seat. Respect the mounting direction of the float.
- Connect the oil return line

6.4.4 Replacing the Oil Filter

- Make sure that the oil is drained

EVP VACUUM SOLUTION

- Remove the oil filter
- Apply a drop of fresh oil on the seal ring of the new oil filter
- Mount the new oil filter and tighten it by hand

6.4.5 Filling in Fresh Oil

- Keep 2.0 liters oil acc. to the table

Note: The amount given in these operating instructions is a guide. The sight glass indicates the actual amount to be filled in.

- Make sure that the oil outlet pug is firmly inserted



CAUTION

Filling oil through the suction connection will result in breakage of the vanes

and destruction of the vacuum pump.

Oil may be filled through the filling port only.

- Remove the oil fill plug
- Fill in oil
- Make sure that the level is on the upper third of the oil sight glass
- Make sure that the seal ring is inserted into the oil inlet plug and undamaged, replace if necessary
- Firmly reinsert the oil inlet plug

6.4.6 Exhaust Filter

1 Check during operation

EVP recommends the use of a filter pressure gauge (available as accessory). Without filter pressure gauge the filter resistance shall be assessed on the basis of the drive motor current drawn.

- Make sure that the vacuum pump is running

Version with filter pressure gauge:

- ◆ Check that the indication of the filter pressure gauge is in the usual range ($< 0,6$ bar)

Version without filter pressure gauge:

- ◆ Check that the drive motor current drawn is in the usual range (see nameplate)
- Check that the discharge air is free from oil.

2 Change of the exhaust filters

2.1 Removing the exhaust filters

- Make sure that the vacuum pump is shut down and locked against inadvertent start up
- Prior to disconnecting pipes/lines make sure that the connected pipes/ lines are vented to atmospheric pressure
- Remove the discharge line, if necessary
- Remove the two fastening screws of the exhaust filter
- Remove the exhaust filter with the help of the integrated handle
- Repeat this procedure for the second exhaust filter.

2.2 Inserting the Exhaust Filters

ROTARY VANE VACUUM PUMP OPERATING INSTRUCTION

Mount the new exhaust filters with the new o-rings. Be sure to fit the exhaust filter as indicated by the arrow at exhaust filter

- Insert the exhaust filters into their housing extraction handle directed downwards.
- Refit the two fastening screws.

NOTE: During operation the exhaust filters get saturated with oil. It is therefore normal that the oil level will drop slightly after replacement of the exhaust filters.

6.4.7 Gas ballast

Check the gas ballast inlet regularly. If the gas ballast doesn't work correctly, disassemble it, clean it and blow it with compressed air.

6.4.8 Inlet flange

Check the inlet flange regularly. The maintenance interval of the inlet flange depends on the application.

To clean the mesh screen at the inlet:

- Remove the fastening screws of the inlet flange
- Remove the flange
- Clean the mesh screen with compressed air
- Check the different seals and replace them if necessary
- Refit the mesh screen and the inlet flange

6.4.9 Discharge valve

The discharge valve must be checked the every 500 to 2000 operating hours (see "Maintenance schedule").

To check the discharge valve:

- Remove the fastening screws of the inspection cover
- Remove the inspection cover
- Check the elasticity of the discharge valve and replace it if necessary
- Check the different seals and replace them if necessary
- Refit the inspection cover

6.4.10 Motor cover

Check the motor cover regularly. A bad maintenance of the motor cover will affect the vacuum pump cooling and may lead to overheating of the vacuum pump.

6.5 Re-commissioning

CAUTION

Vanes can stick after a long period of standstill.

Risk of vane breakage if the vacuum pump is started with the drive motor.

After longer periods of standstill the vacuum pump shall be turned by hand.

After longer periods of standstill:

- ◆ Make sure that the vacuum pump is shut down and locked against inadvertent start up
- ◆ Remove the cover around the fan of the drive motor

EVP VACUUM SOLUTION

- ◆ Slowly rotate the fan wheel by hand several revolutions in the intended direction of rotation (see stuck on or cast arrow.
 - ◆ Mount the cover around the fan wheel of the drive motor
- If deposits could have gathered in the vacuum pump:
- ◆ Flush the vacuum pump (see "Maintenance")

6.6 Dismantling and Disposal

WARNING

In case the vacuum pump conveyed gas that was contaminated with harmful foreign material the operating fluid and the exhaust filter(s) will be contaminated with harmful material.

Harmful material can reside in pores, gaps and internal spaces of the vacuum pump.

Danger to health during dismantling of the vacuum pump.

Danger to the environment.

During dismantling of the vacuum pump personal protective equipment must be worn.

The vacuum pump must be decontaminated prior to disposal.

Prior to shipping the vacuum pump shall be decontaminated as good as possible .

Operating fluid and exhaust filters must be disposed of separately in compliance with applicable regulations.



CAUTION

Used oil, used exhaust filters and used oil filters

ROTARY VANE VACUUM PUMP OPERATING INSTRUCTION

are special waste and must be disposed of in compliance with applicable regulations

- Remove the exhaust filter
- Drain the oil
- Remove the oil filter
- Make sure that materials and components to be treated as special waste have been separated from the vacuum pump
- Make sure that the vacuum pump is not contaminated with harmful foreign material

According to the best knowledge at the time of printing of this manual the materials used for the manufacture of the vacuum pump involve no risk.

- Dispose of the used oil in compliance with applicable regulations.
- Dispose of special waste in compliance with applicable regulations.
- Dispose of the vacuum pump as scrap metal.

7. Troubleshooting

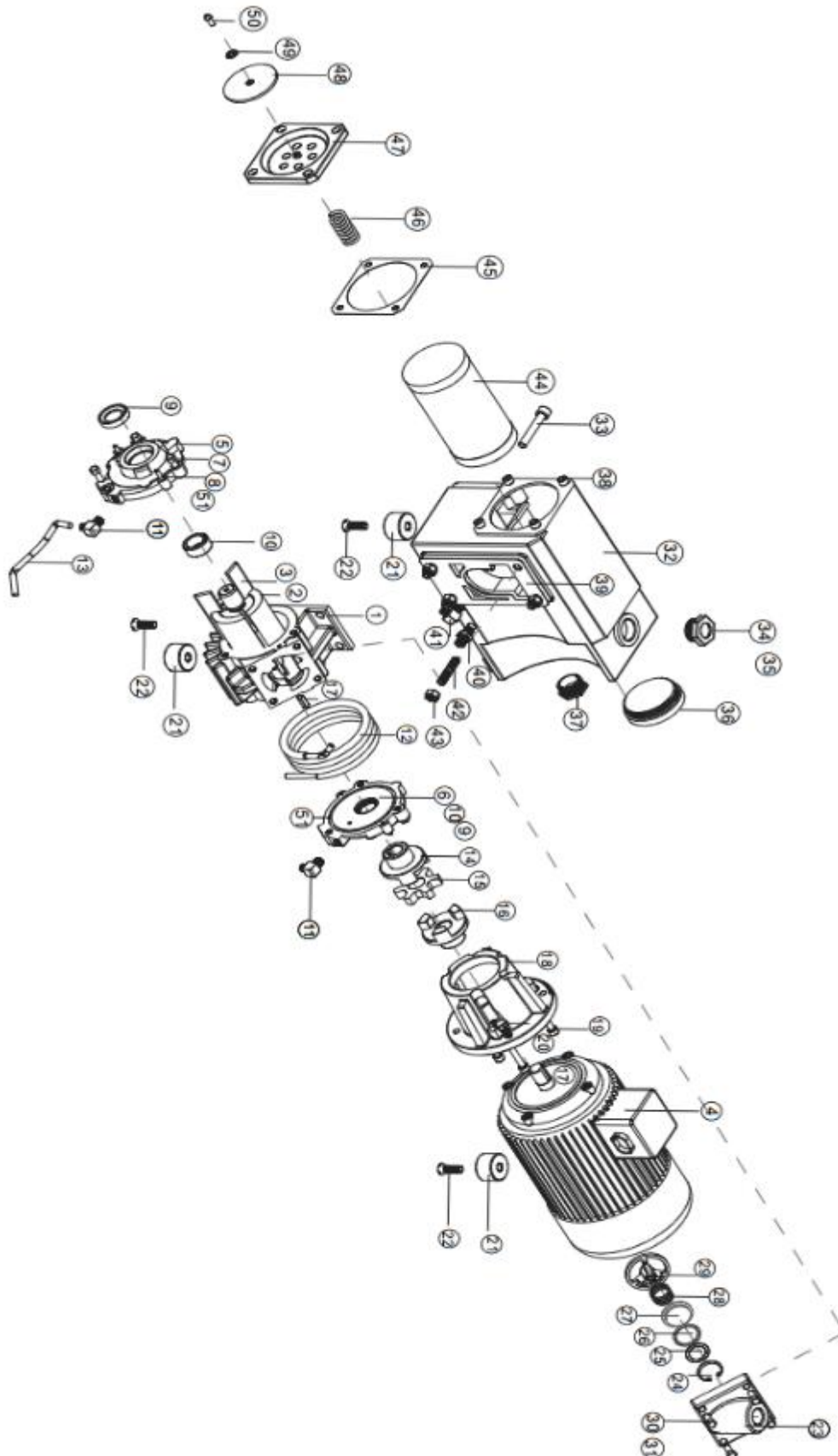
Problem	Possible Cause	Remedy
1. The vacuum pump does not reach the usual pressure; 2. The drive motor draws a too high current (compare with initial value after commissioning); 3. Evacuation of the system takes too long	The vacuum system or suction line is not leak-tight	Check the hose or pipe connections for possible leak
	The vacuum relief valve /regulating system is misadjusted or defective if installed	Adjust, repair or replace, respectively
	Contaminated oil (the most common cause)	Change the oil
	No. or not enough oil in the reservoir	Top up oil
	The exhaust filters are partially clogged	Replace the exhaust filters
	The oil filter is clogged (the oil Flows through the bypass only, the oil does not get filtered any more)	Replace the oil filter
	The filter on the suction connection is partially clogged of installed	Clean or replace the inlet air filter respectively
	Partial clogging in the suction, discharge or pressure line	Remove the clogging
	Long suction, discharge or pressure line with too small diameter	Use larger diameter
	The valve disk of the inlet non-return valve is stuck in closed or partially open position	Disassemble the inlet, clean the screen and the valve as required and reassemble
The gas conveyed by the vacuum pump smells displeasing	1. The oil tubing is defective or Leaking; 2 .The oil return line is broken	1.Tighten the connections; 2.Replace the connections and/or the tubing
	1.Version with float valve and oil return line; 2.The float valve is stuck is open position	Make the float valve movable, replace if necessary
	1.Process components evaporating under vacuum readily volatile and thus gaseous components of the oil, e. g. additives, particularly right after an oil change.	1.Check the process if applicable; 2.Use a different type of oil if applicable
	The drive motor is not supplied with the	Supply the drive motor with the correct

The vacuum pump does not start	correct voltage or is overloaded	voltage
	The drive motor starter overload protection is too small or trip level is too low	1.Compare the trip level of the drive motor starter overload protection with the data on the nameplate if necessary. 2. set the trip level of the drive motor starter with high ambient temperature
	One of the fuses has blown	Check the fuses
	The connection cable is too small or too long causing a voltage drop at the vacuum pump	Use sufficiently dimension-ed cable
	The vacuum pump or the drive motor is blocked	1.Make sure the drive motor is disconnected from the power supply ; 2.Remove the fan cover ; 3.Try to turn the motor with the vacuum pump by hand;
	The drive motor is defective	Replace the drive motor
The vacuum pump is blocked	Solid foreign matter has entered the vacuum pump	1.Repair the vacuum pump; 2.Make sure the suction line is equipped with a screen
	Corrosion in the vacuum pump from remaining condensate	Repair the vacuum pump Check the process
	The vacuum pump was run in the wrong direction	1.Repair the vacuum pump; 2.Make sure the vacuum pump will run in the correct direction
	1.After shutting down the vacuum pump, the Vacuum system exerted under pressure onto the pump chamber which sucked back excessive oil from the oil separator into the pump chamber; 2.When the vacuum pump was restarted, too much oil was enclosed between the vanes and thus broke a vane	1.Repair the vacuum pump 2.Make sure the vacuum system won't exert under pressure onto the shut-down vacuum pump, if necessary provide an additional shut-off valve or non-return valve
	Condensate ran into the pump chamber When the vacuum pump was restarted too much condensate was enclosed between the vanes Condensate could not be compressed and thus broke a vane	Repair the vacuum pump . Make sure no condensate will enter the vacuum pump, if necessary provide a drip leg and a drain cock Drain condensate regularly
The drive motor is running, but the vacuum pump stands still	The coupling between the drive motor and the vacuum pump is defective	Replace the coupling element
1. The vacuum pump starts, but labors or runs noisily or rattles; 2. The drive motor draws a too high current (compare with initial value after commissioning)	1.Loose connection in the drive motor terminal box; 2.Version with motor coils are properly connected;	1. Check the proper connection of the wires against the connection diagram; 2.Tighten or replace loose connections
	vacuum pump runs in the wrong direction	Verification and rectification
	Standstill over several weeks or months	Let the vacuum pump run warm with inlet closed
	Oil viscosity is too high for the ambient temperature	Use synthetic oil and warm up the oil with a heater prior to starting up the vacuum pump, or run the vacuum pump in intervals in order to get warm
	Improper oil quantity, unsuitable oil type	Use the proper quantity of recommended oils
	No oil change over extended period of time	oil change incl. flushing and oil Filter replacement
	The exhaust filters are clogged and appear black from burnt oil	1.Flush the vacuum pump; 2.Replace the oil filter; Fill in new oil
	Foreign objects in the vacuum pump broken vanes and Stuck bearings.	Repair the vacuum pump
The vacuum pump runs very noisily	Defective bearings	Repair the vacuum pump
	Worn coupling element	Replace the coupling element
	Stuck vanes	1.Repair the vacuum pump 2.Use recommended oils and change more frequently
	Insufficient air ventilation	1. Make sure that the cooling of the vacuum pump is not impeded by dust/dirt; 2. Clean the fan cowlings, the fan wheels, the ventilation grilles and the cooling fins; 3. Install the vacuum pump in a narrow

The vacuum pump runs very hot (the oil sump temperature shall not exceed 100°C)		space only if sufficient ventilation is ensured on a vacuum pump with oil-cooler; 4. Clean the intermediate spaces of the finned tube
	Ambient temperature too high	Observe the permitted ambient temperatures
	Temperature of the inlet gas too high	Observe the permitted temperatures for the inlet gas
	The exhaust filters are partially clogged	Replace the exhaust filters
	The oil filter is clogged	Replace the oil filter
	Oil burnt from overheating	1.Flush the vacuum pump 2.Replace the oil filter, exhaust filters ; 3.Fill in new oil
	Mains frequency or voltage outside tolerance range	Provide a more stable power supply
	1.Partial clogging of filters or screens; 2.Partial clogging in the suction, discharge or pressure line	Remove the clogging
1.The vacuum pump fumes or expels oil droplets through the gas discharge 2.The oil level drops	Long suction , discharge or pressure line with too small diameter	Use larger diameter
	An exhaust filter is not properly seated	Check the proper position of the exhaust filters if necessary insert properly
	An o-ring is missing or damaged	Add an o-ring
1.The vacuum pump fumes or expels oil droplets through the gas discharge 2.The oil level drops	An exhaust filter shows cracks	Replace the exhaust filter
	1.The exhaust filter is clogged with foreign matter	Replace the exhaust filters
	1.Version with oil return valve in case the vacuum pump runs for more than 10 hours without interruption, oil can collect in the upper chamber of the oil separator to an extent that it gets expelled together with the discharged gas	1.Regularly shut down the vacuum pump for short periods of time. 2.Check that the oil return valve functions properly and lets oil run from the upper into the bottom chamber of the oil separator as soon as the vacuum pump is shut down
	Version with oil return valve to see does not work properly or is clogged	Clean or replace the oil return valve
	Version with float valve and oil return line is stuck in closed position	Make the float valve movable, replace if necessary
The oil is black	The oil return line is clogged or broken	1.Clean a clogged oil return line 2.Replace a broken oil return line with an identically dimensioned line, top up oil
	1.Oil change intervals are too long 2.The oil was overheated	1.Flush the vacuum pump 2.Replace the oil filter, exhaust filters and fill in new oil
The oil is watery and colored white	The vacuum pump aspirated water or significant amounts of humidity	1.Flush the vacuum pump 2.Replace the oil filter, exhaust filters and fill in new oil 3.Modify the operational mode
The oil is resinous and/or sticky	1.Improper oil type, perhaps in confusion 2.Topping up of incompatible oil	1.Flush the vacuum pump 2.Replace the oil filter, exhaust filters and fill in new oil 3.Make sure the proper oil is used for changing and topping up
The oil foams	Mixing of incompatible oils	1.Flush the vacuum pump 2.Replace the oil filter, exhaust filters and fill in new oil 3.Make sure the proper oil is used for changing and topping up

8. Exploded view

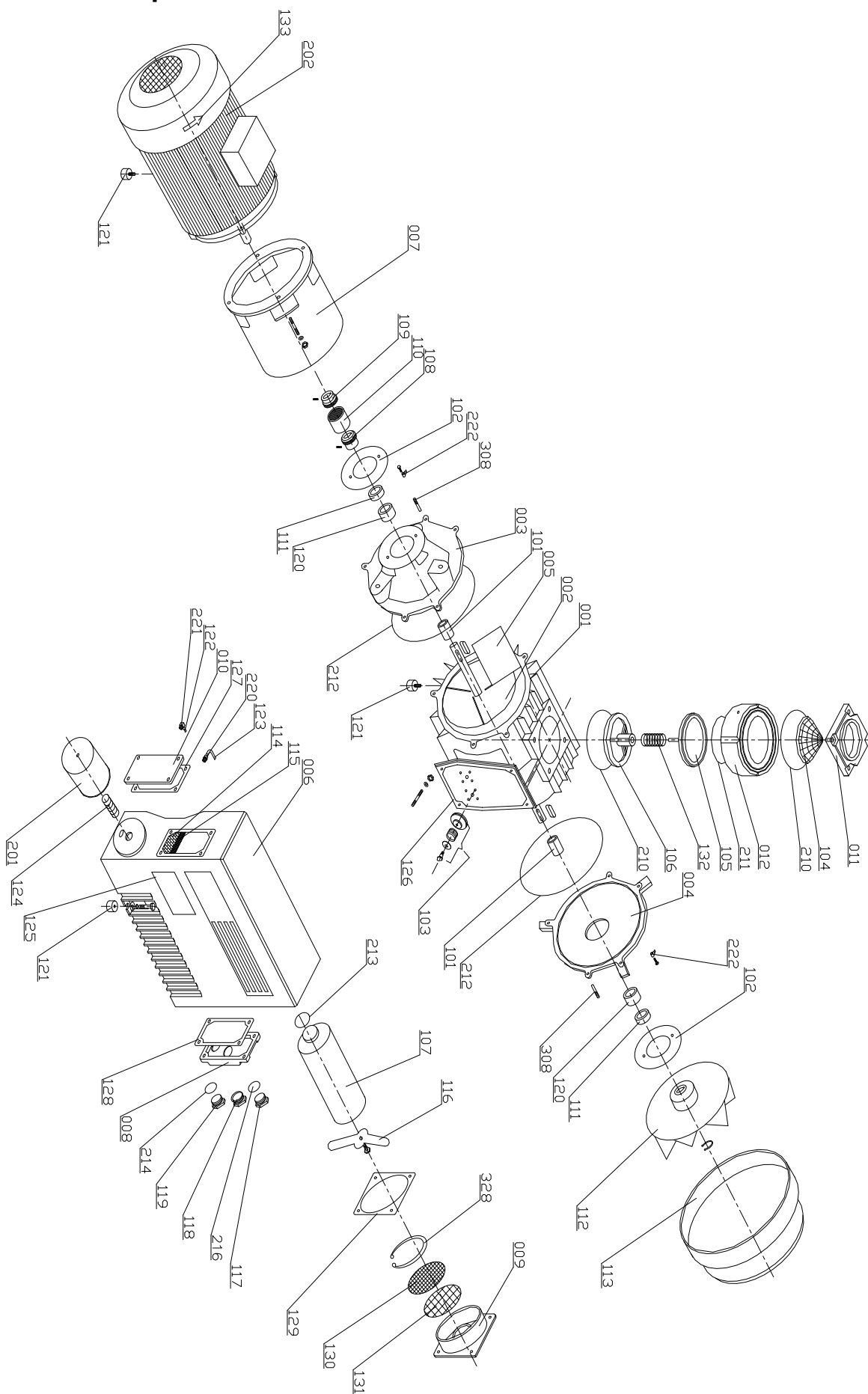
8.1 SV-010 ~ SV-025 exploded view



SV-010 ~ SV-025 Spare parts list

No.	Products Name	Specifications	No.	Products Name	Specifications
1	Stator		26	Seal ring	Outer 25*2.5
2	Rotor		27	Check valve cap	
3	Vane	19*4*7mm	28	Spring	
4	Motor		29	Check valve seat	
5	Stator cover		30	Screw	M6*1
6	Stator cover		31	Seal ring	Outer 56*3
7	Screw	M6*1	32	Oil tank	
8	Dowel pin	Taper M4	33	Nut	M8*1
9	Oil seal	32*20*7	34	Oil filler plug	G3/4
10	Copper bush	28*20*13	35	Oil drain plug	G1/2
11	Oil line connector	M8*1	36	Oil plug	G2
12	Oil pipe		37	Oil glass	G3/4
13	Oil pipe		38	Screw	M6*1
14	Pump coupling		39	Sealing gasket	
15	Coupling rubber		40	Oil line connector	G1/8
16	Motor coupling		41	Oil line connector	G1/8
17	Square cotter		42	Stud bolts	M8*1.25
18	Bracket		43	Stud bolts	M8*1.25
19	Screw	M6*1	44	Exhaust filter	
20	Screw	M6*1	45	Sealing gasket	
21	Rubber pads		46	Filter spring	
22	Nut	M8*1.25	47	Exhaust hole	
23	Inlet duct	G1/2	48	Exhaust rubber	
24	Snap spring		49	Gasket	
25	Screen		50	Screw	M5

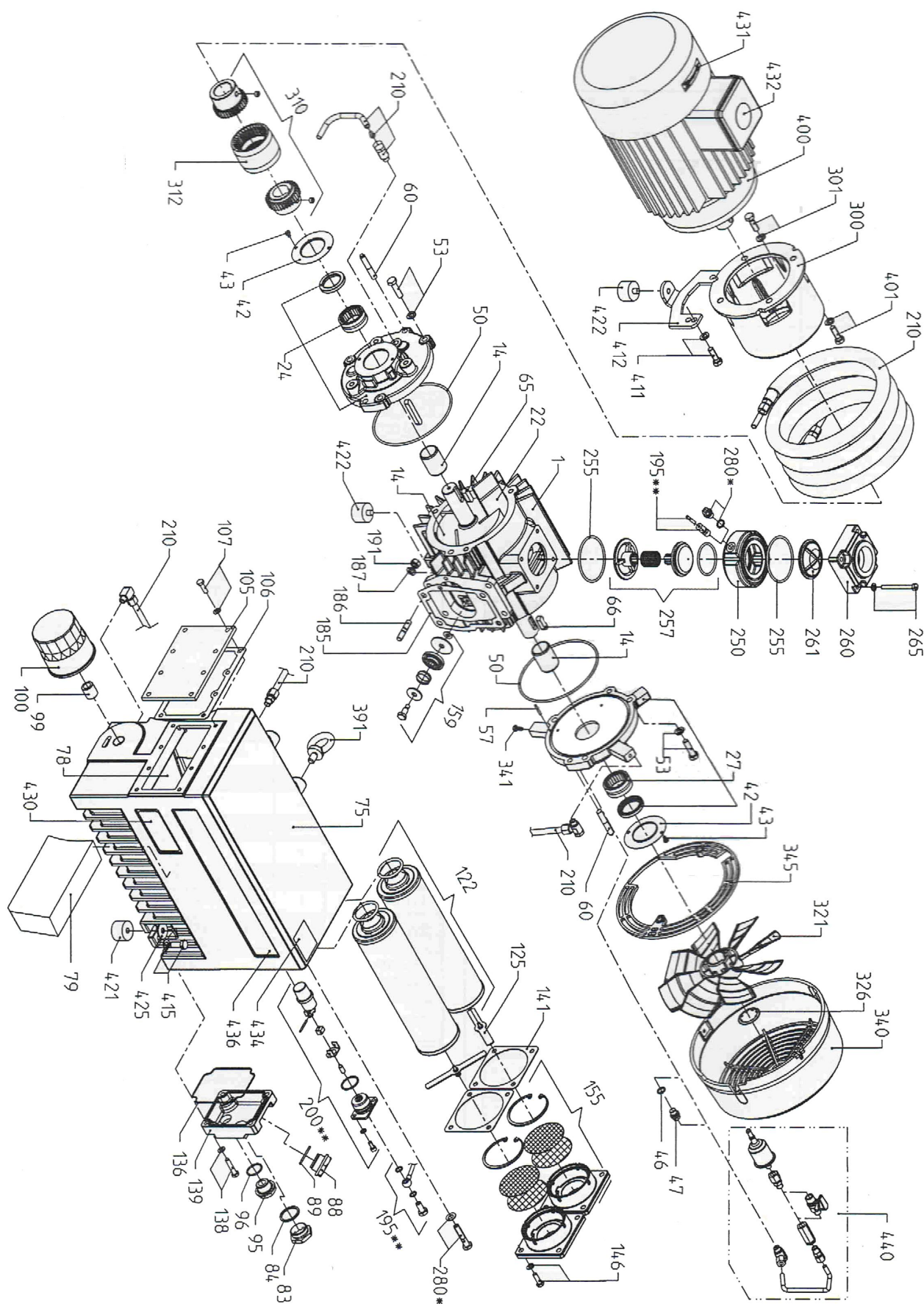
8.2 SV-040 exploded view



SV-040 Spare parts list

Spare parts				Spare parts		
POS.	Part	Qty		POS.	Part	Qty
1	Cylinder	1		202	Motor (60 Hz)	1
2	Rotor	1		210	O-ring	2
3	A-endplate	1		211	O-ring	1
4	B-endplate	1		212	O-ring	2
5	Vane	3		213	O-ring	1
6	Oil separator	1		214	O-ring	1
7	Connecting piece	1		216	O-ring	1
8	Service cover	1		220	Straight stud fitting	1
9	Exhaust cover plate	1		221	Angle studding	1
10	Cover	1		222	Hollow-core screw	1
11	Inlet flange	1		308	Taper pin	4
12	Inlet flange, lower housing	1				
101	Sleeve	2				
102	Supporting ring	2				
103	Exhaust valve	2				
104	Screen	1				
105	Valve plate	1				
106	Guide for valve plate	1				
107	Exhaust filter	1				
108	Oil sight glass. flat	1				
108	Coupler hub. rotor sided	1				
109	Coupling hub, motor sided	1				
110	Coupling sleeve	1				
111	Shaft seal	2				
112	Axial fan	1				
113	Fan hood	1				
114	Expanded metal	1				
115	Demister	1				
116	Filter spring	1				
117	Plug	1				
119	Plug	1				
120	Needle bearing	2				
121	Rubber foot	1				
122	A-tube (50 Hz)	1				
123	B-tube	1				
124	Threaded fitting	1				
125	Nameplate	1				
127	Seal	1				
128	Seal	1				
129	Seal	1				
130	Screen	1				
131	Screen	1				
132	Compression spring	1				
133	Directional arrow	1				
201	Oil filter	1				
202	Motor (50 Hz)	1				

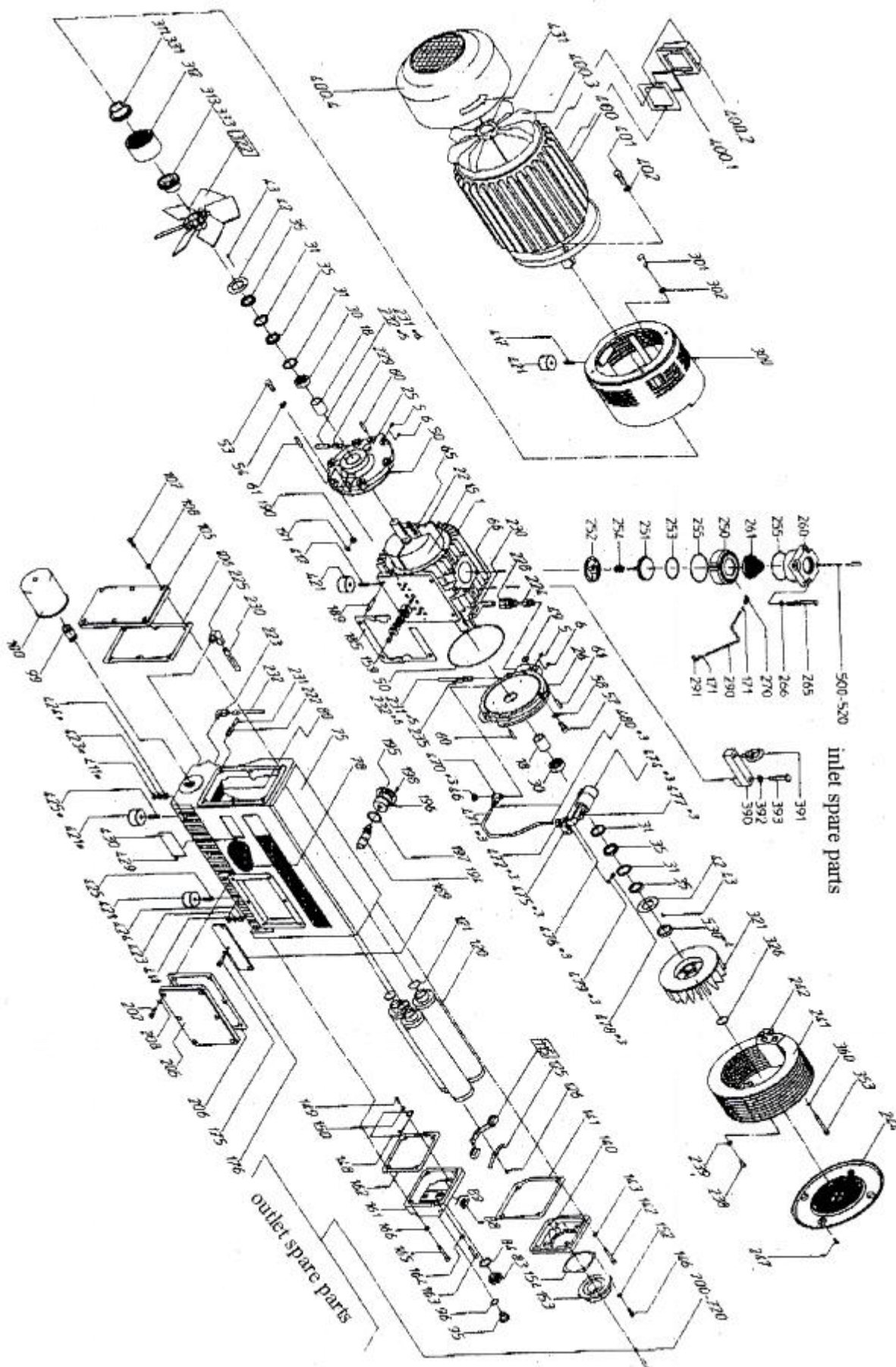
8.3 SV-063 ~ SV-100 exploded view



SV-063 ~ SV-100 Spare parts list

Spare parts			Spare parts		
POS.	Part	Qty	POS.	Part	Qty
1	Cylinder	1	257	Valve insert	1
14	Rotor	1	260	Inlet flange	1
22	Vane	3	261	Screen	1
24	Cylinder cover A-side	1	265	Hex head screw	4
27	Cylinder cover B-side	1	280	Oil return valve	1
42	Supporting washer	2	300	Motor flange	1
43	Hex head screw	4	301	Hex head screw	3
46	Seal ring	1	310	Coupling for motor	1
47	Plug	1	312	Coupling sleeve	1
50	O-ring	2	312	Rubber coupling insert	1
53	Hex head screw	6	315	Protection clip	3
57	Parallel pin	1	321	Axial flow fan	1
60	Taper pin	4			
65	Parallel key	1	326	Locking ring	1
75	Oil separator	1	340	Fan cover	1
78	Expanded metal	1	341	Tapping screw	3
79	Demister	1			
83	Sight glass	1	345	Protective grid	1
84	Gasket	1	391	Eye bolt	1
88	Plug	1	400	motor	1
89	O-ring	1	401	Hex head screw	1
95	Plug	1	411	Hex head screw	1
96	O-ring	1	412	Foot	1
99	Nipple	1	415	Hex head screw	1
100	Oil filter	1	421	Rubber foot	1
105	Cover	1	422	Rubber foot	1
106	Gasket	1	425	Washer	1
107	Hex head screw	8	430	Nameplate	1
122	Exhaust filter with o-ring	1	431	Directional arrow	1
125	Filter spring	2	432	Label before installation	1
136	Round gasket-service cover	1	434	Label hot surface	1
138	Hex head screw	4	436	Gas ballast(optional)	1
139	Service cover	1	440	Gas ballast	1
141	Gasket	2	540	Air filter	1
146	Hex head screw	8	541	Double nipple	1
155	Exhaust cover plate	2			
159	Exhaust valve	2			
185	Gasket	1			
186	Stud bolt	4			
187	Spring lock washer	4			
191	Hex nut	4			
195	Oil return line	1			
200	Float valve	1			
210	Oil supply	1			
250	Inlet flange, lower part	1			
255	O-ring	2			

8.4 SV-160 ~ SV-300 exploded view



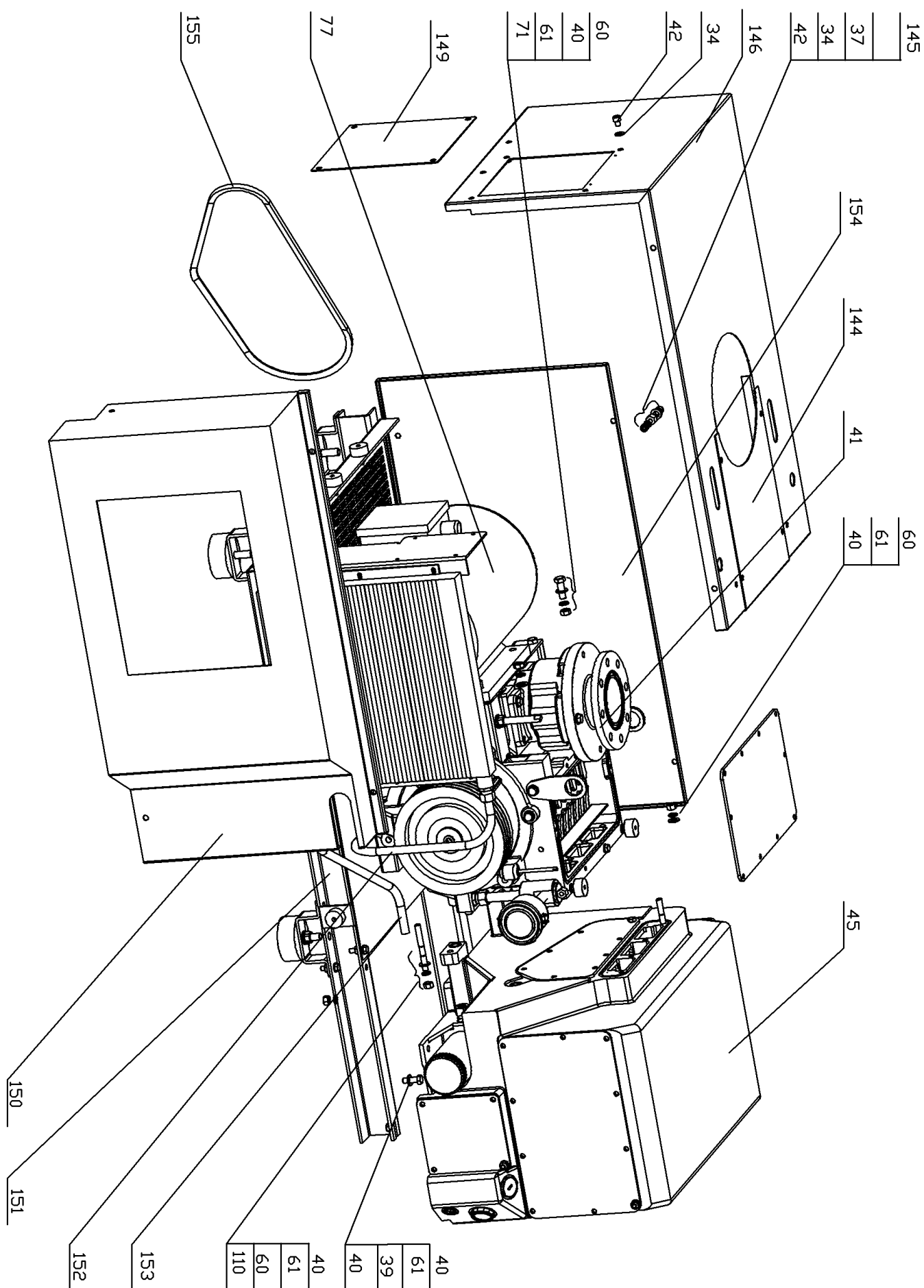
SV-160 ~ SV-300 Spare parts list

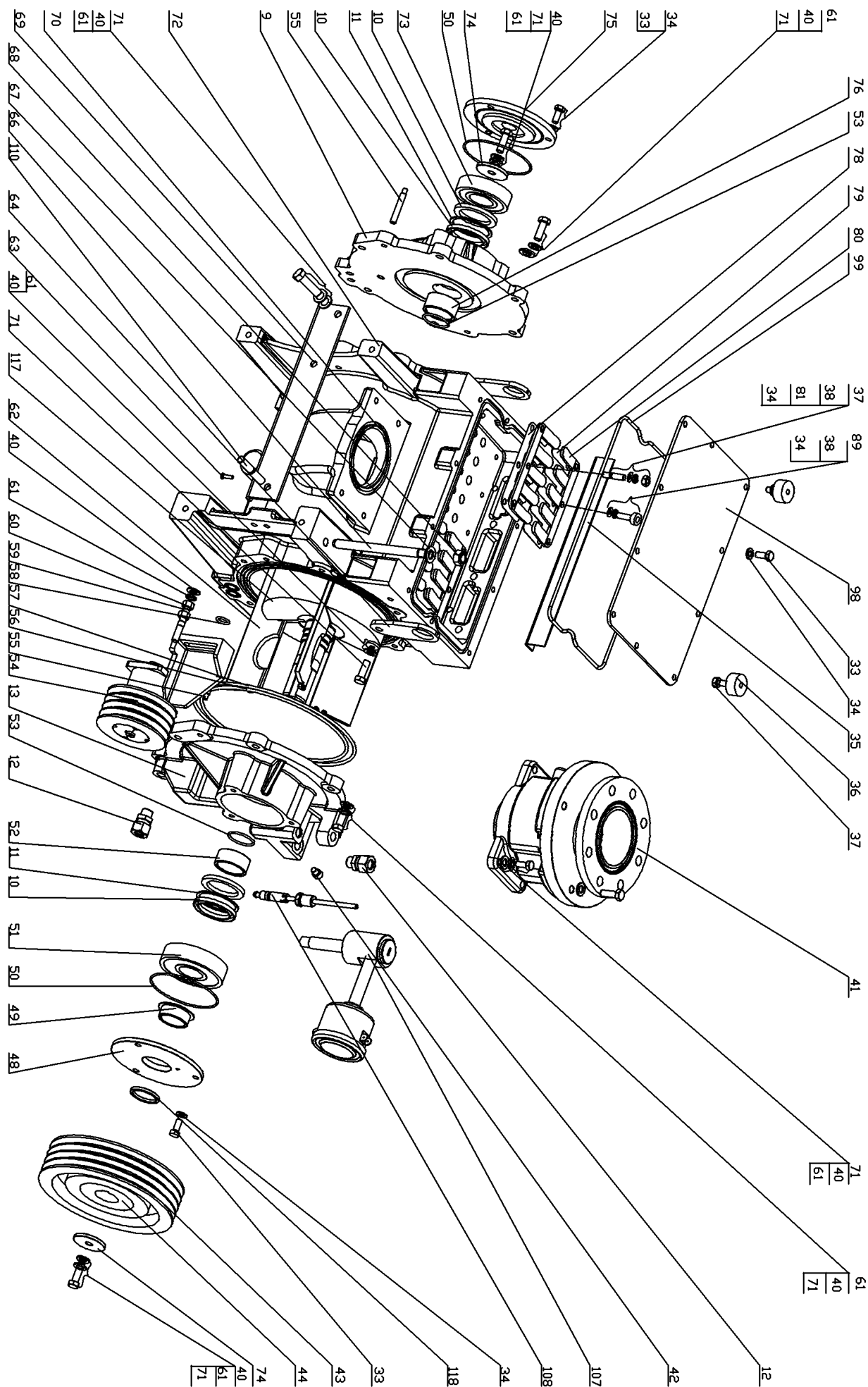
For SV-160/200

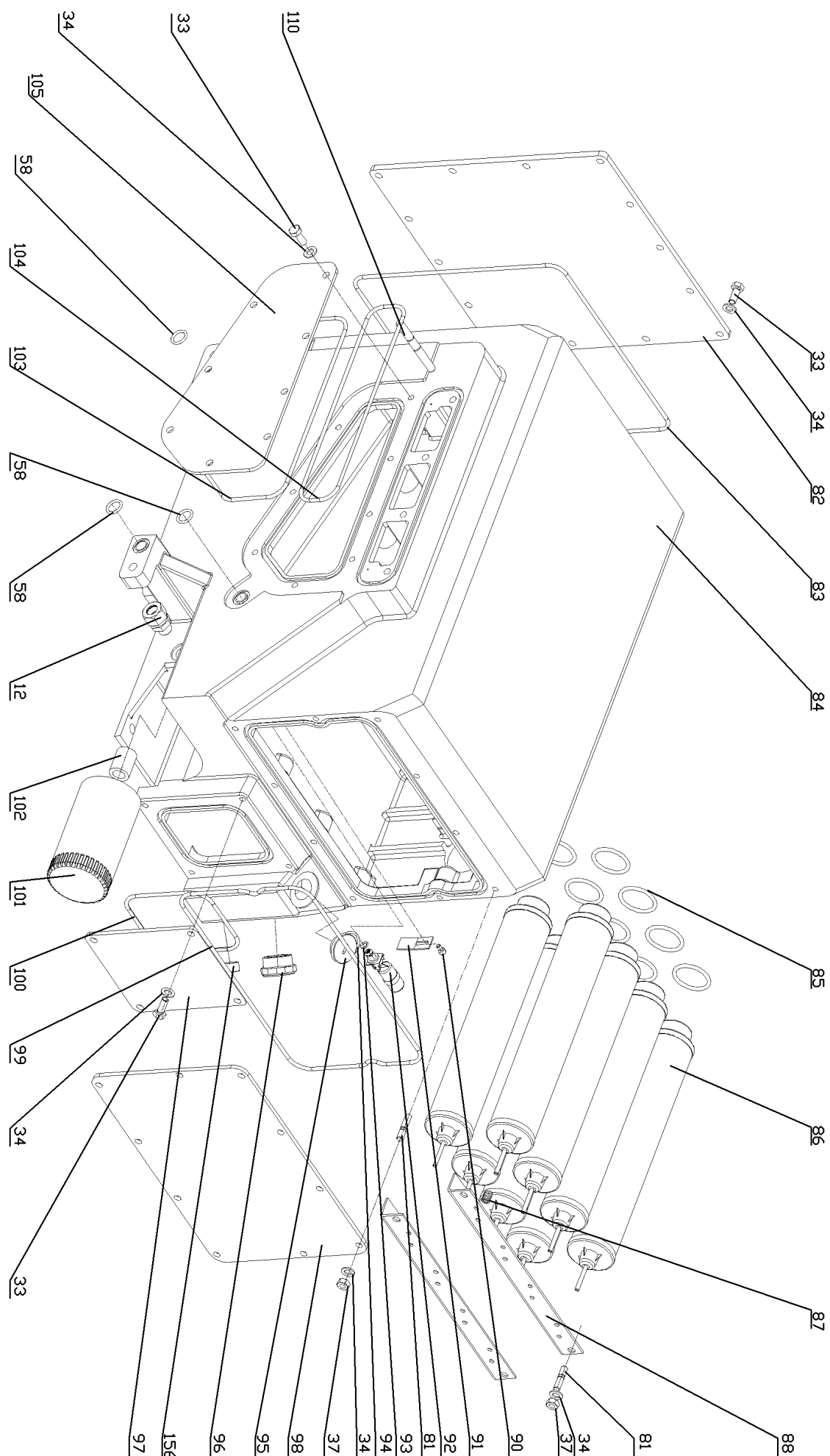
spare parts		
POS.	Part	Qty
18	Sleeve	2
22	Vanes	3
30	Needle bearing	2
35	Shaft seal	4
49	O-ring	2
50	O-ring	2
60	Taper pin	4
61	parallel pin	4
84	Seal	1
88	Plug	1
89	Seal	1
89	O-ring	1
95	Drain plug	1
96	O-ring	1
100	Oil filter	1
106	Oil separator seal	1
120	Exhaust filter	2
121	O-ring	2
141	Seal	1
159	Discharge seal	2
162	Seal	1
185	Oil separator seal	1
197	O-ring	1
206	Oil separator seal	1
242	O-ring	2
253	O-ring	1
255	O-ring	2
261	Mess screen	1

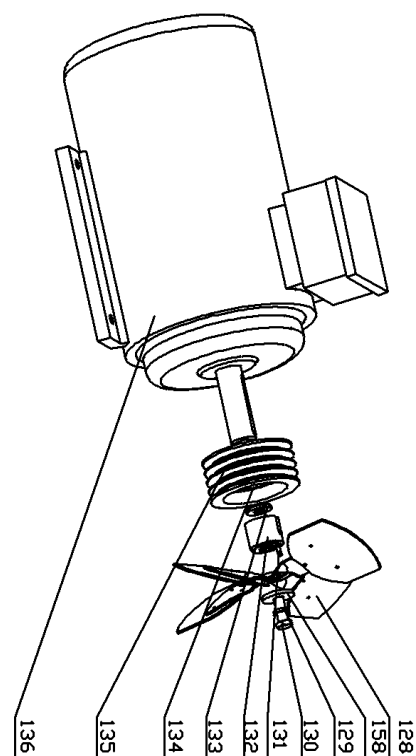
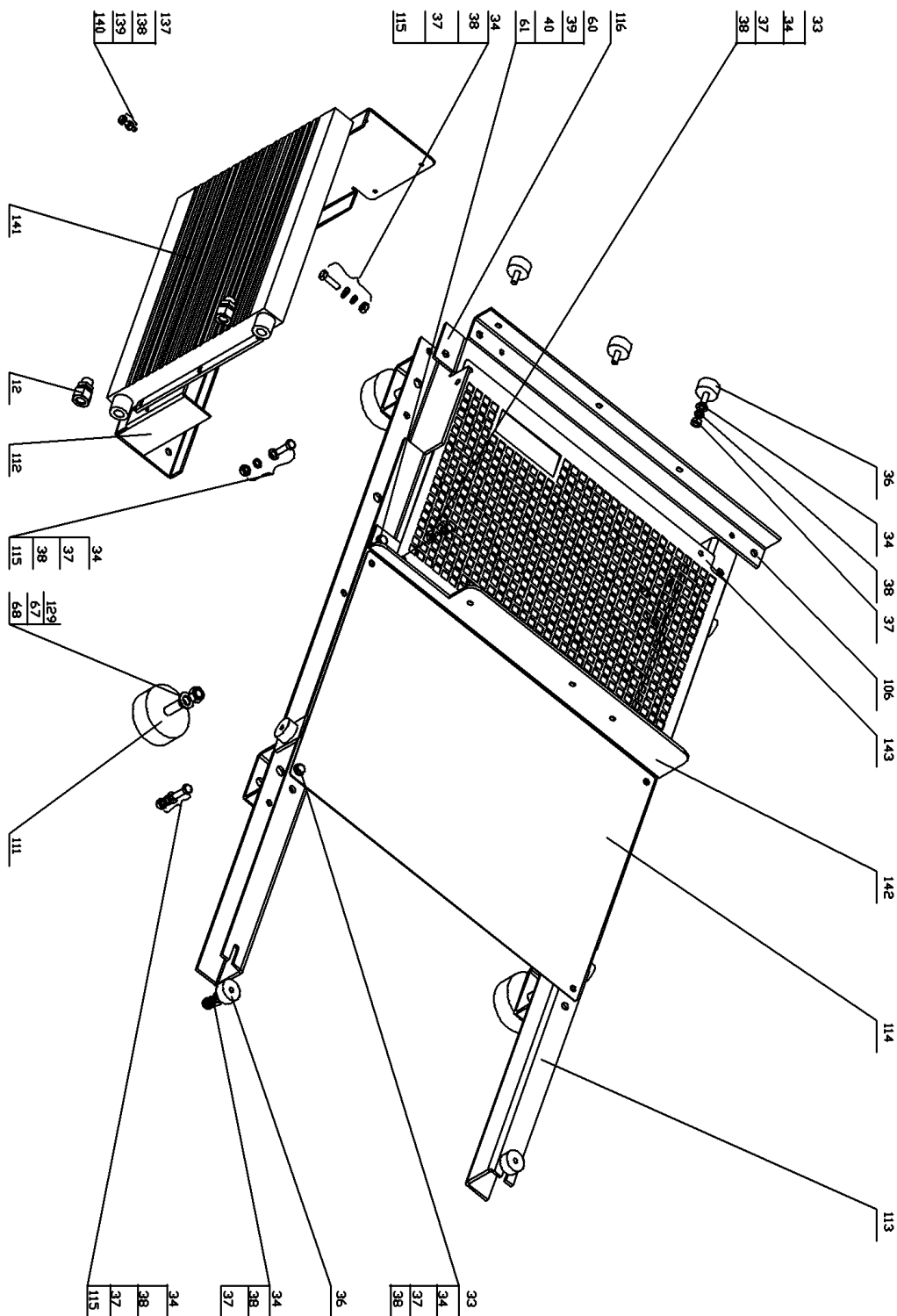
For SV-250/300

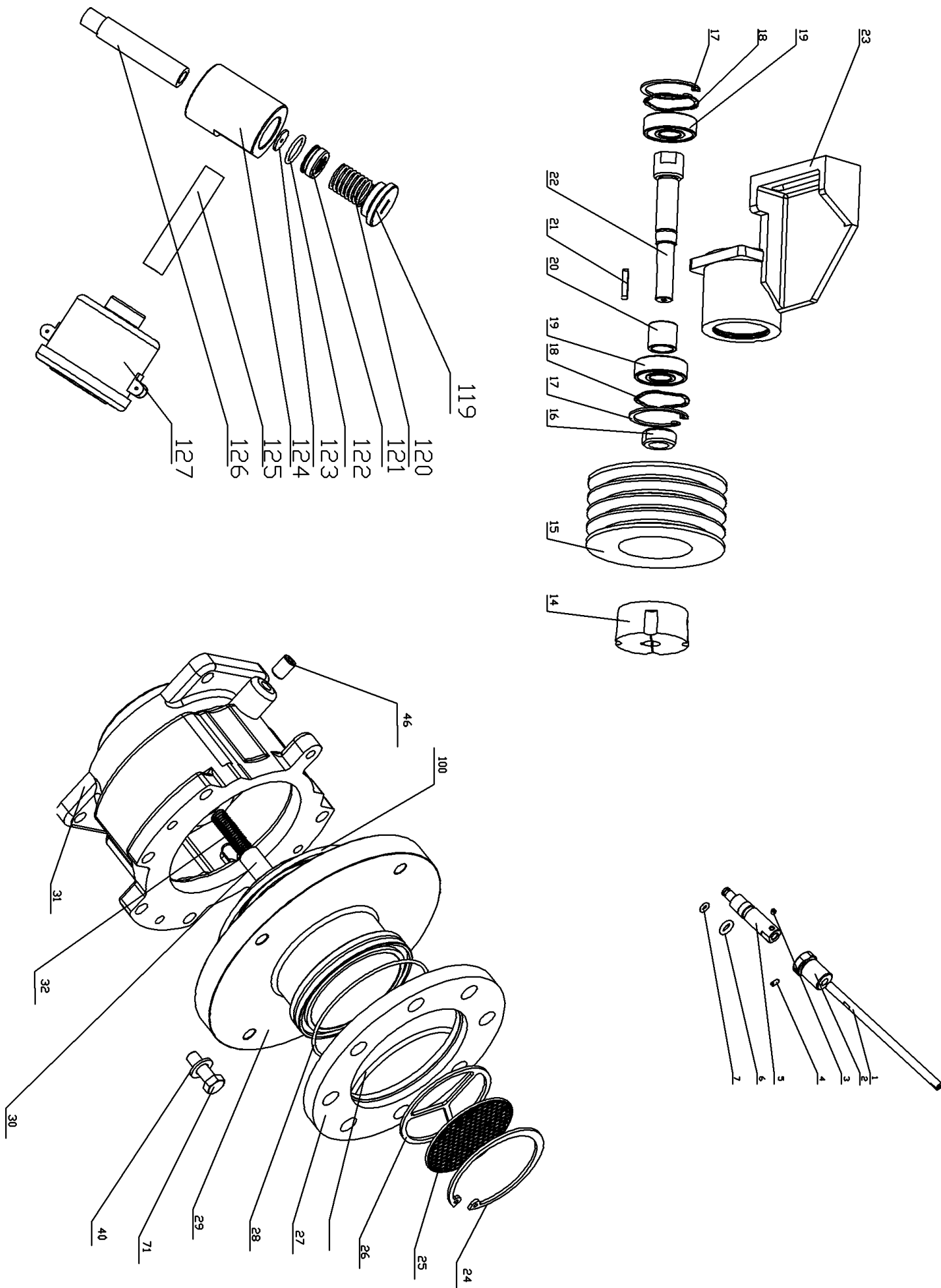
spare parts		
POS.	Part	Qty
18	Sleeve	2
22	Vanes	3
30	Needle bearing	2
35	Shaft seal	4
49	O-ring	2
50	O-ring	2
60	Taper pin	4
61	parallel pin	4
84	Seal	1
88	Plug	1
89	Seal	1
89	O-ring	1
95	Drain plug	1
96	O-ring	1
100	Oil filter	1
106	Oil separator seal	1
120	Exhaust filter	3
121	O-ring	2
141	Seal	1
159	Discharge seal	2
162	Seal	1
185	Oil separator seal	1
197	O-ring	1
206	Oil separator seal	1
242	O-ring	2
253	O-ring	1
255	O-ring	2
261	Mess screen	1

8.5 SV-630 ~ SV-750 exploded view









SV-630 ~ SV-750 Spare parts list

Item	Name	Quantity	Item	Name	Quantity
5	Air control valve	1	85	O ring	8
6	O ring	1	86	Exhaust filter	8
7	O ring	1	87	Exhaust filter spring	8
8	End cap	2	88	Filter bracket	2
9	Pump cover B	1	89	socket head cap screw	6
10	Oil seal	4	90	socket head cap screw	6
11	Clamp ring of oil seal	2	91	Float clamp	1
12	oil pipe joint	5	92	Float component	1
13	Pump cover A	1	93	O ring	1
14	taper sleeve	1	94	O ring	1
15	idle pulley	1	95	oil filler plug	1
16	gland nut	1	96	Oil level window	1
17	circlip for hole	2	97	Oil tank drainage plate	1
18	wave-shaped ring	2	98	Pump body&oil tank discharge plate	2
19	bearing	2	99	O ring	2
20	Clamp ring of idle shaft	1	100	O ring	2
21	Flat key	1	101	oil filter	1
22	Idle shaft	1	102	connector	1
23	Idle foundation	1	103	O ring	1
24	circlip for hole	1	104	O ring	1
25	filter screen	1	105	Oil Tank side cover plate	1
26	filter bracket	1	106	housing separator	1
27	flange	1	107	gas ballasting component	1
28	spring collar	1	108	gas ballasting Control component	1
29	inlet flange seat	1	109	Shock absorber anchor frame	4
30	Inlet check valve	1	110	stud	4
31	Inlet seat	1	111	Rubber shock absorption,	4
32	Intake valve spring	1	112	radiator mounting bracket	1
33	bolt	50	113	Side frame beam B	1
34	flat gasket	95	114	Pump body bottom	1
35	Exhaust oil baffle plate	1	115	bolt	10
36	cushion block	10	116	Side frame beam A	1
37	nut	50	117	rotor	1
38	SPRING WASHER	42	118	Big belt wheel mounting clamp ring	1
39	bolt	22	119	gas ballasting value plate	1
40	flat gasket	43	120	gas ballasting value spring	1
41	Suction component	1	121	gas ballast valve core	1
42	bolt		122	O ring	1
43	belt pulley	1	123	gas ballast vane	1
44	taper sleeve	1	124	gas ballast body	1
45	Oil tank component	1	125	Air filter for gas ballast	1
46	end cap	1	126	gas ballast pipe	1
47	bolt	2	127	air filter	1
48	Bearing cover A	1	128	Cooling fan	1

49	bearing retainer A	1	129	resilient pad	5
50	O ring	2	130	bolt	1
51	bearing	1	131	straight pin	1
52	Shaft sleeve	1	132	Fan foundation	1
53	O ring	2	133	Fan adjustment gasket	1
54	idler pulley component	1	134	taper sleeve	1
55	taper pin	2	135	belt pulley	1
56	O ring	2	136	motor	1
57	O ring	2	137	bolt	3
58	O ring	3	138	flat gasket	3
59	bolt	1	139	resilient pad	3
60	nut	13	140	nut	3
61	resilient pad	33	141	radiator	1
62	Vane	3	142	Motor mounting bracket	1
64	ring	2	143	half tone	1
65	stud	2	144	Casing inlet cover plate	1
66	Idler plunger	1	145	coupling nut	6
67	Flexible flat gasket	1	146	cover	1
68	nut	1	147	flat gasket	
69	Motor holder	1	148	nut	
70	O ring	1	149	Maintenance cover plate	1
71	hexagonal head screw	18	150	radiator shield	1
72	Pump casing	1	151	Frame component	1
73	bearing	1	152	oil charging pipe	1
74	D60 pressing plate	2	153	Oil out pipe	1
75	Bearing cover B	1	154	Shield side cover plate	1
76	Shaft sleeve	1	155	V-belt	4
77	Motor component	1	156	end cap	1
78	Exhaust valve	2	157	O ring	1
79	Exhaust valve	2	158	Fan pressure plate	1
80	Exhaust valve baffle	4	159	bolt	2
81	stud	20	160	flat gasket	2
82	Oil tank cover	1	161	resilient pad	2
83	O ring	1	162	bolt	1
84	Oil tank	1	163	gasket	5
			164	heat exchanger	1
			165	water pipe connector	1
			166	water pipe connector	1
			167	Ball valve	1
			168	flexible pipe connector	2
			169	90 degree connector	3
			170	t-branch pipe	1
			171	oil return pipe	1
			172	oil return pipe	1
			173	Water cooled heat exchangers	1
			174	Water cooled heat exchangers foundation	1

9. Recommended vacuum oil

Item	HFV-A100	HFV-A200	HFV-A250	Measurement methods
viscosity(40℃),mm²/s	41.4-50.6	61.2-74.8	90-110	GB/T265
Viscosity index(VI)	105	105	105	GB/T2541
Flash point ℃	225	240	250	GB/T3536
Pour point ℃	10	10	10	GB/T3536
anti-emulsification (40-40-0)ml,min				
54℃	10	10	---	GB/T7305
82℃	---	---	10	
Spumescence (ml/ml)				
24℃	80/0	80/0	80/0	GB/T2579
93.5℃	50/0	50/0	50/0	
Ultimate pressure kpa				
Partial pressure	2*10 ⁻⁵	2*10 ⁻⁵	2*10 ⁻⁵	GB/T6306.2
Total pressure	2*10 ⁻⁴	2*10 ⁻⁴	2*10 ⁻⁴	