Version : 2024 Rev.0

Dry Screw Vacuum Pump

SH-DSV130/330/530/830

TABLE OF CONTENTS

Keep this manual on-hand so it can be used by all operators of the unit.
Use the unit only in the way described in this manual.
Failure to follow the instruction in this manual may cause wrong operation.

1. Notices for Use

Dear users, Thanks for your trust and support for our DSV series dry screw vacuum pump(the pump or the product). We're dedicated to providing you high-quality services. Upon receiving the product, please carefully check whether the product is consistent with the ordered one, whether the accessories and User Manual are available, and whether there is any product damage during transportation. If any of the problems above occurs, please feel free to contact our Sales Department or the local distributor in time.

In order to ensure the long-term stable operation of the product, please read this Manual carefully before installing, operating, overhauling or maintaining the product so as to fully understand relevant points about the product, such as safety issues, technical parameters and operation methods.

Warning

Attention should be paid to prevent a possible threat to personal safety.

Notice

Special attention should be paid to prevent damage to the pump.

There may be danger of electric shock, Cut off the power supply before wiring, repairing and maintenance.
Cover the junction box when the pump is running.

The pump temperature is very high when the pump is running and after it stops. Do not touch it.

Notice

Before using this product, please read this operation instructions carefully. Follow the operation instructions strictly. This product (including the operation instructions) is subject to change without prior notice. Fill the pump oil as required before using a new product

2. Precautions

To ensure personal safety, please read the following information carefully before installing, operating, overhauling or maintaining the product.

Warning

Make sure the power supply used is the one marked on the product. Connect power supply by personnel holding an electrician license according to the technical standards of power equipment and wiring requirements.

Warning

Cut off the power supply before checking or repairing the pump, so as to avoid personal injury or death due to electric shock or sudden start of the pump

Warning

Before starting the pump, make sure that the power supply of motor is the one marked on the product. The rated current of the selected cable and motor protection switch must match the rated current on the motor nameplate.

Warning

The product cannot be used for pumping active, corrosive, toxic, flammable or explosive gases. If necessary, please feel free to contact us.

Warning

Please do not place any object that affects ventilation effect around the motor, so as to avoid scalding or fire caused by abnormal temperature rise.

Warning

Make sure the exhaust port is kept unblocked prior to running the pump. It is forbidden to block or restrict air flow of the exhaust port in any way. The size of the exhaust pipe shall be such designed to ensure that the absolute pressure does not exceed 1.15 bar (relative pressure does not exceed 0.15 bar)

Attention

If the vacuum degree and current become abnormal, check whether the exhaust port is blocked. If the exhaust filter element is installed, check whether the element needs cleaning or replacing.

Attention

The ambient temperature of the pump is 5-40℃

Attention

Check the oil level of the gear box before running the pump. Do not use the pump without oil or oil shortage in the gear box, otherwise the pump will fail.

Attention

Please fill oil to the pump in strict accordance with the requirements of scale line. Excessive oil may cause pump failure.
The normal oil level is at 1/3 of the oil immersion lens.

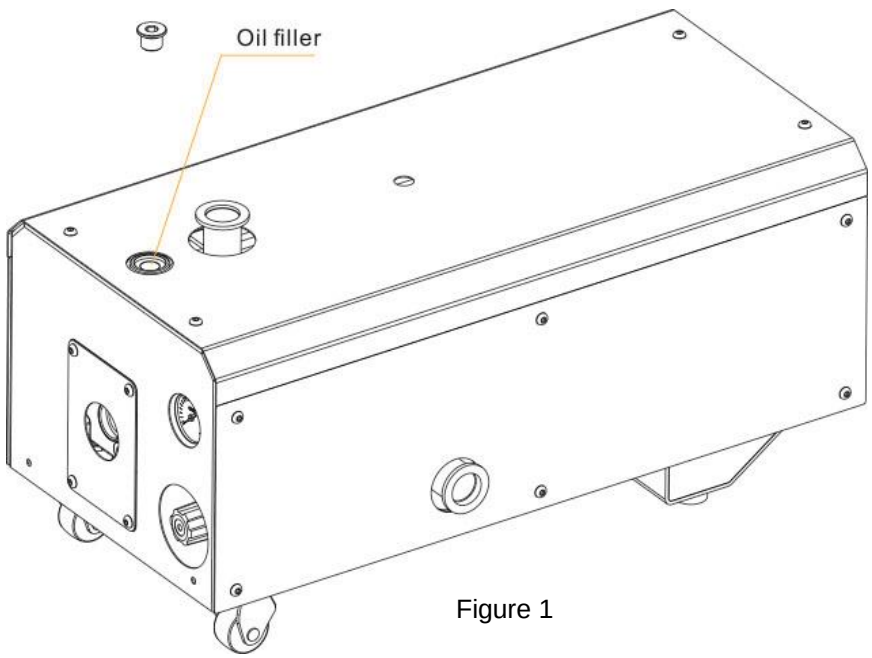


Figure 1

Attention

When the pump runs abnormally or the total running time exceeds 6,000 hours, remove the front plate to check the status of oil:

1. If the lubricating oil turns dark or the oil level is lower than min. requirements, replace or add oil instead.
2. Tighten the filler plug and drain plug after oil change or filling ; otherwise the vacuum degree will be affected and oil leakage may occur.
3. Fill the specified vacuum pump oil.

Attention

Connect the pump to the vacuum system by placing pump feet directly on the ground horizontally or connecting pump feet via bolts.

Attention

The temperature of pump surface may be very high when the pump is running and within 1 hour after it stops running. Therefore, it is forbidden to touch the surface of gear box and the pump in order to avoid scalding.

Attention

Please install the pump stably and firmly within an angle of 10˚. Otherwise, the gear lubricating oil will flow into the pump cavity, which may cause vibration, noise and even damage of the pump.

Attention

Please dispose waste oils and other parts according to relevant environmental protection regulations

Attention

Use corresponding accessories when pumping a small amount of dust; otherwise, pump failure or sharp performance drop will occur.

Attention

Non-professionals are forbidden to disassemble the pump. Otherwise, pump may be damaged or fail to run normally. Where necessary, please feel free to contact us.

3. Product Overview

Application: Plasma physics, Freeze drying, Vacuum oven, Thin film deposition, Electron microscopy, Mass spectrometry.

This pump is Screw type Dry vacuum pump, which rotates a pair of non-contact multi-stage rotors, synchronized by timing gears. The timing gears and bearings are enclosed in a compartment that is independent of the casing. For lubrication Perfluoro-Polyether (PEPE) oil and grease are used. The pump is factory filled with lubrication oil.

The DSV screw pumps function according to the double screw-pump principle. Two Screw rotors rotate in the compression chamber. The medium to be pumped is trapped between the individual screw coils, compacted and transported to the gas outlet. During the compaction process, the two screw rotors do not come into contact with each other, nor with the suction chamber.

3.1 Working Principle Diagram of DSV Series Vacuum Pump

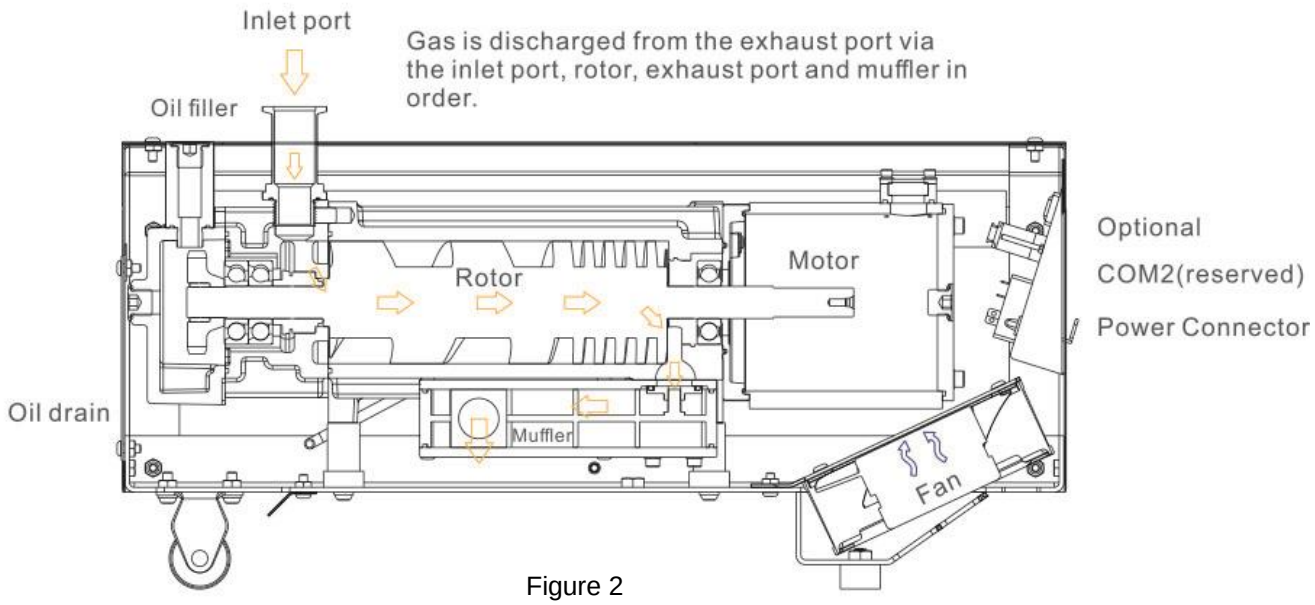


Figure 2

3.2 Schematic for purge gas and switches

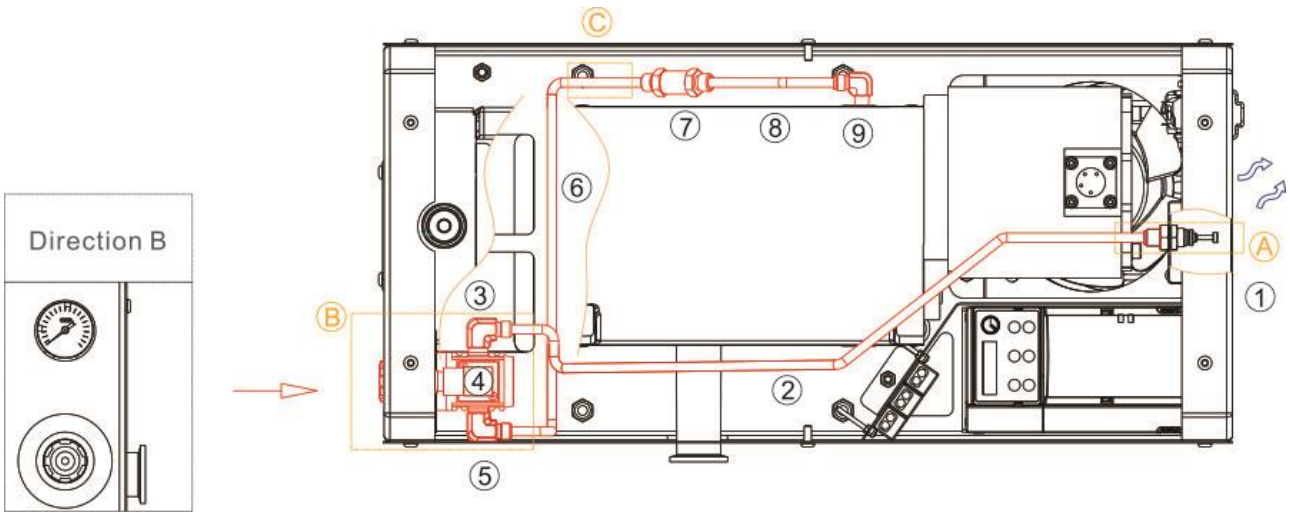


Figure 3

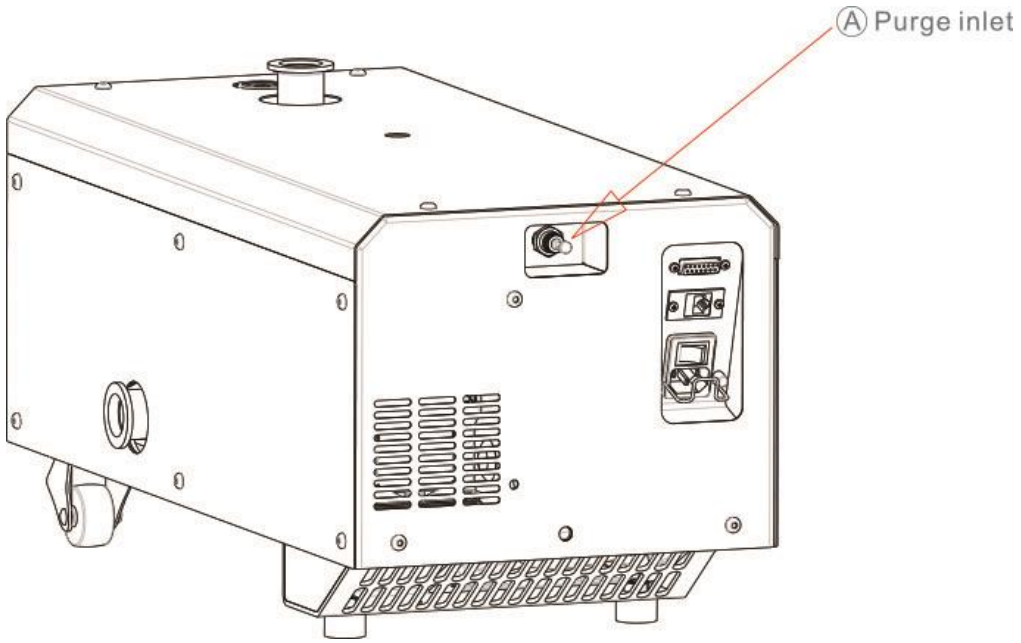


Figure 4

3.2.1 Preparations before purging

*** Purpose of performing this process**

The purpose of this process is to increase the durability of the pump by connection air or nitrogen gas to clean the pump head, but only in cases where dust or corrosive gases enter the pump during operation.

A1 One-touch fitting

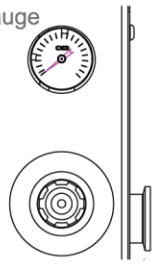
Remove the plug.

A2 One-touch fitting

Plug φ6 tube. Notes: CDA or N2 is recommend.

B1 Pressure gauge

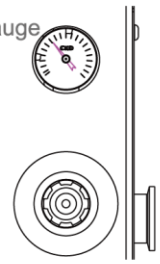
Regulator



Initial state: 0MPa

B1 Pressure gauge

Regulator



Slowly turn the pressure adjustment knob clockwise to set the pressure(gauge pressure) to 0.05Mpa.Then press the knob to lock which in position.

C

Thermal mass flow meter can be installed here.

4. Check before Installation

4.1 Specifications & Model

Check the specification, if which not fits your needs, please contact us.

4.2 Accessories

Check the following items on receipt of the pump package.
Accessories for all DSV series 130/330/530 dry screw vacuum pumps:

Items	Qty.	Unit
DB15 wiring leaflet	1	Piece
User Manual	1	Pcs
Hex Wrench (3mm-type 7)	1	Set
Hex Wrench (4mm-type 7)	1	Set
Hex Wrench (5mm-type 7)	1	Set
Hex Wrench (8mm-type 7)	1	Set
Power cord 1	1	Set
DB15male head (short pins 7 and 8)	1	Set
DB15male head with cables and with cable number	1	Set

Table 1

Accessories for all DSV series 830 dry screw vacuum pump:

Items	Qty.	Unit
User Manual	1	Pcs
Hex Wrench (3mm-type 7)	1	Set
Hex Wrench (4mm-type 7)	1	Set
Hex Wrench (5mm-type 7)	1	Set
Hex Wrench (8mm-type 7)	1	Set
Power cord 1	1	Set

Table 2

4.3 Moving Method

1. The DSV 130/330/530 is equipped with a pair of directional wheels and 2 legs. Lift one end of the legs when trying to move the machine.
2. The DSV 830 base is equipped with anti-skid and shock-absorbing feet, a pair of directional wheels and a pair of directional wheels and a pair of universal wheels. When trying to move the machine, please make sure that the feet have been raised to the highest position and that the universal wheel brake has been released in order to avoid damaging the feet and wheels during transportation.

4.4 Precautions for Lifting

A silencer is designed at the bottom of the vacuum pump. it is forbidden to lift the vacuum pump without protection. Instead, sling is recommended for handling.

5. Specifications

Specification of Power Cord						
Confirm the voltage of power supply voltage						
Voltage / Model	90-120V		200-220V		380-415V	
	Wire diameter		Wire diameter		Wire diameter	
DSV130	1.5㎟	14AWG	1.5㎟	14AWG		
DSV330	1.5㎟	14AWG	1.5㎟	14AWG		
DSV530	1.5㎟	14AWG	1.5㎟	14AWG		
DSV830					2.5㎟	14AWG

Table 3

See Table 4 for the technical parameters

Model		SH-DSV130	SH-DSV330	SH-DSV530	SH-DSV830
Pumping Speed		130L/min	330L/min	530L/min	830L/min
Extreme vacuum degree		3 Pa (2.25x10^{-2} Torr / 3x10^{-2} mbar)			
Gas Purge	Dry nitrogen/Dry compressed air	NA	0~100 slm		
	Pressure		0.05~0.1 Mpa		
	Joint		NA	One touch fitting Φ6mm	
Motor	Rated motor	1.8 kW			2.2 kW
	Input power	200~240V, 1P			380~415V, 3P
	Allowable voltage variation	± 10%			
	Input frequency	50/60 Hz			
	Control mode	Inverter			
	Rotating Speed	3000~4500 rpm	3000~4800 rpm		2850~4500 rpm
	Current at ultimate pressure	6 A	7 A	8 A	1.5 A
	Peak current	13 A			6 A
Control functions	PID function	YES			
	Analog speed control	YES			
	Parallel control and monitoring	Digital and Modbus-rtu control			
	Serial communication	MODBUS-RTU			
Connection	Inlet port	25 KF			40 KF
	Exhaust port	16 KF	25 KF		25 KF

Model		SH-DSV130	SH-DSV330	SH-DSV530	SH-DSV830
Max water vapor pumping rate		134 g/h	200 g/h		250 g/h
Gas ballast		NA	Gas Purge Port		
Oil products		PEFP			
Oil quantity		80 ml			
Overall dimensions		520x300x320mm	600x300x320mm		663x350x400mm
Lifting ring		M10 lifting ring (optional)			
Weight		38±5kg	48±5kg		75±5kg
Noise		≤58 dB(A)	≤60 dB(A)		≤63 dB(A)
Ambient temperature		5~40 °C			
Operating humidity		Below 90%			
Storage temperature		0~50 °C			
Maintenance cycle		1 time/year			
Cooling mode		Air cooling			
Working Conditions	Clean condition	/			
	High steam condition	Enable gas purging, pressure 0.07MPa; enable gas ballast			
	Mildly corrosive condition	Enable gas purging, pressure 0.1MPa			

Notes

I: Refer to Appendix DSV 330/530 gas flow-pressure relationship.

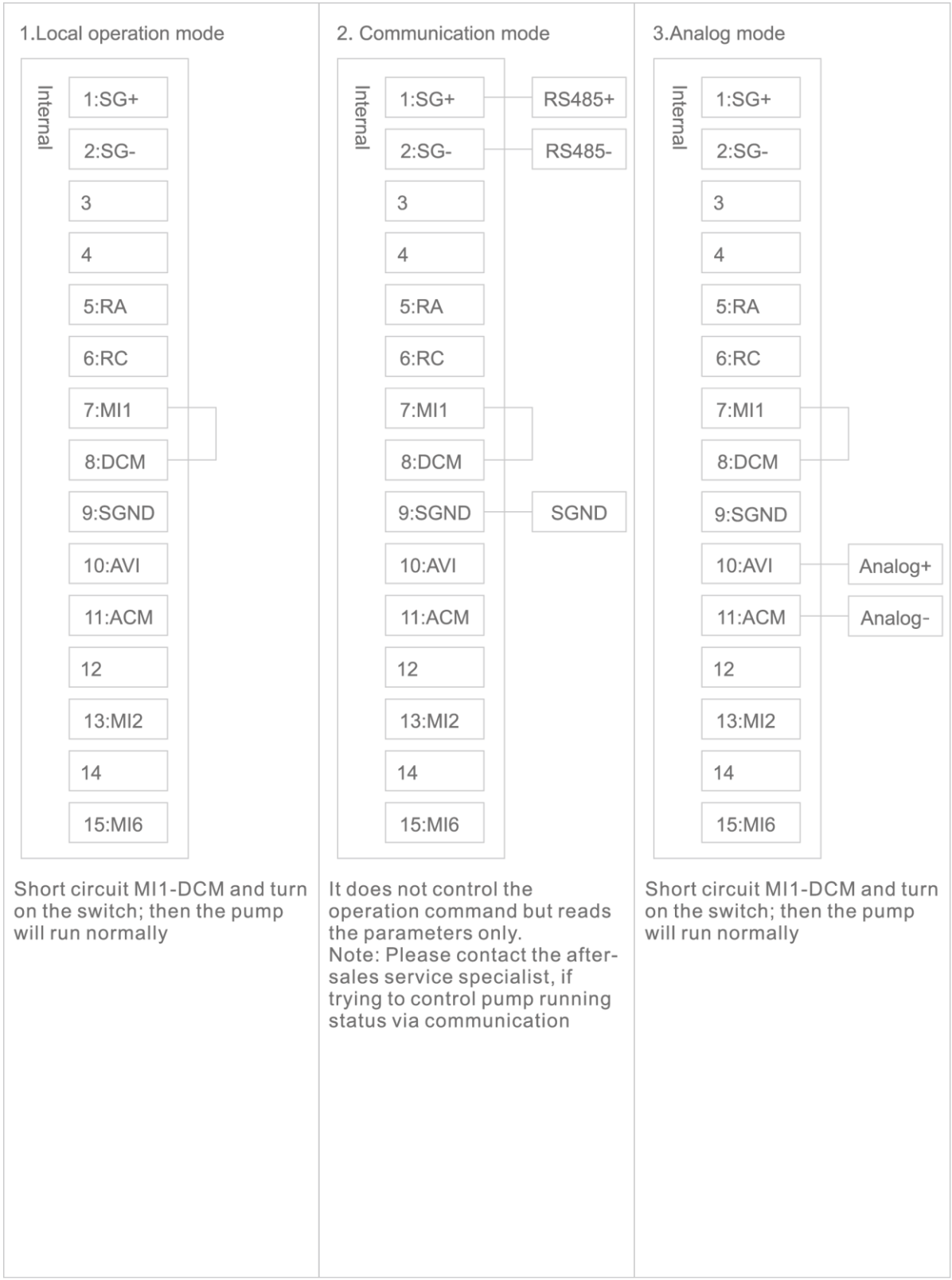
II: When the pump works in the working condition with high water vapor content, Need to run at a ultimate pressure period of time after the working condition end, in order to completely discharge the water vapor in the pump.

Some signals of DSV130/330/530 inverters have been connected to the connector.
See the appearance below

DB15 control terminal corresponding wiring						
DB15No.	I/O	Items	Use		Definition of corresponding wire No of inverters	Remark
1	Rs485+	MODBUS	Communication+		SG+	Default communication format 9600-8-N-2
2	Rs485-	MODBUS	Communication-		SG-	
3						
4	Output	24V				
5	Output	Operation check	Closed: Alarm	Disconnect: Normal	24V	Relay output terminal
6	Output	Output common terminal			RA	
7	Input	Running command	Closed: Running	Disconnect: Shutdown	RC	
8	Input	Output common terminal 1			MI1	
9	RS485-GND	Communication signal ground			DCM	
10	Input	Speed control	Analog quantity+		SGND	Input analog quantity(0-10V)
11	Input	Speed control	Analog quantity-		AVI	
12					ACM	
13	Input	Analog control Enabling command			MI2	Analog control terminal
14						
15	Input	Alarm reset	Closed: Reset		MI6	
Others	Temperature	Motor temperature			MI7	
		Common terminal			DCM	Common terminal of temperature sensor

Control mode

1. Local mode: Short connect MI1-DCM for normal operation.
2. Communication mode: RS+ is connected with Rs485+, RS- is connected with connected with signal ground.
3. Analog quantity mode: Connect MI1-MI2-DCM, connect AVI with analog quantity + and ACM with analog quantity-. Note: Do not run the motor below 3,000 rpm for a long time, for it will seriously damage electrode. For DSV130, 6.6-10V corresponds to 3,000-4,500rp; for DSV330/530, 6.25-10V corresponds to 3,000-4,800rpm.



6. Installation Process

6.1 Installation

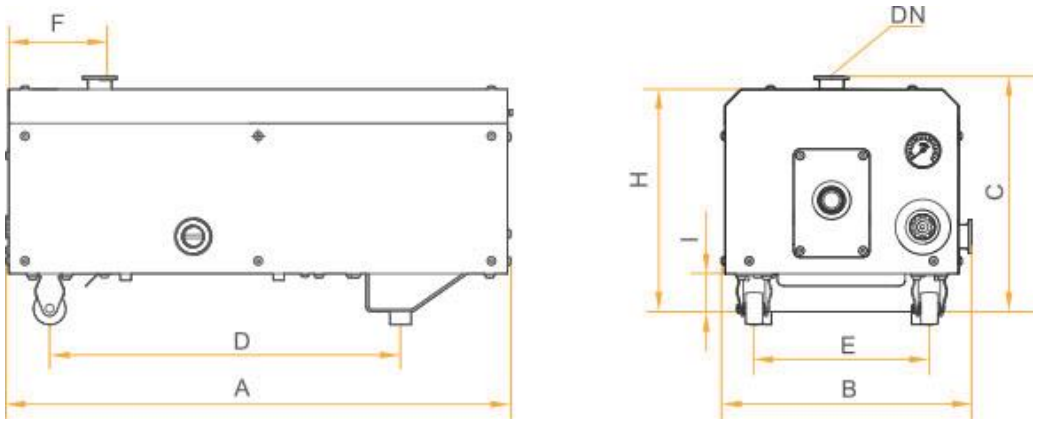
1. Confirm the voltage of power supply						
Voltage / Models	90-120V		200-220V		380-415V	
	Wire diameter		Wire diameter		Wire diameter	
DSV130	1.5㎟	14AWG	1.5㎟	14AWG		
DSV330	1.5㎟	14AWG	1.5㎟	14AWG		
DSV530	1.5㎟	14AWG	1.5㎟	14AWG		
DSV830					2.5㎟	14AWG
2. DSV130/330/530/830 is placed horizontally. A 30cm space is reserved in front and back respectively for heat dissipation.						
3. Connect the vacuum system to the vacuum pump.						
4. Connect the exhaust system.						
5. For DSV330/530/830, it is necessary to connect purge gas(CDA or N dry N2)						
6. Parallel control and monitoring is available.						

DSV130/330/530 starts

7. If purge gas is available, Which has to set the pressure to 0.04MPa-0.07MPa
8. Turn on the power switch.
9. In local mode, plug DB15 male connector in the accessory at com1, turn on the switch, and then the vacuum pump will start directly. In parallel control and monitoring mode, referring to communication instructions.
10. Check the parameter

DSV830 starts
Direct power-on operation

6.2 Installation specifications



DSV series screw vacuum pump dimensions(unit: mm)									
Models	A	B	C	D	E	F	H	I	DN
DSV130	520	300	320	342	210	107	280	60	KF25
DSV330	600	300	320	415	210	107	280	60	KF25
DSV530	600	300	320	415	210	107	280	60	KF25
DSV830	655	312	325	485	242	133	307	70	KF40

6.3 Pumping Rate Curve

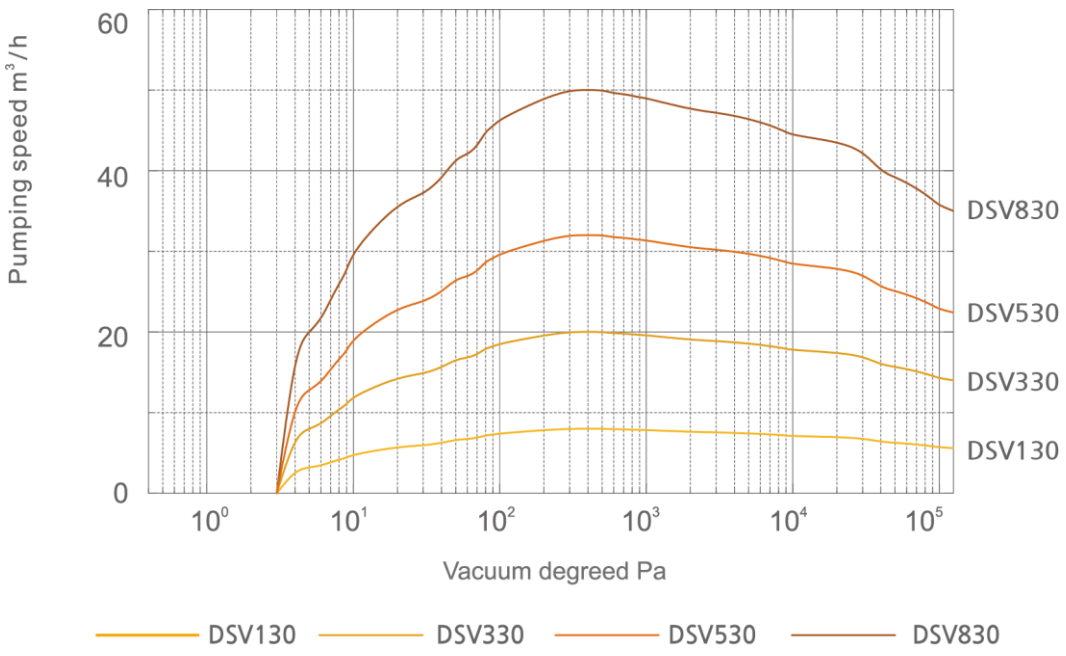


Figure 5

7. Handling and Storage

Warning

Do not move the pump until it stops running and power supply has; been cut off.

Attention

Any carelessness during handling may cause damage to the pump, so please handle it with care. Move the fully filled pump vertically and horizontally to avoid any oil spillage.

Attention

Please dispose packaging materials as per applicable environmental protection regulations.

8. Product Overview

Warning

Please check and maintain the product by personnel undergoing corresponding training in strict accordance with safety regulations.

Warning

In case of any hazardous substances, determine their nature first and obey the appropriate safety regulations. If the potential hazard still remains, decontaminate the pump before any maintenance work.

8.1 Check & Maintenance

Maintenance Content	Maintenance Cycle	Remark
Oil change interval	After running for 6,000h or oil turns black	8.2.1
Check the pump sound	When running	8.2.2
Change the oil for the first time	After running for 3,000h	8.2.3
Clean the silencer	After running for 6,000h or sound becomes abnormal	8.2.4
Clean the fan cover	Before running	8.2.5
Check wiring	Before running	

Table 6

8.2 Routine maintenance methods

8.2.1 Check oil level

① When the pump is working, the oil level should always be kept between the lowest and the lowest and the highest oil level line. Add oil in time, if the liquid level is lower than the lowest line. If the liquid level is higher than the maximum oil level line, unscrew the oil drain plug to drain excess pump oil; otherwise, oil may enter the pump chamber.

② Observe the color of pump oil. Normal pump oil is clean and transparent. Change the oil. if it turns dark or becomes turbid.

8.2.2 Check pump sound

① The sound when the pump is running should be continuous and stable and free of any abnormal sound. In case of any abnormal sound, analyze and treat the fault as per Table7.

8.2.3 Change oil

① Change oil after the pump stops and becomes cool, in order to avoid scalding.

② To change oil, open the oil drain plug and drain the used oil into a suitable container. When oil stops flowing, screw on the oil drain plug. The oil drain plug and the oil filler plug must be screwed tightly to ensure gearbox airtightness and prevent the entry of any external air, thus causing a lower vacuum degree.

③ Drain the replaced oil into a designated container and dispose it in accordance with applicable environmental protection regulations.

8.2.4 Clean the silencer

① In case of any abnormal sound when the pump is running or after it stops, Check exhaust silencer;
② Please stop the pump before checking the exhaust filter. Wait for a period of time until the pump cools down.
③ Open the exhaust port housing at the bottom of the pump, remove the exhaust muffler cover plate, and clean impurities inside the cavity.

8.2.5 Clean fan housing

① Please check whether there is a large amount of dust on the fan housing of the lower fan inlet before running the pump. Ensure full ventilation of fan housing surface in order to avoid affecting heat dissipation and pump performance.

9. Troubleshooting

9.1 Check Methods for Rotor Rotation

Troubleshooting for rotor sticking

1. Remove 4 M5X 12 stainless steel screws from the front cover plate of the gear, as shown in figure 6
2. Remove the front cover plate of gear.
3. Screw off the end face of the front cover of the gear with an 8mm 7-shaped wrench, and align the oil plug of shaft head of the driving and driven rotors, as shown in Figure 7.
4. Use a 5mm 7-shaped wrench to turn the driving rotor counterclockwise to experience the resistance during rotation, as shown in Figure 8.

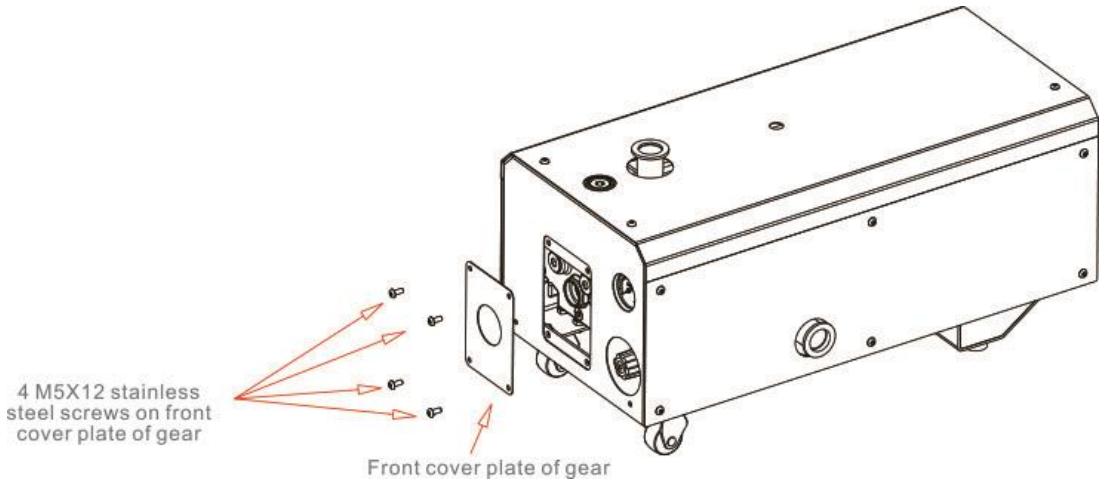


Figure 6

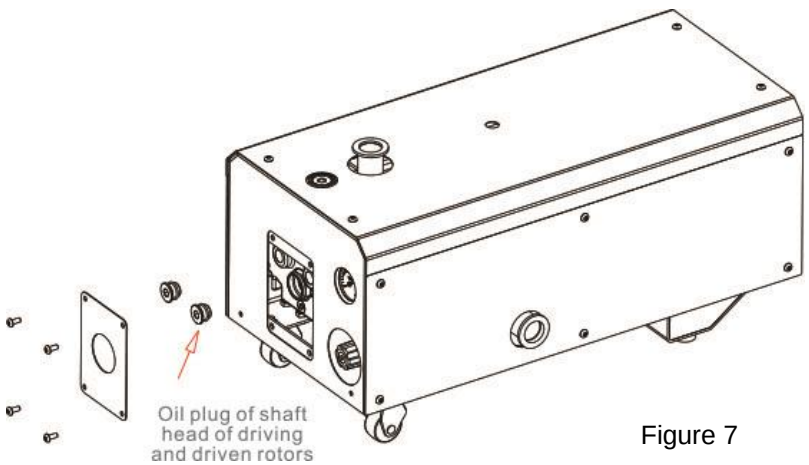


Figure 7

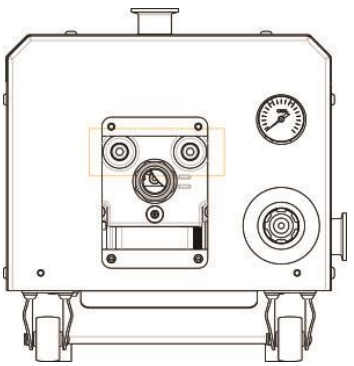


Figure 8

9.2 Error Code Query of Controller

Troubleshooting for rotor sticking

1. Remove 4 M5X12 stainless steel screws from the upper cover plate, as shown in Figure 9.
2. Remove two M5X12 stainless steel screws in the middle of the left and right-side plates.
3. Remove the upper cover plate.
4. The location of controller display is shown in Figure 9.

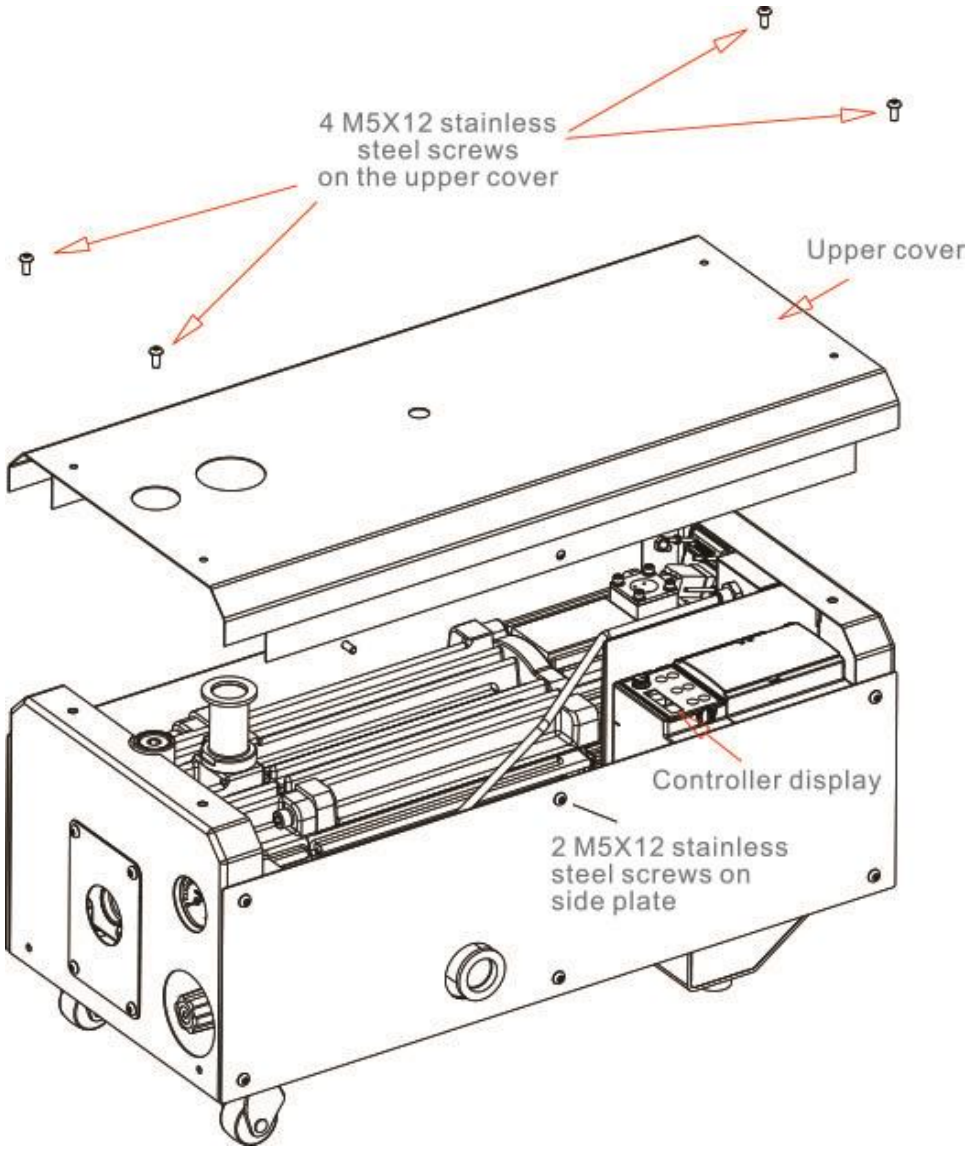


Figure 9

9.2 Examples for faults

Example: User shall carry out inspection, if pump could not be started normally.

Possible cause 1:
Load changes suddenly in working environment and exceeds the bearing range of controller; the controller gives out protective warning (including but not limited to ocX, ovX, and olX).

Solutions for cause 1:
Power off the pump completely for 3 min (unplug and disconnect the switch), reinsert power plug, turn on the switch and access the run command. Then the pump will run normally.

Possible cause 2:
If unplanned shutdown occurs repeatedly in a working environment with high concentration of dust, corrosion and vapor, solid-liquid mixture may attach to the pump gap, which results in the increase of load.
Record the controller error code as per the requirements in Figure9.

Solutions for cause2:
1. Full-cycle start purging (pump shutdown purging and operation purging);
2. Use gas ballast in environment with high water vapor.

Possible cause 3:
It's completely stuck.

Solutions for cause 3:
Check whether the rotor is stuck according to the steps shown in Figure 6, Figure 7 and Figure 8.

Example: User shall carry out inspection, if abnormal noise occurs while pump is running.
1. Check whether the current of controller is normal according to the requirements in Figure9;
2. Listen carefully to confirm if the motor produces any Abnormal noise.

Faults	Reasons	Troubleshooting
The pump cannot be started	1. The power supply is not started	1.1 Check power line connection
		1.2 Running command is not entered
	2. The input power supply voltage is abnormal	2. Make sure the voltage is within +10% of the rated voltage
	3. The motor becomes faulty	3. Change motor
	4. Enable protection of overload protector	4. Check ambient temperature or temperature of pumped gas
	5. Ambient temperature is too low	5. Raise ambient temperature by 5℃ or above
	6. The pump is stuck by foreign matter inside it	6. Repair the pump
	7. The pump has been idled for too long a time	7. Repair the pump
	8. The air outlet is blocked	8. Clean the exhaust silencer or unblock exhaust pipe
	9. The internal parts of the pump are damaged	9. Repair the pump
The pump can't reach the extreme pressure or pumping speed is too slow	1. Vacuum system configuration is unreasonable	1. Choose another proper pump
	2. Leakage of vacuum system	2. Check the system
	3. Improper measurement or regulation	3. Measure the vacuum degree directly at the pump inlet using correct measurement method and pipe
	4. Air inlet is blocked	4. Clean the air inlet duct
	5. Air inlet pipe is too small or too long	5. Use short and thick air inlet pipe
	6. Air outlet is blocked	6. Unblock air outlet
	7. Exhaust silencer is blocked	7. Clean the exhaust silencer
	8. Motor speed is too low	8. Check supply voltage
	9. Exhaust pipe is blocked	9. Clean the exhaust silencer or unblock exhaust pipe
	10. The internal parts of the pump body are damaged	10. Repair the pump

Faults	Reasons	Troubleshooting
The vacuum degree of the system drops too quickly after the pump stops running	1. Leakage of vacuum system	1. Check the system
	2. No anti-reflux valve	2. Add vacuum valve or anti-reflux vale
Abnormal noise during operation	1. The input power supply voltage is abnormal	1.1 Check the connection of power supply, switch and line
		1.2 Ensure the voltage is within ±10% of the rated voltage
	2. Foreign matters inside the pump	2. Repair the pump
	3. Too low oil level	3. Add oil of specified amount
	4. The internal parts of the pump are damaged	4. Disassemble, repair and replace parts
Pump temperature rise too high	1. Poor installation ventilation	1. Improve ventilation environment
	2. The fan is damaged	2. Replace the fan
	3. Temperature of the pumped gas is too high	3. Add a cold trap at air inlet
	4. Exhaust pipe is blocked	4. Clean the exhaust pipe
	5. Poor lubrication	
	5.1 Improper or deteriorated pump oil	5.1 Add qualified oil
	5.2 Insufficient oil in gearbox	5.2 Add oil to specified level
	5.3 Ambient environment is too high	5.3 Reduce ambient temperature
Oil exists in the inlet pipeline of the pump	1. Oil is from vacuum system	1. Check the vacuum system
	2. Oil level is too high in gearbox	2. Drain off excess pump oil

10. Accessories

Please use accessories we supply in order to ensure reliability of the pump. When ordering any accessory, customer needs to provide the pump model and the code of wearing parts. Optional parts are shown in the diagram. For any other requirements for accessories, please feel to contact us.

Accessories we supply;

1. Other types of inlet/exhaust interfaces
2. Dust filter

Memo

Memo


SH SCIENTIFIC