

# JUST PUMPS

## Oil Sealed Rotary Vane Vacuum Pump

SV Model

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### Operating Manual



CE

Model:SV-020 ~ SV-300

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## 1 Important basic information

### 1.1 Statement

These operating instructions form 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 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.

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

### 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 of 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 that any unpleasant misunderstanding takes place once the sale has been completed. When our vacuum pumps have to be installed in new applications or any time there is a doubt on the good result of the installation, please ask 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 SAFTY :

- This vacuum pump is produced according to the latest technical standards and safety specification. There will occur Danger 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 pumping corrosive, toxic, explosive gas or transport the other object.

## JUST PUMPS CC

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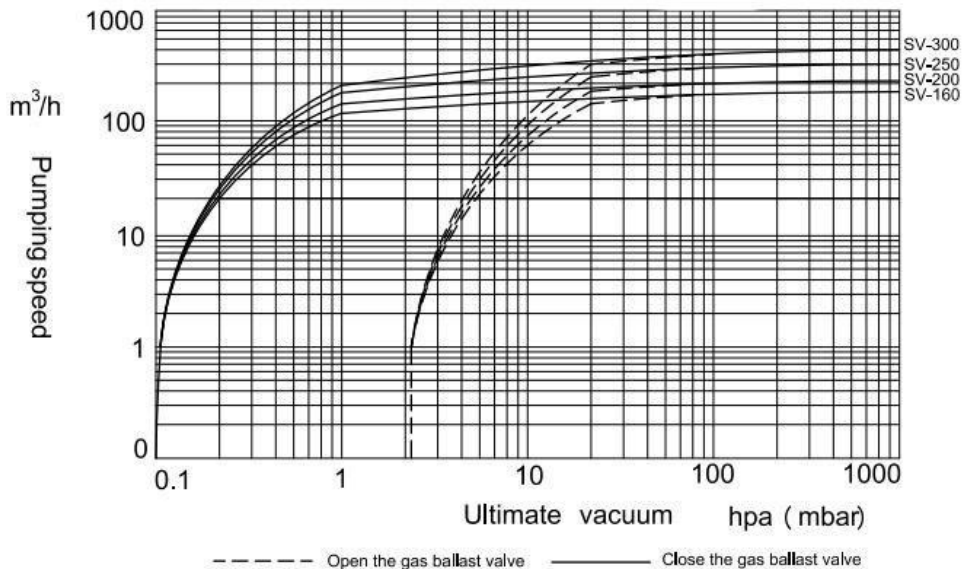
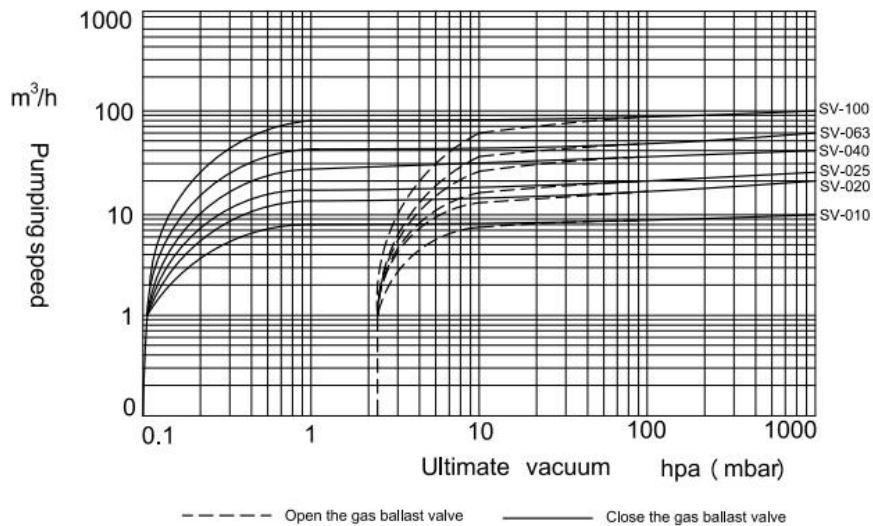
Email: [sales@justpumps.co.za](mailto:sales@justpumps.co.za)

### 2. Performance specification

#### 2.1 Technical data

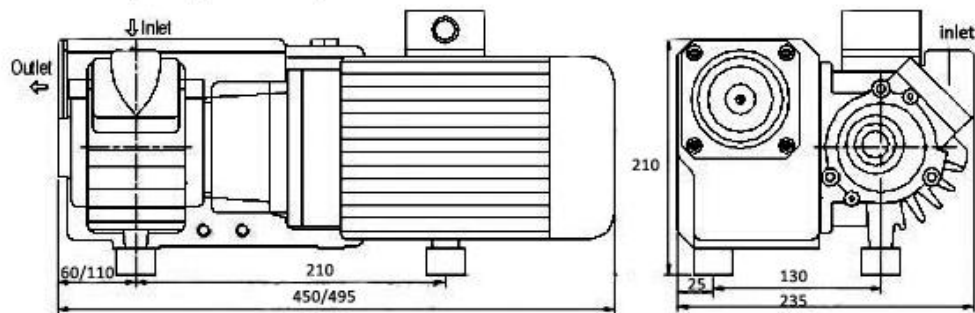
Model	Pump capacity (m <sup>3</sup> /h)		Ultimate vacuum (Pa)	Motor Power (KW)		Inlet Diam (inch)	Rotary speed (rpm)	Oil Capacity (L)	N.W (kg)	Noise dB (A)	Dimensions (mm)
	50HZ	60HZ		50HZ	60HZ						
SV-020	20	24	200	0.75-3ph		G1/2	2800	0.5	25	70	450*235*210
SV-025	25	30	200	0.90-1ph		G3/4	2800	0.5	28	70	495*235*210
SV-040	40	48	50	1.5		G1 1/4	1440	1.5	57	67	650*300*280
SV-040N	40	48	50	1.5		G1 1/4	1440	1.5	57	67	520*300*270
SV-063	63	75	50	2.2		G1 1/4	1440	2.0	82	68	650*430*300
SV-063N	63	75	50	2.2		G1 1/4	1440	2.0	82	68	555*420*295
SV-100	100	120	50	3.0		G1 1/4	1440	2.0	93	72	720*430*300
SV-140	140	168	50	3.5		G2	1440	3.5	116	70	810*470*480
SV-160	160	192	50	4.5		G2	1440	4.5	130	74	850*505*430
SV-200	200	240	50	4.5		G2	1440	4.5	158	76	850*505*430
SV-250	250	300	50	7.5		G2	1440	7.0	223	76	1060*560*410
SV-300	300	360	50	7.5		G2	1440	7.0	223	76	1060*560*410

#### 2.2 Performance curve

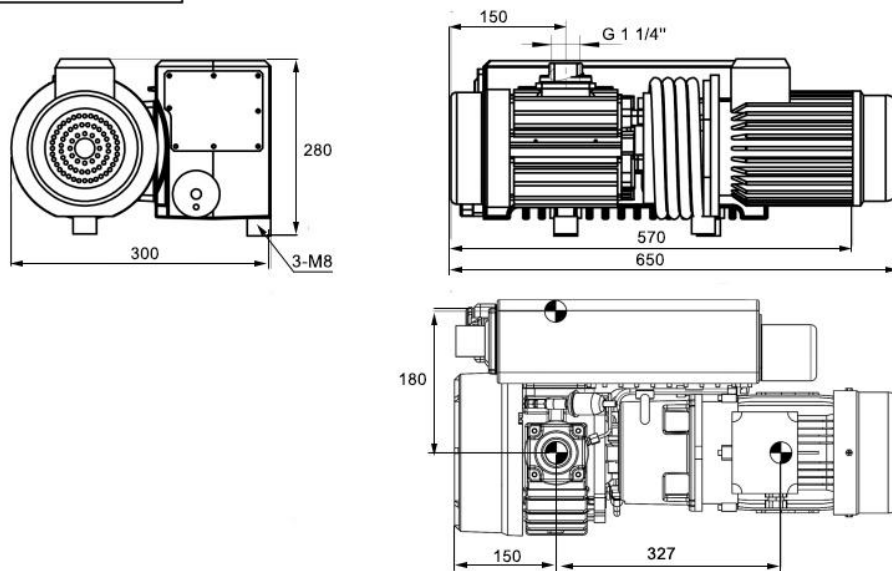


### 2.2 Installation size (Unit: mm)

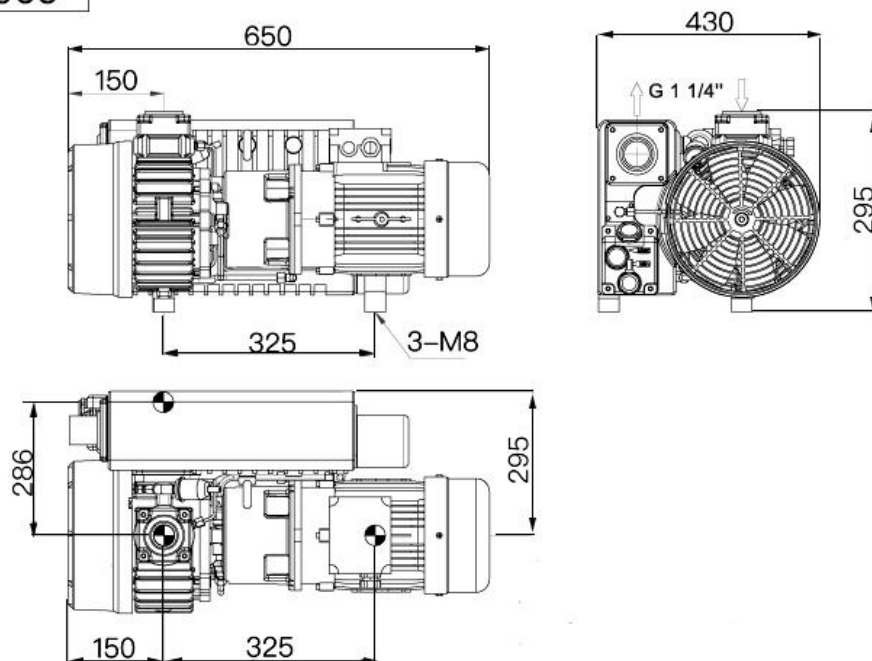
SV020/025(unit:mm)



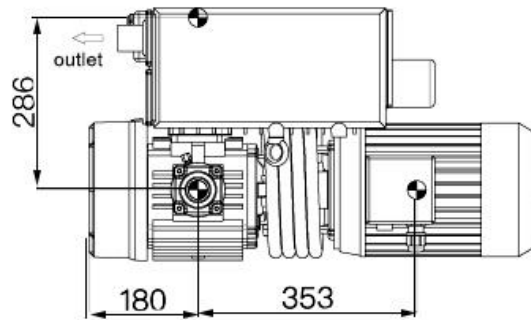
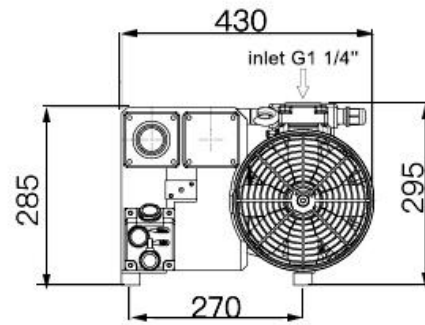
SV-040



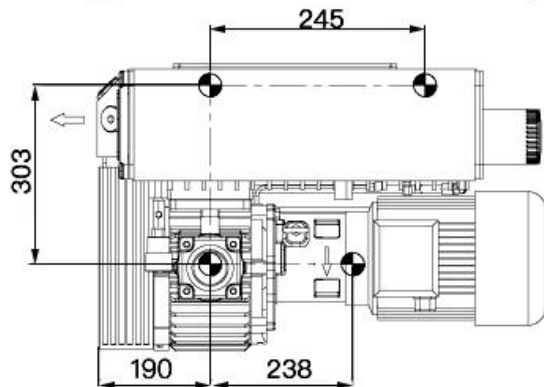
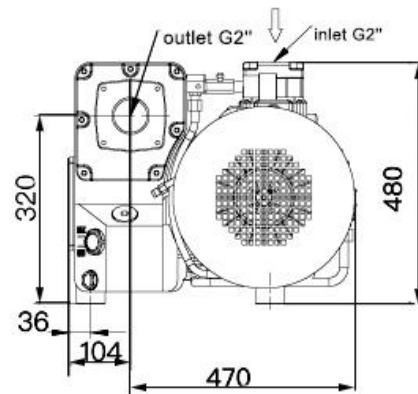
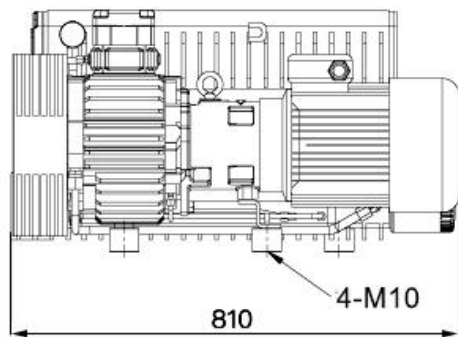
SV-063



### SV-100

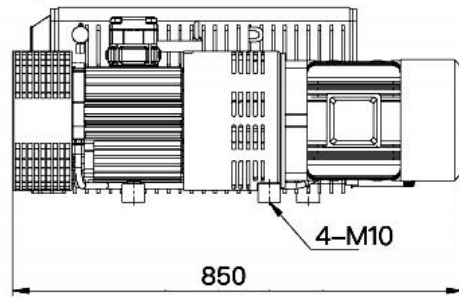


### SV-140

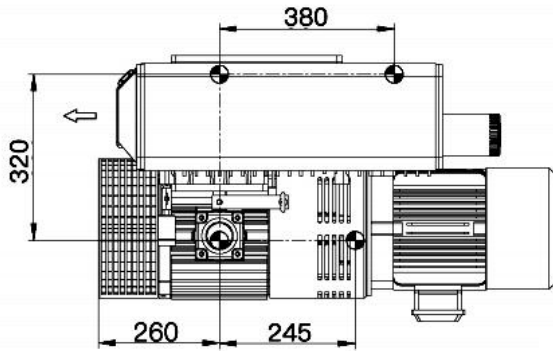
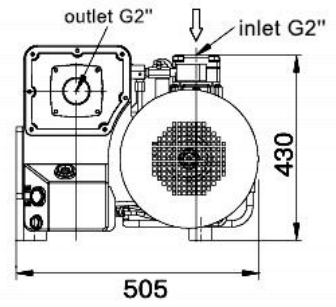


# JUST PUMPS

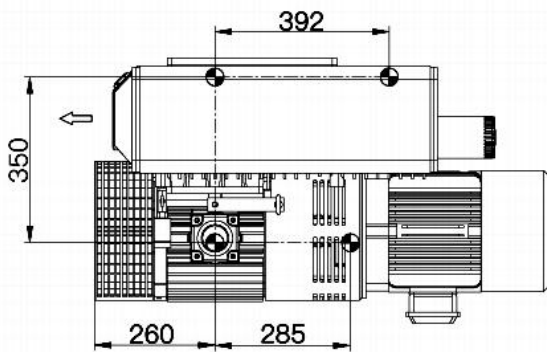
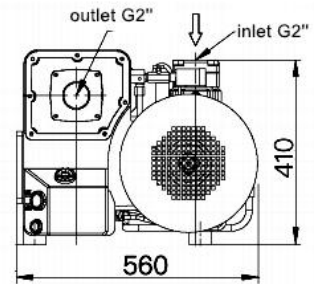
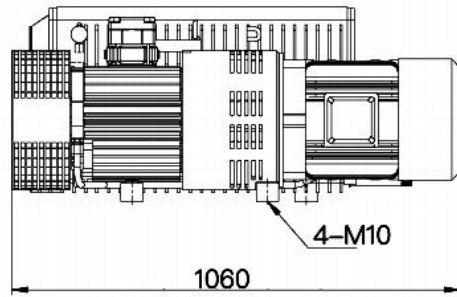
## SV-160/200



## Operating Manual



## SV-250/300



## 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"

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.

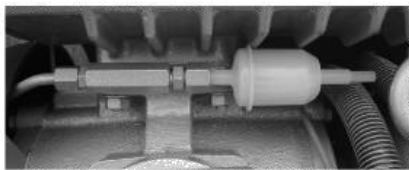
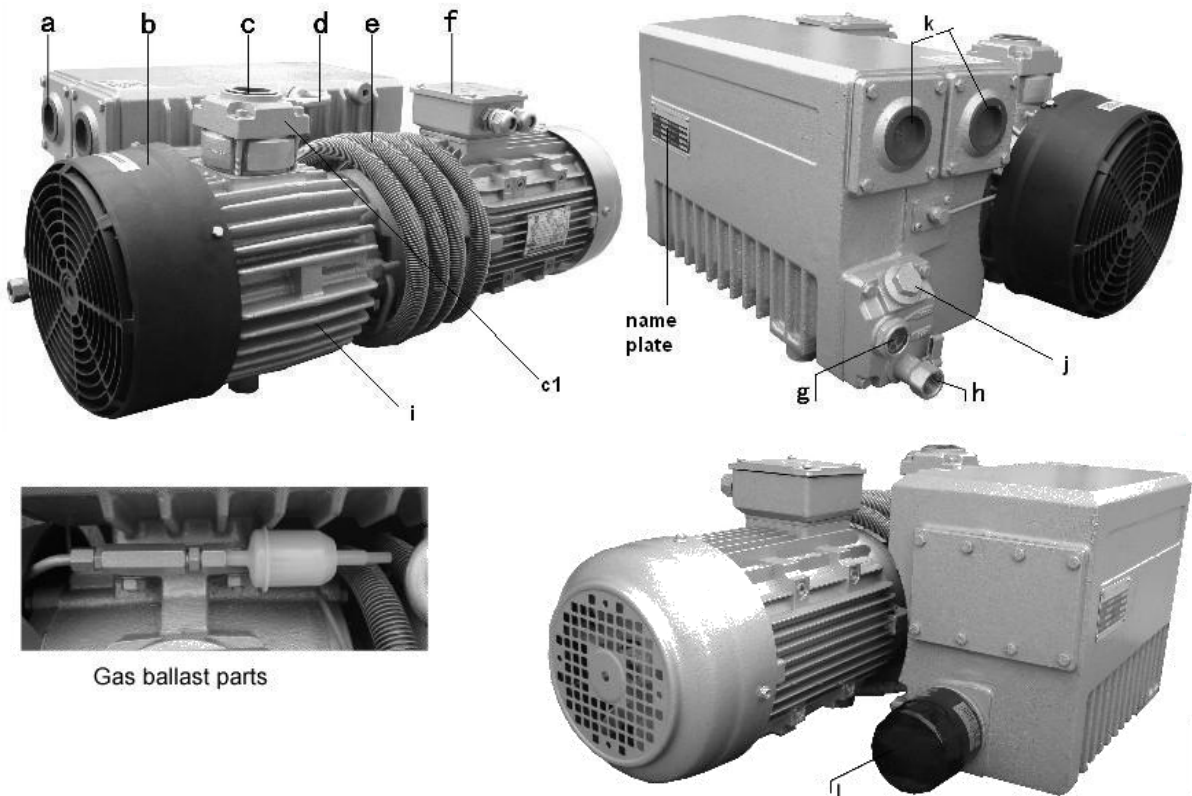
Version with float valve and oil return line; The vacuum pump is thermally suitable for continuous operation. Version with oil return valve;

The vacuum pump is thermally suitable for continuous operation.

The vacuum pump is ultimate pressure proof.

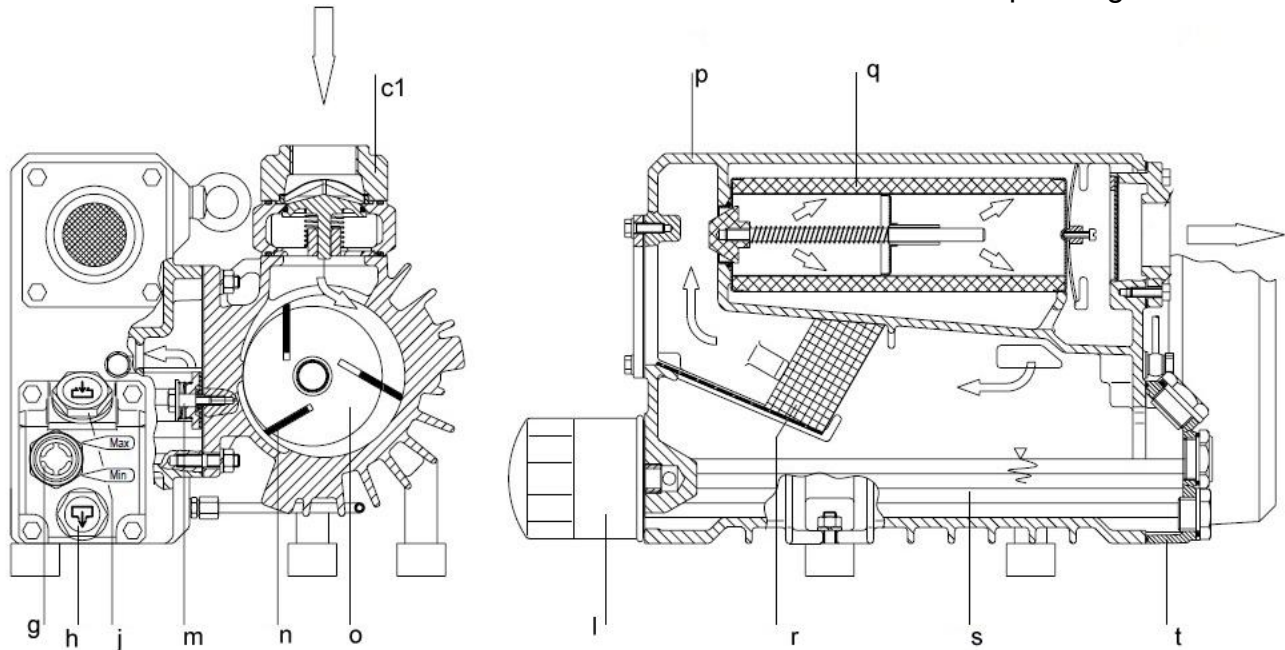
### 3.2. Operating principle

Illustration showing for SV model



Gas ballast parts

- |                   |                              |                  |                    |
|-------------------|------------------------------|------------------|--------------------|
| 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 centrally on the shaft of the vacuum pump. The shaft of the vacuum pump is driven by the drive motor shaft by means of a flexible coupling.

The rotor rotates in an also 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 no 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 :

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

## 4 Installation and Commissioning

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.

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. 15minutes .

After turning off the vacuum pump the pressure difference 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 pump shaft.

### 4.1 Installation Prerequisites

#### 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.
  - ◆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.



#### CAUTION

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

**Risk of burns!**

- 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.

### 4.2 Suction Connection

#### 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 .
- Make sure that the suction line fits to the suction connection of the vacuum pump.
- 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.

### 4.3 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

### 4.4 Mounting

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

### 4.5 Connecting Electrically

#### CAUTION



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

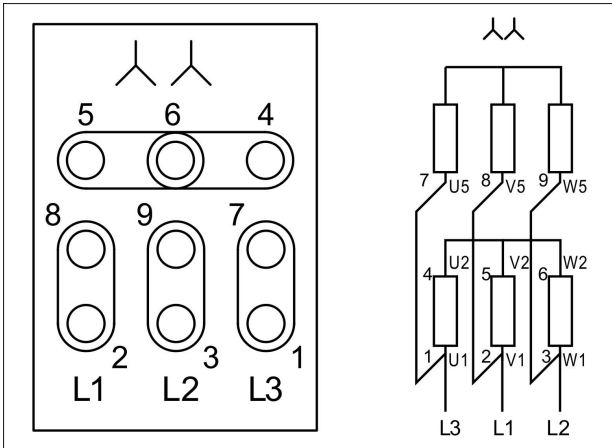
#### Risk of damage to the drive motor!

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

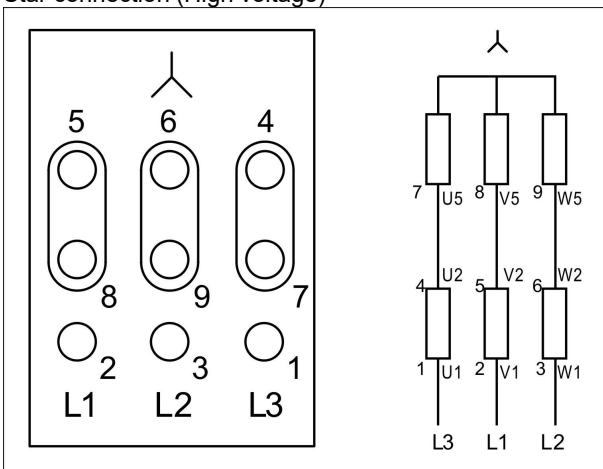
- Electrically connect the drive motor.
- Connect the protective earth conductor.

#### 4.5.1 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"

Before changing the oil type, compatibility shall be checked and, if necessary, the pump be flushed.

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**



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.

**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 if work 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 - 3000 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

## 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 500hr operating 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
- 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 according 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

We 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

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
  - ◆ 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 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
<p>1. The vacuum pump does not reach the usual pressure;</p> <p>2. The drive motor draws a too high current (compare with initial value after commissioning);</p> <p>3. Evacuation of the system takes too long</p>	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
	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	
The gas conveyed by the vacuum pump smells displeasing	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 vacuum pump does not start	The drive motor is not supplied with the correct voltage or is overloaded	Supply the drive motor with the correct 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 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 run 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 labours 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
The vacuum pump runs very noisily	Foreign objects in the vacuum pump broken vanes and Stuck bearings.	Repair the vacuum pump
	Defective bearings	Repair the vacuum pump
	Worn coupling element	Replace the coupling element
The vacuum pump runs very hot (the oil sump temperature shall not exceed 100°C)	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 space only if sufficient ventilation is ensured on a vacuum pump with oil-cooler; 4.Clean the intermediate spaces of the 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 vacuum pump runs very hot (the oil sump temperature shall not exceed 100°C)	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
	Long suction , discharge or pressure line with too small diameter	Use larger diameter
1.The vacuum pump fumes or expels oil droplets through the gas discharge 2.The oil level drops	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	Check and replace O-ring
	An exhaust filter shows cracks	Replace the exhaust filter
1.The vacuum pump fumes or expels oil droplets through the gas discharge 2.The oil level drops	1.The exhaust filter is clogged	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 return line is clogged or broken	1.Clean a clogged oil return line 2.Replace a broken oil return line
The oil is black	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. Oil

Item	HFV-A100	HFV-A200	HFV-A250	Measurement methods
viscosity(40℃),mm <sup>2</sup> /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 <sup>-5</sup>	2*10 <sup>-5</sup>	2*10 <sup>-5</sup>	GB/T6306.2
Total pressure	2*10 <sup>-4</sup>	2*10 <sup>-4</sup>	2*10 <sup>-4</sup>	

#### The periodic table of pump oil change

Application	Change period
Low vacuum drying,vacuum mixer, food packing	1 week
High vacuum drying, vacuum forming,vacuum impregnation, vacuum packing equipment.	1 month
Heat-treatment,metallurgy industry.	1 month
Round exhaust machine, large vacuum coating machine.	3 months
Vacuum equipment for research and experiment, small vacuum equipment	6-12 months