USER'S MANUAL

Rotary Vane Vacuum Pump

(Dry-Running)

Type: SML-030~280

Please read this Manual thoroughly before operating this product.

Introduction

Thank you very much for using the DOOVAC Vacuum Pump. We at DOOVAC specialize in the design and manufacture of vacuum pumps and air compressors on the basis of our abundant experience and technical prowess.

This User Manual describes the procedures for the installation, operation and maintenance of the product, including the specifications, safety cautions, transportation, storage, testing, commissioning, environmental conditions, maintenance, troubleshooting, and recommended spare parts.

Please perform installation and commissioning prior to operating the product, after reading this Manual carefully. If you have any problems, please contact us.

Keep this User Manual near the product for convenient reference.

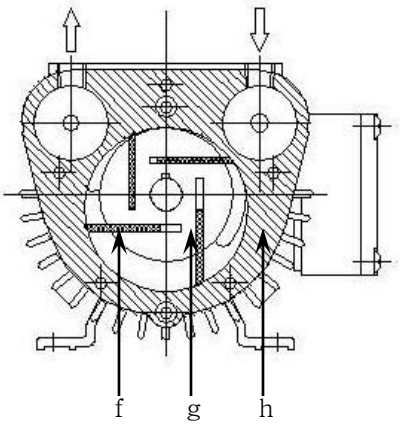
Technical specifications

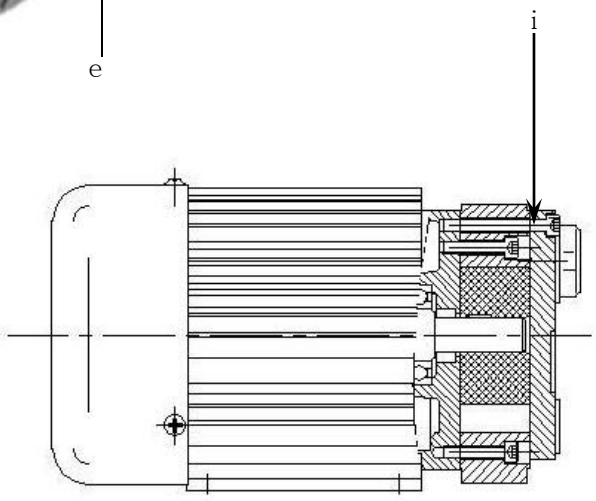
Technical Data		SML-030	SML-060	SML-N60	SML-140	SML-280
Nominal displacement	50Hz ℓ/min	25	50	50	120	235
	60Hz ℓ/min	30	60	60	140	280
Ultimate pressure		550~600	550~600	550~600	660	660
	mmHg	1	1	1	1	1
	bar					
Motor version(3~)	50Hz	-	-	-	-	220/380
	V	-	-	-	-	220/380
	60Hz V					
Motor version(1~)	50Hz	110/220	110/220	110/220	110/220	110/220
	V	110/220	110/220	110/220	110/220	110/220
	60Hz V					
Nominal motor rating(3~)			-	-	-	420
	W					
Nominal motor rating(1~)		40	90	90	350	550
	W					

Nominal motor speed	50Hz RPM	1430	2850	1430	1430	1430
	60Hz RPM	1720	3420	1720	1720	1720
Sound level db(A)		58	58	58	58	68
Inlet Port pt”		1/4	1/4	1/4	1/4	3/8
Exhaust Port pt”		1/4	1/4	1/4	1/4	3/8
Weight (approx.) kg		7	7	8	13.5	25.5

Parts and Identifications

a. Electric motor
b. Power connector
c. Exhaust port
d. Inlet port
e. Filter handle
f. Vane
g. Rotor
h. Cylinder
i. Cylinder side plate





I. Product Description

1. Operating Conditions

This SML type, oil-less vacuum pump is designed and manufactured in accordance with the following operating conditions:

- ◈ Air and inert gases
- ◈ Inlet gas temperature: 0℃ ~ 42℃
- ◈ Ambient temperature: 5℃ ~ 40℃
- ◈ Operating pressure: below the maximum pressure achievable by the pump
- ◈ Others: The performance of the product may vary according to the operating conditions and use.

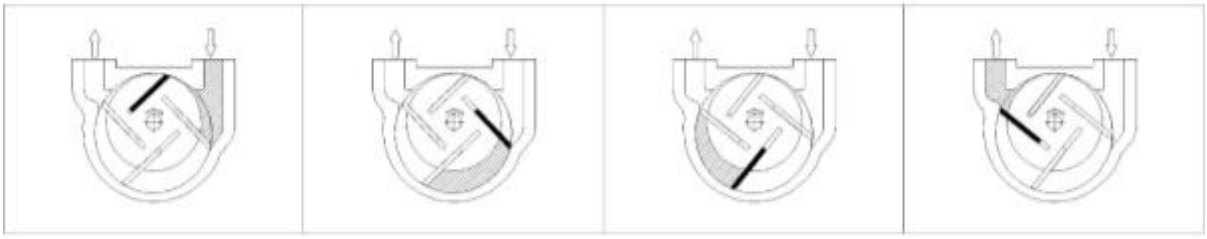
Please contact us for the optimal specifications before placing an order with us.

Processing high-density gases may cause critical damage to the product; therefore it is strictly prohibited to use this product for high-density gases.

The maximum pressure of the product is tested at our factory before shipping.

2. Operational Principles and Functions of the Major Parts

2-1) Operational Principles



Suction Expansion Compression Exhaustion

This product is a dry, vane-type vacuum pump comprising a rotor, vanes, and cylinder. The rotor and cylinder are eccentric with each other. 4~6 vanes rotates in contact with the cylinder inner wall by centrifugal force. The volume of the space (cell) between the vanes varies, generating vacuum pressure by suction, expansion, compression, and exhaustion.

The vacuum at the inlet and positive pressure at the outlet are generated continuously thanks to the superior lubrication and wear resistance of the carbon vanes.

Dry type rotary vane pumps have a higher operating temperature than that of oil-circulating types. Therefore, though the carbon vanes have an excellent lubrication effect and wear resistance, they need to be replaced after long-term operation. (See Vane Replacement of Maintenance section.)

3. Cooling

Cooling of the vacuum pump is performed as follows;

◈ Heat radiation on cylinder surface.

◈ Air flow generated with the cooling blower blade of the motor.

4. Valve Opening/Closing

This product is not provided with an on/off valve; which need to be provided and installed by the user.

II. Safety

1. Safety Precautions

The following precautions must be observed for safe installation and operation.

◈ Connect power with the main power supply cut-off.

◈ Power connection and electrical servicing (check, repair, etc) must be conducted by a qualified engineer.

◈ If the operation or safety of the product seems abnormal, stop the vacuum pump immediately.

◈ Do not touch the outer surface of the vacuum pump during operation. Otherwise, you may get burned.

◈ Do not insert your hand into the rotating body. Do not run the vacuum pump with the cooling fan blades removed.

2. Warning Signs

This manual contains the following symbols to indicate safety related cautions and warnings.

DANGER	This sign indicates danger which may cause fatal or serious injuries if the necessary precautions are not taken.
WARNING	This sign indicates potential dangers which may cause fatal or serious injuries if the necessary precautions are not taken.
CAUTION	This sign indicates dangers which may cause injuries or damages to property if the necessary precautions are not taken.

This sign indicates tips for efficient and/or effective use or operation of the product.

III. Transportation and Storage

The suction inlet and exhaust outlet are plugged with a rubber plug to protect the product from foreign matter during transportation and storage. Do not remove the rubber plugs until installation has been completed.

Store the product indoors, preferably, with the original packing.

IV. Installation

1. Installation Site

◈ Avoid the places where there is a possibility of explosion.

◈ Ambient temperature: 5~40℃

◈ Ambient pressure: atmospheric pressure

◈ Other environmental conditions: compliance with the motor protection class.

If you are not sure of the safety of the product's condition or its operation during installation, stop the installation work immediately.

Place the product horizontally on a level floor. Install and fix the product firmly in a place where inspection and maintenance can be conducted conveniently.

For effective cooling of the vacuum pump, the circulation of cooling air is important. Ensure 25cm or greater distance from the adjacent walls.

2. Power Connection

2-1) Precautions when Connecting Power

Make sure to cut-off the main power supply before connecting the power cable.

WARNING

Since connecting is dangerous work, only a qualified engineer may carry out power connection work, in compliance the following standards;

IEC 364, CENELEC HD 384, or DIN VDE 0100

- IEC-Report 664, DIN VDE 0100
- BGA A2 (VBG4) or applicable regulations of the region.

CAUTION

The power cable must have sufficient capacity for the electric motor power.

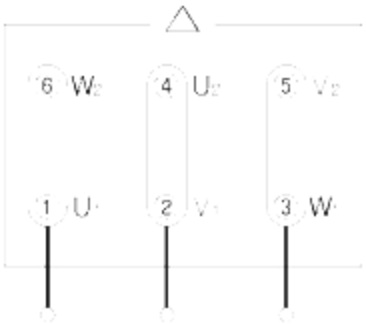
Make sure to provide an electronic contact, overload protector, and ground cable.

CAUTION

When connecting 3-phase power supply, make sure that the motor rotates in the direction marked on the casing.

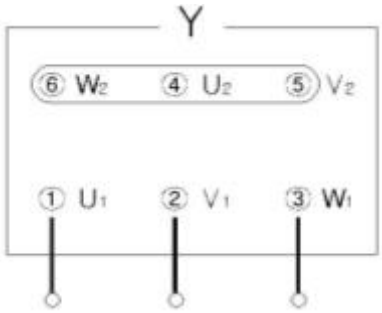
Install a reverse rotation protector to prevent reverse rotation.

2-2) Wiring: 3-phase



Delta connection

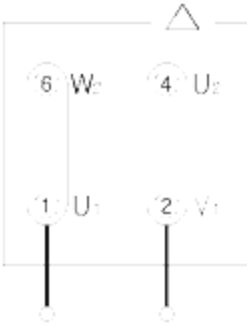
Low Voltage (220V)



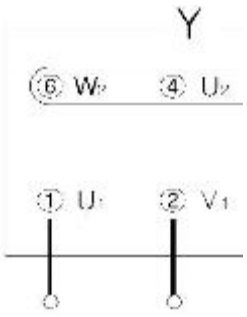
Y -connection

High Voltage (380V)

2-2-1) Wiring: single phase



Low Voltage (110V)



High Voltage (220V)

If the direction of rotation is not correct under 3-phase wiring, change the wiring of 2-phase.

3. Inlet and Outlet Connection

Remove the rubber plugs and check the cleanliness of the pipes before connecting the inlet and

outlet pipes.

Foreign matter will damage the vacuum pump seriously. If the inlet gas or environment is not clean, install an air filter at the inlet pipe.

The incoming pipe size should be one step larger than the inlet diameter. Otherwise, especially if the incoming pipe is long, the performance of the vacuum pump may be degraded.

◈ Take care that there is no leak hole at the connection between the incoming pipe and the vacuum pump inlet.

4. Discharge Pipe Connection

A silencer provided at the outlet side can greatly reduce noise.
(The silencer is an optional item.)

V. Cautions for Commissioning and Operation

1. Precautions before Operation

Check the following before starting up the product

◈ Check that the power voltage and frequency are in accordance with the ratings on the motor's nameplate.

◈ Check that the inlet and outlet pipes are properly connected.

◈ Check that the motor rotates in the designated direction (for 2-phase supply power).

Improper voltage and/or frequency may damage the motor critically.

2. Cautions for Operation

Do not run the vacuum pump with the cooling fan cover open.
Do not insert your hands inside the cooling fan cover.

CAUTION

Do not touch the surface of the vacuum pump during operation. Otherwise, you may get burned.

CAUTION

If any abnormal noise or vibration is emitted, stop the vacuum pump immediately

VI. Maintenance

1. Inlet Filter maintenance

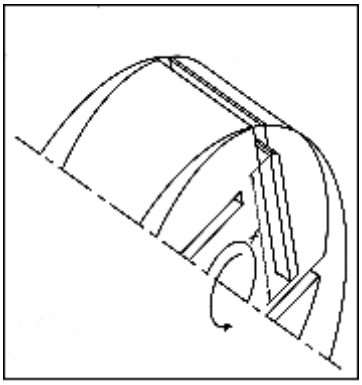
Check the inlet filter regularly. Clean or replace a dirty filter.

If the inlet filter is very dirty, replace with a new filter.

CAUTION

Foreign matter will seriously damage the vacuum pump. If the inlet gas or environment is not clean, install an air filter at the inlet pipe.

2. Vanes



The SML type products have 4 vanes.

For the first 6,000 hours of operation and for every 3,000 hours of operation thereafter, remove the cylinder cover, remove the vanes and measure the vanes' heights (X).

(See the figure on the right).

The minimum allowable vane heights (X) per model are presented in the Table below. If any one of the vanes has been worn to a height less than the allowable value, replace all 4 vanes with new ones.

	SML-030/060	SML-N60	SML-140	SML-280
Minimum Allowable Height (X)	15mm	19mm	31mm	35mm

3. Cleaning Cooling Fan and Fan Cover

A dirty cooling fan cover may disturb the flow of the cooling air. Check and clean the cooling fan cover regularly.

VII. Troubleshooting

Problem	Possible Cause	Troubleshooting
Rated vacuum pressure is not	Leak at inlet line	Check the inlet piping. Correct if there is leakage.

achieved, or motor current is too high	Vacuum On/Off valve failure	Replace with a new valve.
	Inlet filter is clogged	Clean the filer or replace with a new one.
	Inlet or outlet pipe is clogged	Clean the pipe(s).
	Inlet/outlet pipeline's diameter is too large or too long.	Replace with a pipe of the appropriate diameter.
	Vane has been damaged	Check and replace, as necessary.
	Gap between the vane and cylinder wall is inappropriate	Adjust the gap (contact us).
	Failure of an inner part	Contact us.
Vacuum pump will not run. Motor has failed	Wrong supply power voltage	Check supply voltage and frequency with the nameplate.
	Motor winding failure	Rewind
	Vacuum pump or circuit breaker failure	Open the pump-side cooling fan cover. Rotate the fan by hand. If it rotates freely, the problem is at the pump. Otherwise, check the circuit breaker.
	Motor failure	Replace the motor
Vacuum pump clogged	Foreign material in the vacuum pump	Send us the product for repair. Check the inlet filter. Install an additional filter if necessary.
	Vacuum pump has corroded	Send us the product for repair.
	Reverse rotation of vacuum pump	Send us the product for repair. Check the direction cable wiring.
	After the pump stopped, foreign matter entered it and damaged the vane.	Send us the product for repair.
Vacuum pump runs, but is overloaded or generates abnormal noise, or motor current is excessive	Wrong cable wiring	Check cable wiring with wiring diagram.
	Reverse rotation of vacuum pump	Change phase connection.
	After long-term shutdown	Cap the outlet for warming up.
	Foreign matter has entered and damaged the vane or bearing	Send us the product for repair.
Abnormal noise	Damaged bearing	Send us the product for repair.
	Damaged vane	Send us the product for repair.

Vacuum pump temperature rises too high	Insufficient cooling air flow	Check the installation site. Check cooling fan and cover, clean as necessary.
	Ambient temperature is too high.	Maintain specified ambient temperature condition.
	Incoming gas temperature is too high.	Maintain specified inlet air temperature condition.
	Improper supply voltage or frequency.	Provide power in accordance with the specifications.
	Inlet filter clogged.	Clean the filter.
	Incoming pipeline's diameter is too small or length is too long.	Replace the incoming pipe with a pipe of suitable size.