No. 16100-2-01-3

ULVAC

INSTRUCTION MANUAL

OIL ROTARY VACUUM PUMP

MODEL : GC-25Sa
MODEL : GC-50Sa

Before Use

For safe and efficient use of this pump, please read this manual carefully before operation.

After reading the manual, keep it in your file for future reference.

Specifications in this manual are subject to change without notice due to future improvement.

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0. Preface

0.1 Before Using This Pump

We, ULVAC KIKO, Inc. thank you for purchasing our vacuum pump. When receiving our vacuum pump, please confirm the product is the same Model No. as you ordered. Also, check to make sure there are no damages.

⚠ CAUTION

To ensure a long life for this pump, read this manual carefully prior to installation, operation, and maintenance. Also, pay attention to ascertain the details of safety, specification, and operational precautions of this pump.

⚠ NOTE

0.2 Safety precautions (General Expression)

Safety precautions are identified in this manual using headers DANGER, WARNING, CAUTION, and NOTE.

DANGER

"Danger" Indicates major hazardous situations, which present an immediate threat of death or serious injury.

WARNING

"Warning" Indicates hazardous situations, which may present a potential to death or serious injury.

CAUTION

"Caution" Indicates hazardous situations where a potential hazard or unsafe practice could cause personal injury or equipment damage.

NOTE

"Note" Indicates undesirable situations where a potential hazard could cause equipment damage or abnormal operation.

0.3 Safety Precautions

DANGER

When evacuating toxic or inflammable gas, there may be danger of leaking gas from parts besides inlet port. Practice cautionary steps when working any kind of gases.

DANGER

After evacuating toxic gases, the inside of pump and pump oil is contaminated and toxic. Therefore, handle pump with care during maintenance.

WARNING

Do not overhaul or repair this pump. Only authorized maintenance personnel should handle this pump to avoid ignition, abnormal action, and electric shock.

WARNING

Switch off power before checking or repairing the pump to avoid any problems (electric shock or personal injury) caused by suddenly starting up.

WARNING

Connect an electrical wire cord to ground potential terminal tightly to avoid electric shock caused by mechanical trouble or electrical leakage.

WARNING

Do not plug exhaust port or place any materials inside of exhaust port, because it will reduce pumping speed during operation. Pump explosion, oil level gauge bursting, or motor over loading are consequences of excessive pressure inside the pump. This pump is not a compressor. The maximum pressure inside this pump is 0.03 MPa (GAUGE).

⚠ WARNING

Do not use this pump in an explosive or flammable atmosphere. It may cause personal injuries or fires.

⚠ CAUTION

Do not insert objects, fingers, or another pump body parts into the inlet port. It may cause electric shock, personal injuries, or fires.

⚠ CAUTION

Do not touch the motor body, shaft, or shaft coupling joint during operation. It may cause personal injuries.

⚠ CAUTION

Do not place flammable objects around the pump. It may cause fires. Also, do not place obstacles around the pump so as to obstruct cooling air. Abnormal temperature rising may cause burns or fires.

⚠ CAUTION

Electric wiring should be carried out in accordance with Electric Regulation and Instructions. Miswriting may cause fires.

⚠ CAUTION

Switch off electric power right away in case of a malfunction to prevent any troubles. In the case of a malfunction, contact your local agent or ULVAC KIKO,Inc. Sales and Service Center immediately.

⚠ NOTE

Do not start the pump without pump-oil. Failing to do so will lead to pump destruction.

0.4 Acceptance and Store of Product

0.4.1 Acceptance of Product

We delivered the pump with the utmost care. After unpacking, please check up and confirm items as shown below,

(1) The pump is what you ordered.

(2) Spare parts (single use of pump oil, optional parts)

(3) Any damages during transportation.

(4) Any loose screws and nuts.

If you find any abnormal circumstances, please contact your local ULVAC KIKO,Inc. Sales or Service Center.

0.4.2 Store of Product, Installation, Operating condition

This pump is a type of precision equipment; therefore, it is necessary to satisfy the following items for store product.

(1) Operational temperature and humidity : 7～40° C , 85 % RH >

(2) Installation place should be at an altitude no higher than 1000m above sea levels for storing or operation.

(3) Required conditions while storing or operating

a. Do not use corrosive or explosive gases.

b. No areas with high moisture.

c. No areas with dust particles.

d. Use indoors only.

e. Do not pile up, or lay on its side.

f. Keep out of direct sun light.

g. Keep away from heat source.

NOTE

Do not treat with force, or lay on its side. It may cause damage.

0.5 Protective Precautions

The pump is provided with a single-phase 100V (50/60Hz) motor.

An overload protector (manually reset thermal protector) is incorporated.

The use of another protective device (such as an earth leakage breaker) in addition to the overload protector is recommended.

NOTE

Do not apply any voltages other than specifically rated for the motor of this pump. The over-load protector does not operate normally, consequently it may cause burning the motor or firing.

CONTENTS

Attached Sheets (1) Material Safety Data Sheet(MSDS)
(2) Check sheet for repair
(3) Sales and Service Centers

DRAWING AND TABLE LIST

1.For Safety Operation

1.1 Hazardous of Product and Safety Precautions

Before operating or inspecting the pump, read this manual carefully. And pay attention to ascertain the detail of potential hazardous and preventive procedure so that must be operated or inspected the pump.

1.1.1 ⚠ **DANGER** Leakage of hazardous gases and materials

Cause		Preventive Procedure
Leakage of toxic or inflammable gases.	⇒	Before evacuating gases to the pump inlet, dilute them to safety level.
Injuries of skin by direct contact with contaminated oils or adhered hazardous materials of the pump body when checking or disposing dispose the pump.	⇒	① After wearing suitable protector for evacuating hazardous materials, check or abolish the pump. ② Before checking or disposing the pump, non-hazardous treatment must be requested for the authorized professional specialist, then check or the pump. ③ Disposal must be requested for the professional specialist authorized by the administration.

1.1.2 ⚠ **WARNING** Electric shock

Cause		Preventive Procedure
Electric shock by touching electrical bare portion of the motor when electric power is on.	⇒	① Switch off power certainly before electric wiring Connect electrical wire cords to ground potential terminals tightly. ② Switch off power before inspection or removing. ③ Do not insert objects, fingers, or any thin bars into the inlet port.

1.1.3 ⚠ WARNING Explosion

Cause		Preventive Procedure
Pump explosion is consequence of excessive pressure inside the pump.	⇒	The maximum pressure inside the pump is 0.03 MPa (GAUGE). If inlet pressure of the pump is higher than 0.03 MPa (GAUGE), eliminate any objects which may cause obstruct gas flowing to the inlet port. When using oil mist trap, exchange or clean them to avoid gas flowing.

1.1.4 ⚠ CAUTION High Temperature

Cause		Preventive Procedure
Burn at high temperature.	⇒	① Temperature of the pump is high as shown below pump body → 70 ～ 80 ℃ motor → 70 ～ 80 ℃ ② High temperature surface of the pump may cause to burn as a result of direct skin contact by accident. Do not touch the pump body during operation. Inspection should be carried out after stopping and cooling down the pump.

1.2 Material Safety Data Sheet (MSDS)

The chemical material, which is applied or possible to contact when operating this pump are described. Read this manual carefully to understand characteristics of the chemical material (vacuum pump oil) which is described on MSDS sheet. When applying other vacuum pump oils besides the description in this manual, contact your local ULVAC KIKO,Inc. Sales and Service Center.

⚠ CAUTION

MSDS presents the reference information of hazardous chemical material to keep safety precautions. When handling the pump oil, it is necessary to take proper and practical treatments, which are adapted handling the oil. After understanding the above mention, these treatments must be done. Therefore, MSDS is a not safety warranty.

2. General Description of the Pump

2.1 Principal Features

This oil rotary vacuum pump is a sliding vane type (so called Gaede type), with direct driven motor. As it is a small sized, lightweight, and simple structure, it is easy to maintain or over-haul.

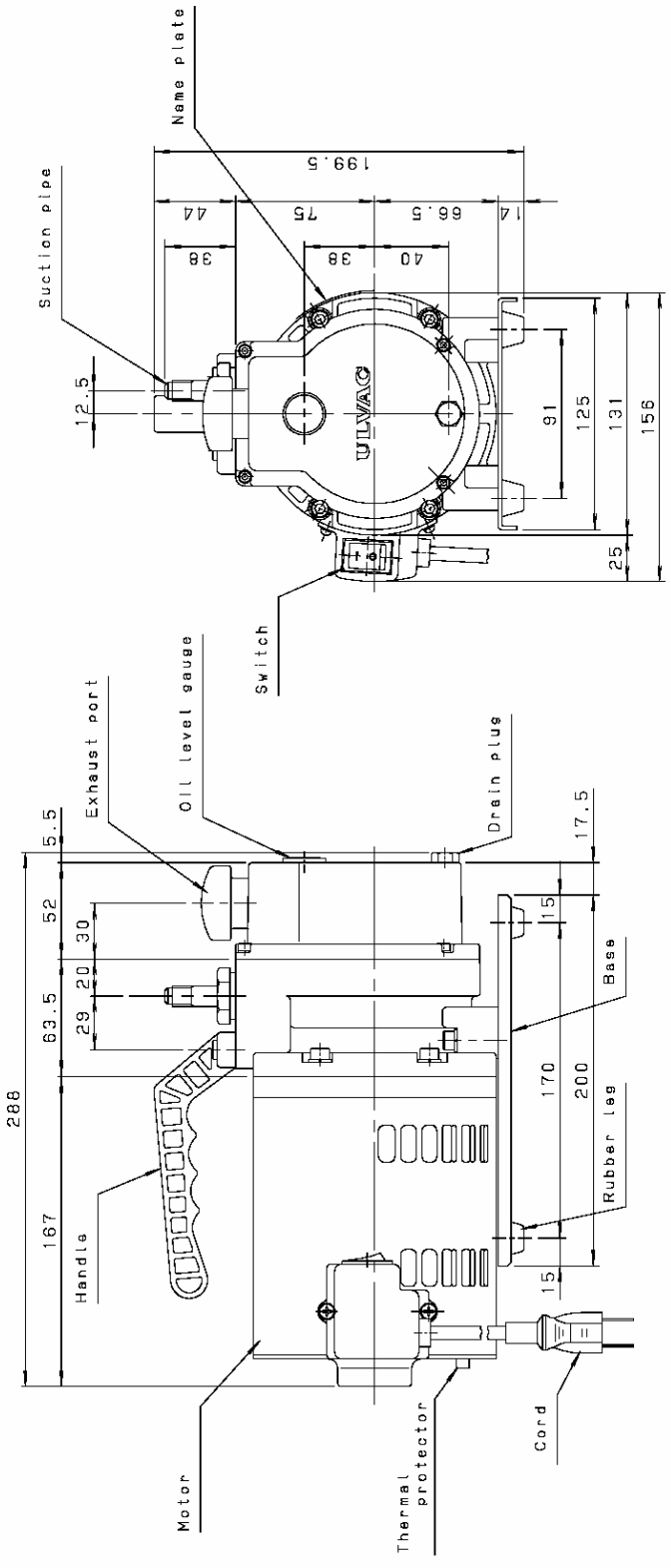
Table-1 Specification

Model		GC-25Sa	GC-50Sa
Type		Sliding vane 1 stages	Sliding vane 1 stages
Pumping speed (L/min)	50Hz	20	50
	60Hz	24	60
Ultimate pressure	Pa	9.3	9.3
Motor	W, (Poles)	100 (4)	200 (4)
Full load current (A)	50Hz	3.7	5.6
	60Hz	3.0	4.8
Motor revolution (r/min)	50Hz	1,450	1,450
	60Hz	1,740	1,740
Pomp oil	Recommended	SMR-100	
	Capacity (mL)	230	360

Note 1. Ultimate pressure indication by Pirani gauge.

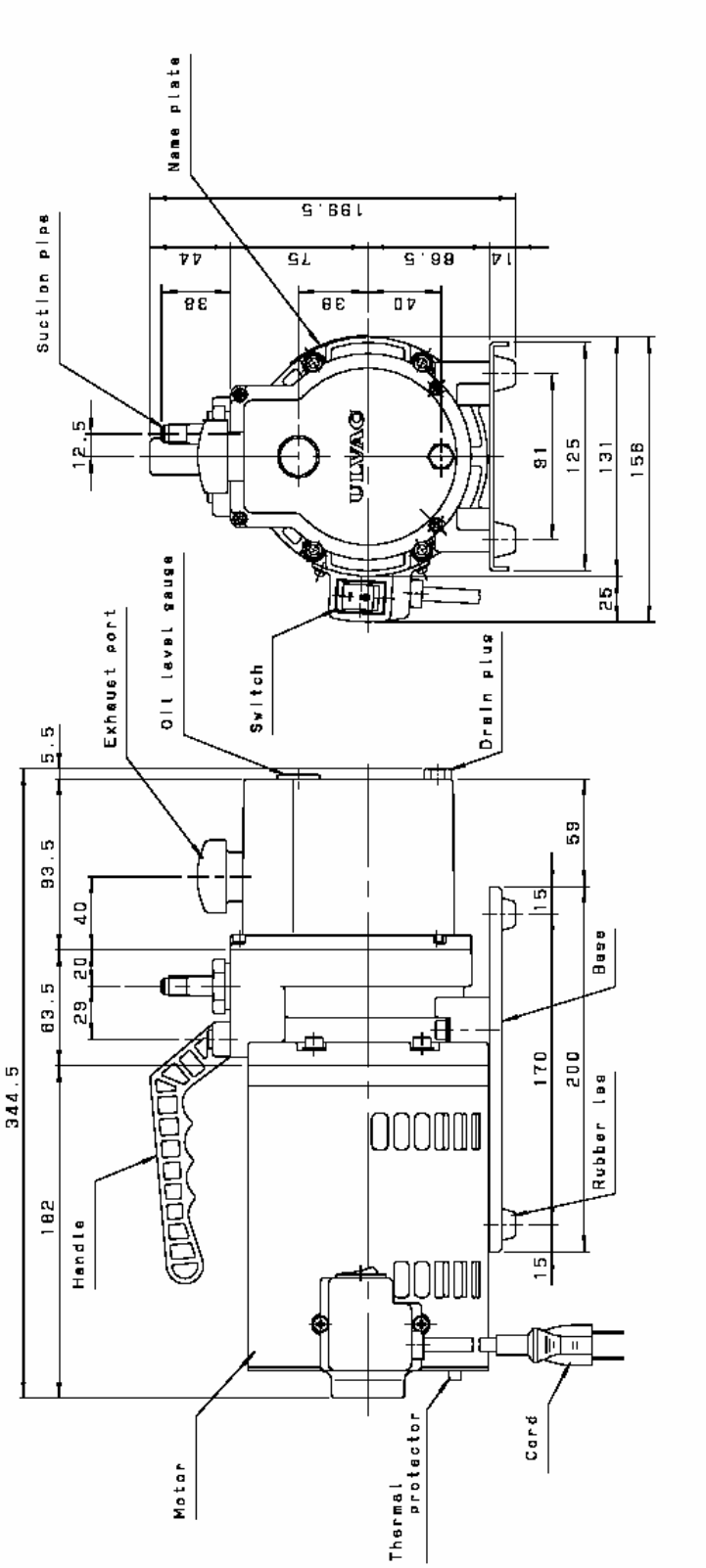
2. Vapor pressure, viscosity, or characteristics of vacuum pump oils are different respectively. Our recommended oil is SMR-100.

2.2 Dimensional Drawings



Motor ; Single phase, 100V(50/60Hz), 100W, 4Poles,Split phase starting
Weight ; 8.5 kg(with motor)

Fig-1 General Assembly Drawing of GC-25Sa



Motor ; Singhle phase, 100V(50/60Hz), 200W, 4Poles, Split phase starting
Weight ; 11.0kg(with motor)

Fig-2 General Assembly Drawing of GC-50Sa

3. Setting up

3.1 Installation

Installation must be done at a place of low moisture, low dust particle, and also level. The layout arrangement should be considered for setting up, overhaul, checking, or cleaning the pump. When setting up the pump in any systems, pay attention to temperature in atmosphere. Mount rubber isolator to absorb vibration from the pump. On the environmental condition, refer to 「**0.4.2 Store of Product**」.

⚠ CAUTION

Do not tilt, lay its side, or operate up side down. It may cause damage. The pump must be placed on a level place in an upright position as shown in Fig-1, 2.

3.2 Oil charging

Remove the oil-filling plug, and then fill the oil (one time charge) to the pump or recommended oil (SMR-100) up to specified quantity through the oil filling port. In first oil charging, pour the oil up to maximum scale of oil gauge. Then, attach the exhaust port. (see Fig-3)

Oil quantity must be checked or adjusted to keep the oil quantity is always in the range of oil gauge during operating the pump.

Improper oil quantity may cause the performance deterioration of the pump, and also may cause damage. When oil quantity is out of gauge scale ultimate pressure become higher, and it may cause bubbling sound like "poko poko".

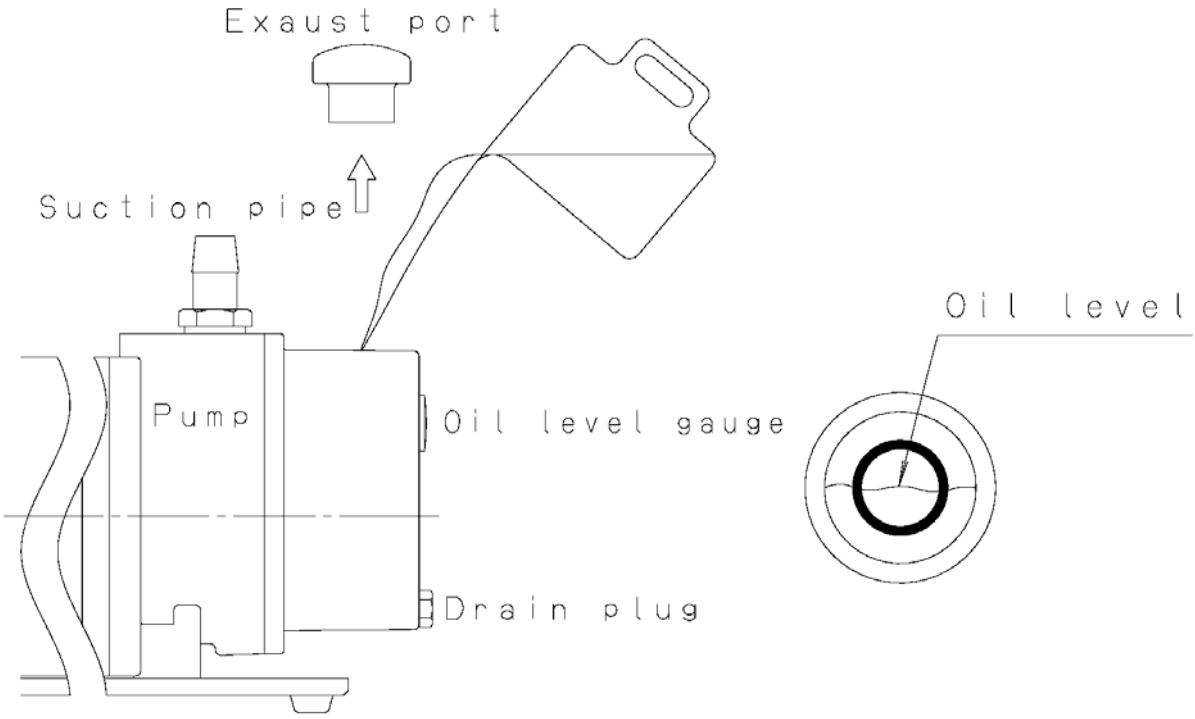


Fig-3 Oil Charge to Rotary Vacuum Pump

CAUTION

① Wear protective rubber gloves or goggles.

② Before charging oils, read the「1.2 Material Safety Data Sheet(MSDS)」. When the contaminated oil touching the skin or coming into the eye accidentally, follow the item first-aid-treatment of「Material Safety Data Sheet(MSDS)」.

NOTE

Do not apply other vacuum pump oils besides our recommended. If applying other vacuum pump oils, it may cause the performance deterioration or shortening the lifetime of the pump.

3.3 Vacuum Tubing

(1) Clean inner surfaces of vacuum vessel, tubing and valve. Then, after eliminating water moisture, small particle, dust or rust carefully, connect tube to the pump.

NOTE

If evacuating small size powder or dust particle, vacuum pump may cause trouble.

(2) Install the shut off valve (A) and the pump vent valve (B) in between the pump inlet port and the vessel as shown in Fig-4.

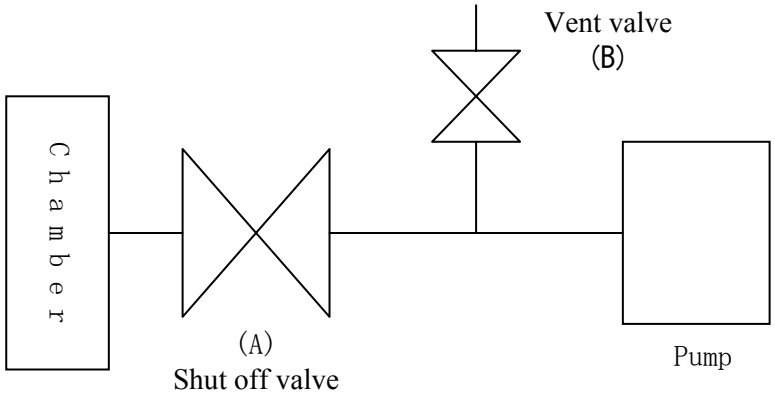


Fig-4 Vacuum Pumping System Diagram

(3) Vacuum tubing between inlet port and another port is provided with vacuum rubber hose.

NOTE

Do not eliminate mesh-filter for preventing different objects come into the inlet port of the pump.

3.4 Electric wiring

(1) This pump has performed beforehand electric wiring by the side of a pump.

(2) Plug the power wire cord in the power outlet of 100V, single phase.

(3) The over-load protector (thermal protector, manual reset type) is provided for this pump.

⚠ WARNING

Switch off power before electric wiring. Never connect electric wire cord when power line is hot. This may cause electric shock.

⚠ NOTE

Electric wiring should be carried out in accordance with Electric Regulation and Standard. Miss wiring may cause fire.

3.5 Fluctuations in the power voltage and frequency

Standard: Rotation electricity machine general rules

JIS C 4034-1:1999, JEC-2137-2000

To the voltage change and frequency change in Domain A, in main rated values, it operates continuously, and can be used practically convenient, and to the voltage change and frequency change in Domain B, it shall operate with main rated values and shall be used practically convenient.

However, operation with "it is convenient and safe is maintained on "practical use, it means not resulting in the grade which shortens a life remarkably, and the characteristic, a temperature rise, etc. do not apply correspondingly in the state of rating. Moreover, main rating shows rated torque (N·m).

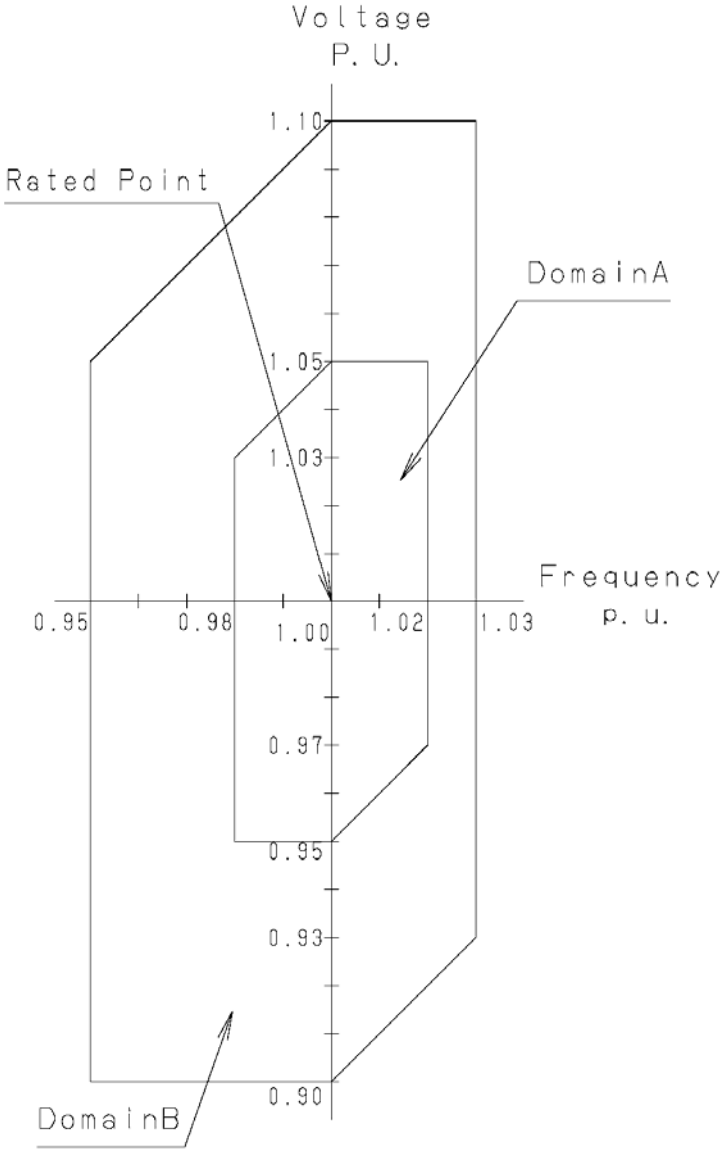


Fig. 5 Change region of the voltage and frequency

4. Operating Instructions

4.1 Operating precautions

⚠ WARNING

Explosion hazard. Do not plug the exhaust port or place any materials inside of the exhaust port, because it will reduce pumping speed during operation. Pump explosion, oil level gauge bursting, or over loading of the motor are consequences of excessive pressure inside the pump. This pump is not a compressor.

The maximum pressure inside this pump is 0.03 MPa (GAUGE).

⚠ NOTE

① In manufacturing process of semi-conductor, pump oil will be contaminated in a very short term. First oil changing should be done within 10 days. Then, after checking oil contamination, it should be recommended to decide the interval for changing oil.

② When evacuating much quantity of water moisture, change oil frequently. If operating pump a long term as taking water moisture into the pump, this may cause deterioration of oil lubricity, corrosive acceleration of parts inside the pump, also trouble of the pump.

③ When evacuating chemicals (acid or like), change the pump oil after stopping the pump immediately to prevent operational impossibility owing to rusting while stopping it for one night.

④ When evacuating solvents, change the pump oil after stopping the pump to prevent deterioration of oil lubricity and trouble cause (sticking, etc).

⑤ Continuous running at suction presser higher than 1.0kPa may cause high consumable rates of pump oil and oil shortage. And too oil shortage may also cause parts consumption and sticking, therefore supply pump oil without fail.

4.2 Start up Operation

Close the pump vent valve (B); open the shut-off valve (A) to inlet port of the pump, then turn on the power switch to start operation. The pump begins running(see Fig 4).

⚠ CAUTION

① Firing hazard. Do not touch the motor or the pump body as these surface temperature should be higher (70～80° C).

② Operating the pump at high-pressure region must be generated oil mist from exhaust port. Attach the oil mist trap or connect the duct to exhaust oil mist

⚠ NOTE

If the pump rotation is not so smooth, take action needed as described below.

① Check oil quantity, and charge proper quantitative oil.

② When stopping the pump for long term (3days or more) at low temperature, pump oil will come into the pump cylinder. (At end of former operation, vented air into the pump may also cause same situation) If restarting the pump at this condition, over load protector may be operated. Then, carry out several start-stop operations in a short time cycle.

⚠ NOTE

After operating the pump for several hours, oil temperature inside the pump may be risen up to 70 ～80° C. If the temperature is over this, the pump may have troubles. Maintain the pump, or contact ULVAC KIKO ,Inc.

4.3 Shut down Operation

Close shut off valve (A), open pump vent valve (B), then turn off power switch of the pump(see Fig 4). If stopping the pump by no opening pump vent valve, the oil will be filled inside the pump cylinder within several minutes. This may cause back flowing oil to the vacuum vessel. For next operation, restarting the pump will be difficult because of not so smooth rotation, thermal protector operating, motor firing by over loading.

When stopping the pump operation by electric stoppage, close shut off valve (A) quickly and then open pump vent valve (B).

⚠ CAUTION

Firing hazard. As the surface of the pump body is higher temperature(70 ～80° C) during operation, do not touch it until cooled down after stopping the pump.

⚠ NOTE ① Closing shut off valve (A) and opening pump vent valve (B), stop the pump. If this procedure is not performed, pump oil must be filled inside the pump. It may cause difficulty on restarting or damage the pump, also back flowing oil to the vacuum vessel.

② If the shut off valve (A) is not closed for shut down operation, this may cause air leakage through inside the pump to the vacuum vessel.

4.4 Start up procedures in cold climate

In winter-season, when operating the pump in cold environment or outdoor especially, it will be difficult to start up the pump. It is called over-load operation because of high viscosity of the pump oil at low temperature.

Warm up the pump oil, or repeatedly turn on and turn off the pump (several times on-off operation) until motor starts rotation.

In the case of the pump stoppage after several second operating, continuous operating will be possible by opening the pump vent valve. After warming up the pump, close the pump vent valve, and operate normally.

4.5 Set up oil mist trap (option)

Oil mist trap OMT-050A for GC-25Sa, 50Sa can be equipped for trapping oil mist out of the pump. After eliminating the standard exhaust pipe, equip the oil mist trap to the exhaust port. This can reduce oil mists and exhausting noise.

Read the instruction manual of OMT-050A in detail.

4.6 Restriction in an operation of the oil mist trap (option)

When using oil mist trap, the following items should be restricted in an operation.

When the filter clogged with oil, change the filter.

The maximum pressure inside this pump is 0.03MPa(GAUGE).

For pressure reading excess 0.03MPa(GAUGE) in exhaust port, change the filter.

⚠ WARNING

Explosion hazard. Keep the operational restriction in setting the oil mist trap. When the filter clogged with oil, change the filter.

5. Specification

5.1 Ultimate Pressure

The 「Ultimate Pressure」 described in the catalog or this manual means obtainable minimum pressure by vacuum pumping at inlet port without conducting gas (no load operating). Our ULVAC KIKO, Inc. applies the specified pump oil and measures the pressure at inlet port attached the sensor of only the Pirani gauge.

Pirani gauge indicates 5～10 times higher pressure reading than by the McLeod gauge. This means condensable contents (almost water vapor), included in the gas, could not be measured by the McLeod gauge.

In actual vacuum system, the ultimate pressure reading will be higher than the catalog description. This reason will be shown as follows.

① When the vacuum sensing head location is far from the pump, any water vapor or gas, generated from any water droplet or any rust adhered to the inside surface of the vacuum vessel or the vacuum tubing may cause high ultimate pressure.

② Any volatile contents dissolved into the pump oil will vaporize and it may cause higher ultimate pressure.

③ If there is any leakage or gas source in the vacuum tubing, the ultimate pressure will be high.

5.2 Pumping Speed

Pumping speed of the oil rotary pump must be changed with sort of gases. Generally, pumping speed will be max in high-pressure range, and will be proportional to vacuum pressure reduction. The standard pumping speed of this pump shows the maximum speed when pumping dry air. Inlet pressure Vs pumping speed is shown in Fig-6.

5.3 Required Electricity

Driving power for motor is totaled mechanical work based on rotor friction and air compression work. It will be maximum at 4×10^{4} ～2.7×10^{4} Pa. At lower pressure than 13.3Pa, compression work is small and almost power will be mechanical work consumption.

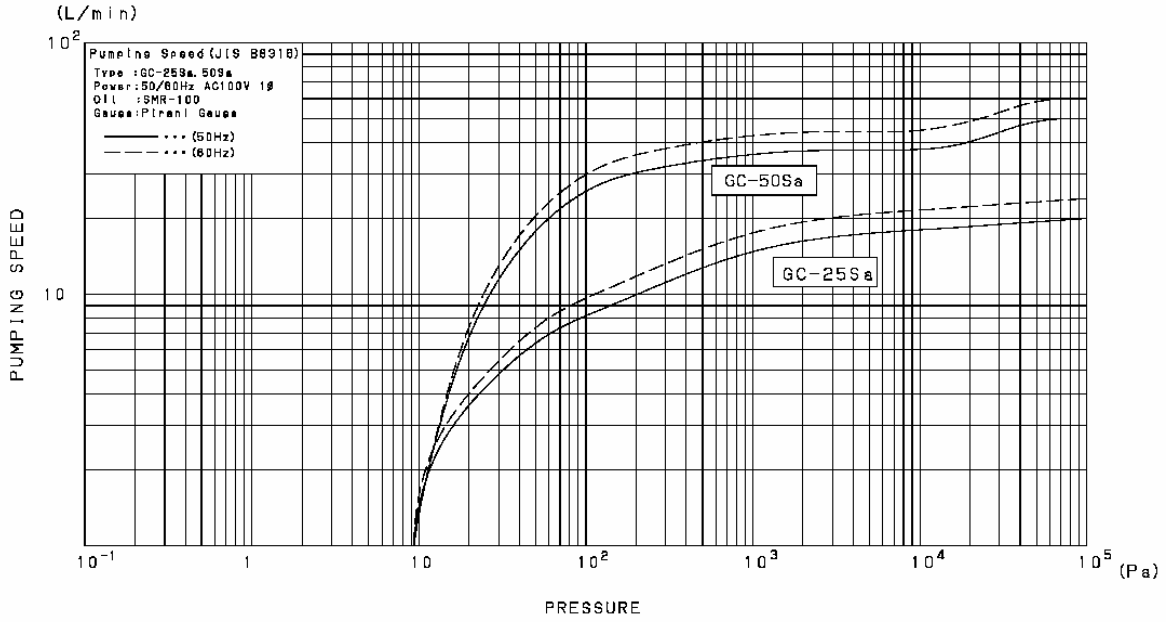


Fig-6 Characteristics of Vacuum pumping speed

6. Maintenance, Inspection, Repair

6.1 Maintenance

Check and confirm the following items at least every 3 days while operating.

(1) Oil level is in red ring marking of oil gauge.

(2) Change in color of the oil.

(3) Usual sound or not?

(4) Motor current, normal or not?

(5) Oil leak from oil seal assembly.

If detecting any problems, take an action needed by 「6.5 Trouble Check List」.

6.2 Scheduled Inspection

The inspection items should be changed for operational conditions of the pump. Inspecting the following items will be effective to avoid any troubles or to extend the pump life.

⚠ CAUTION

① Turn off power switch certainly before inspection. Never turn on power switch for inspection. It may cause personal injuries.

② Directly after stopping the pump, the pump body is high temperature. Wait until it will be cooled down, and inspect it. Burning hazard.

(1) Periodical changing the pump oil

Pump oil should be deteriorated with operating time. After checking the oil contamination and viscosity, change the oil quickly. Periodical changing the pump oil can suppress the performance deterioration, also elongate the pump life. If continuing the pump operation in the situation with much water, the ultimate pressure comes up to higher pressure. Then the pump motion become dull by mechanical friction, the pump may cause damage. Change the pump oil by 「6.3 Oil Change」.

Table-2 Scheduled Inspection

Inspect cycle	Inspect Item	Inspect content	Action item
Every 3 days	Oil quantity Oil contamination	Specified oil level	Recharge oil
		Reddish brown or milky white→abnormal Black→not abnormal	Change oil
	Sound & Vibration	Unusual sound & Unusual vibration	Tighten bolts/nuts or Contact your local Representative
	Motor current	Specified rating	Confirm over current source or Contact your local Representative
Weekly	Surface temperature rising	>45℃ UP →abnormal	Confirm over heat source or Contact your local Representative
	Oil leak	Oil leak from seals or plugs	Change seals, O-rings or Contact your local Representative
Every 3000hr or Every half year	Mesh filter, inlet port	Dust clogging	Clean the mesh filter
	Pump oil	Inspect oil certainly	Change oil
Every year	Spider	Broken spider	Change spider

(2) Inspecting the pump oil quantity

Recharge the specified pump oil as oil level is always in the range (red circle marking) of oil gauge during operating.

(3) Inspecting the pump oil leakage

When happening the oil leakage from shaft seals or drain-plug seals, repair must be needed. As our service center provides the specified O-rings or seals, please contact your local ULVAC KIKO, Inc. service center.

(4) Inspecting the mesh filter in the inlet port

Any dust included in evacuated gases may cause clog the mesh filter and down pumping efficiency.

(5) Inspecting the abnormal noise or vibration

Check up any loose screws and nuts.

(6) Inspecting the spider of coupling

When broken the spider of coupling. Change the spider of coupling by「6.4 Replacement of Spider in Coupling」.

(7) Inspecting the oil mist trap

When applying the oil mist trap instead of the standard vacuum tubing, pay attention for clogging of the mesh filter of the oil mist trap. Heavy clogging may cause increasing inside pressure or bursting out the oil level gauge. Also, it may cause oil leakage from shaft seals or drain plug seals.
The maximum pressure inside this pump is 0.03 MPa (GAUGE).

Besides the inspecting items mentioned above, overhaul is useful when continuing the operation for long term or observing heavy contaminated oils.
Please contact your local ULVAC KIKO,Inc. Sales and Service Center.

⚠ DANGER

When requesting overhaul or repair the pump, inform the sort of evacuated gases on the "Check sheet for repair" attached at end of this manual, and submit the sheet by all means. When evacuating toxic gases, the pump body and the oil may cause toxic. We cannot overhaul or repair the pump evacuated some sort of toxic gases.

6.3 Oil change

Oil deterioration may cause the operating pressure rising. Confirm the specked ultimate pressure by plugging the pump inlet port. If observing the high ultimate pressure, change the pump oil. If mixing volatile contents (water, solvent) in the pump oil or precipitated sludge on the pump bottom, several times oil changing procedures should be necessary. The oil deterioration may be caused not only by oil contamination due to evacuated gases but also by oil performance change depending on long operating time. We recommend periodical oil change by the Table-2 "Scheduled Inspection".

DANGER

When evacuating toxic gases, the pump body and the pump oil may cause toxic. Pay attention certainly.

CAUTION

① Wear suitable protector (rubber gloves, goggles).

② Before charging the oil, read the「1.2 Material Safety Data Sheet(MSDS)」. When the contaminated oil touched skin or came into eye accidentally, follow the first-aid-treatment of「1.2 Material Safety Data Sheet(MSDS)」.

NOTE

Do not apply the different type of vacuum pump oil besides our recommended. If applying the different type of vacuum pump oil, it may cause the performance deterioration or shortening the lifetime of the pump.

[Oil Change Procedure]

(1) Unplug the inlet port and operate the pump for 5 sec. We can discharge the remained oil inside the pump, effectively.

(2) Disconnect the standard exhaust pipe, unplug the drain port, and then drain off the oil.

(3) Plug the drain port; charge the recommended new oil as fixed quantity from the exhaust port. (see Fig.3)

(4) If the oil contamination is heavy, operating the pump for several minutes with the new pump oil will be necessary for cleaning the pump inside. Several cleaning procedures should be necessary for very heavy contamination.

(5) After warming up the pump by operating with the new pump oil, confirm the ultimate pressure.

(6) When depositing the oil sludge on the pump bottom as heavily contaminated oil, the specified ultimate pressure is difficult to obtain. Overhauling and repairing should be needed.

6.4 Replacement of Spider in Coupling

The spider (made of rubber) is used between the pump head and the motor. It is recommended that it be checked once a year and replaced if found defective. If the pump is started and stopped hundreds of times per day, it is necessary to check it within a shorter time. To remove the spider, please remove the 4 bolts, which time the coupling, will be visible.

To have the pump reassembled after overhauling, fit the spider to the coupling, (as shown by Fig-7), adjust the direction of indented part of the pump head (female) and that of the motor (male), fit them tightly together, and tighten the bolts firmly to the motor.

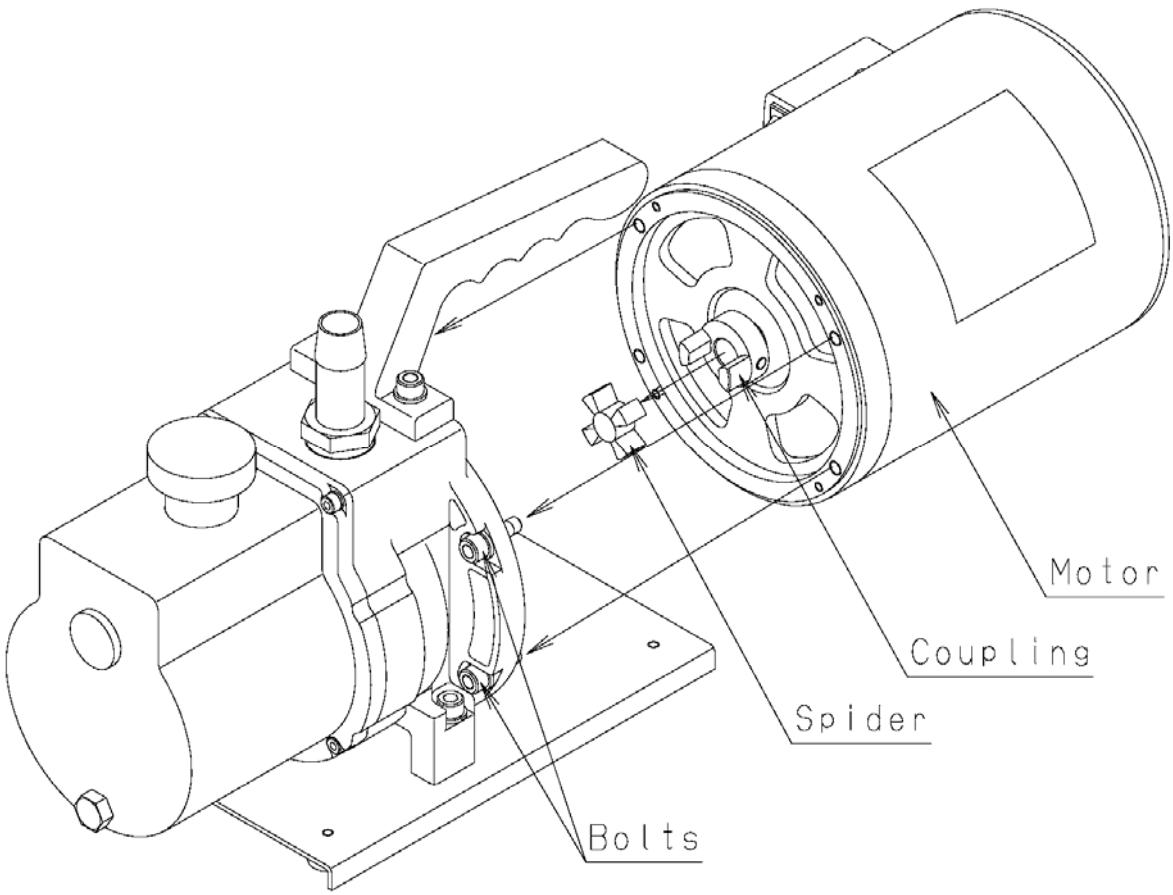


Fig-7 Replacement of Spider in Coupling

6.5 Trouble Check List

Table-3 Trouble Check List

Trouble	Cause	Procedure	Note
No rotating pump	① No connecting power	① Connect power cord	3.4
	② Power switch off	② Turn on power switch	4.2
	③ Abnormal input voltage	③ Adjust input voltage within ±10%	3.5
	④ Overload relay operated	④ Reset button switch	
	⑤ Inferior motor	⑤ Replace motor	
	⑥ High oil viscosity at low temperature	⑥ Warm atmosphere above +7℃	4.5
	⑦ Sticking the rotor by coming different objects into the pump	⑦ Overhaul and repair (change cylinder or rotor)	6.2
	⑧ Generating rust inside the pump by evacuating water vapor or solvent	⑧ Overhaul and repair (change cylinder or rotor)	6.2
	⑨ After evacuating reactive gases, reacted materials deposited inside the pump	⑨ Overhaul and repair (clean and eliminate any reacted materials inside the pump)	
	⑩ Internal parts damaged	⑩ Overhaul and repair (change the parts)	
Irregular rotation of the pump	①Abnormal input voltage	①Adjust input voltage within ±10%	3.5
	②Inferior wire connect ion to the pump	②Connect wire again to the pump	3.4
	③High oil viscosity at low temperature	③Warm atmosphere above +7℃	4.5
	④Coming different objects into the pump	④Eliminate different objects then overhaul and repair the pump	
No pressure reduction	① Low pumping capacity for vacuum vessel volume	① Re-select the pumping capacity	5.2
	② Vacuum pressure measuring is not correct	② Measure the vacuum pressure correctly	5.1
	③ Inadequate applying vacuum gauge	③ Apply the corrected vacuum gauge adapted to measuring pressure range	
	④ Small diameter and long suction tubing	④ Connect same diameter tubing with inlet port(suction) and short distance to the vacuum vessel	5.1
	⑤ Clogged the different objects on the mesh filter inside the inlet port	⑤ Disconnect the suction tubing, clean the mesh filter	6.2
	⑥ Insufficient quantity of the oil	⑥ Fill the oil up to the specified quantity	3.2
	⑦ Oil deteriorated	⑦ Change the oil	6.3

Trouble	Cause	Procedure	Note
	⑧ Leakage from the tube connection with the pump	⑧ Detect leakage by the leak detector, and stop leakage	
	⑨ Applying no specified oil	⑨ Charge specified oil after overhauling or repairing	6.3
	⑩ No circulating oil. Clogging the oil aperture of the pump cover	⑩ Overhauling and repairing, clean the oil aperture	
Unusual sound	① Abnormal input voltage	① Adjust input voltage within ±10%	3.5
	② Inferior motor	② Replace motor	
	③ Coming different objects into the pump	③ Eliminate different objects then overhaul and repair the pump	
	④ Insufficient quantity of the oil	④ Fill the oil up to the specified quantity	3.2
	⑤ broken the spider of coupling	⑤ Change the spider of coupling	6.4
	⑥ No circulating oil. Clogging oil aperture of the pump cover	⑥ Overhauling and repairing, clean the oil aperture	
	⑦ Internal parts damaged	⑦ Overhauling and repairing (Replace parts)	
Abnormal high temperature on the pump surface R.T > +50 ℃	① Continuous operating at high suction pressure	① Temperature of the pump surface will be 80℃ during continuous operation, but no problem happened	
	② Insufficient quantity of the oil(Oil shortage, low cooling effect)	② Fill the oil up to the specified quantity	3.2
	③ High temperature evacuating gases	③ Set the gas cooling unit on suction side	
	④ No circulating oil. Clogging the oil aperture of the pump cover	④ Overhauling and repairing, clean the pump aperture	
Oil spouting from exhaust port	① Too sufficient oil quantity for the specified level	① Drain the oil to the specified level	3.2
	② Continuous operating at high suction pressure	② Set oil mist-trap on exhaust side	4.6
Oil leak out of the pump	① O-rings or oil seals of the case or the cover	① Inspect and replace o-ring or oil seals	6.2

7. Product Disposal

When disposing the pump, check and dispose the pump in accordance with laws and regulations by the local administration.

⚠ CAUTION

When evacuating toxic gases which present hazardous situations to the human body entrust the pump should be disposed with authorized professional specialist.

8. Warranty

(1) ULVAC KIKO, Inc. warrants the product for one (1) year from date of shipment out of our factory unless otherwise negotiated at time of sale.

(2) ULVAC KIKO, Inc. will reconditions the product without charge for any problems under normal operational conditions during the warranty period. Normal operational conditions are shown as follows,

a) Operational ambient temperature and humidity: +7～+40℃, <85% RH

b) Sort of evacuating gases and gas temperature

: Dry air or dry nitrogen, +7～+40℃

c) Operation by this instruction manual.

(3) The following cases should be with compensation even if during the warranty period.

a) Problems caused by natural disasters or other causes beyond the control of ULVAC KIKO, Inc.

b) Problems caused by abnormal environment (pollution, etc.).

c) Problems caused by incorrect or careless operation that are not in compliance with instructions given in this manual.

d) Problems caused by unauthorized modification of the product by a party other than ULVAC.

e) Consumable parts.

f) Problems decided that are not in compliance with the operational conditions of the product by our engineers.

Our warranty, described in this manual covers only the product, but does not cover any damages resulting from problems of the product.

Also, our warranty does not cover any problems except repairing or changing parts.

A guarantee is effective only in Japan.

9. Main Expendable parts

9.1 Main Expendable Parts List

Table-4 Main Expendable Parts List

Location	No	Code No	Parts Name	Standard & Dimension	Materials	Q'ty
Coupling	1	10830072	Spider		PU	1
Oil seal housing	2	00092038	O-Ring	S-29 (NOK)	NBR	1
	3	00093005	Oil-seal	HTC11-25-7	NBR	1
Suction port	4	00092223	O-Ring	JIS B 2401 P-18	NBR	1
Casing	5	00092022	O-Ring	S-15 (NOK)	NBR	1
Pomp	6	10750062	Discharge valve GC-25Sa…2 GC-50Sa…3	9×24×t0.1	SUS	—
	7	00093107	Oil-seal	SC15-30-7 (NOK)	NBR	1
Rotor	8	10830063	Vane(GC-25Sa)	20×13×t4	S45C	2
		11130062	Vane(GC-50Sa)	45×13×t4	S45C	2
	9	11190061	Vane spring	φ2.4×24	SWP	2
Side cover	10	00091003	Ball bearing	6900open	SUJ	1
Casing	11	00092081	O-Ring	S-120.9 (NOK)	NBR	1
Front cover	12	00092211	O-Ring	JIS B 2401 P-8	NBR	1
	13	10790073	Oil level gauge	KW-No. 0A	PC	1

9.2 Disassembly Drawing

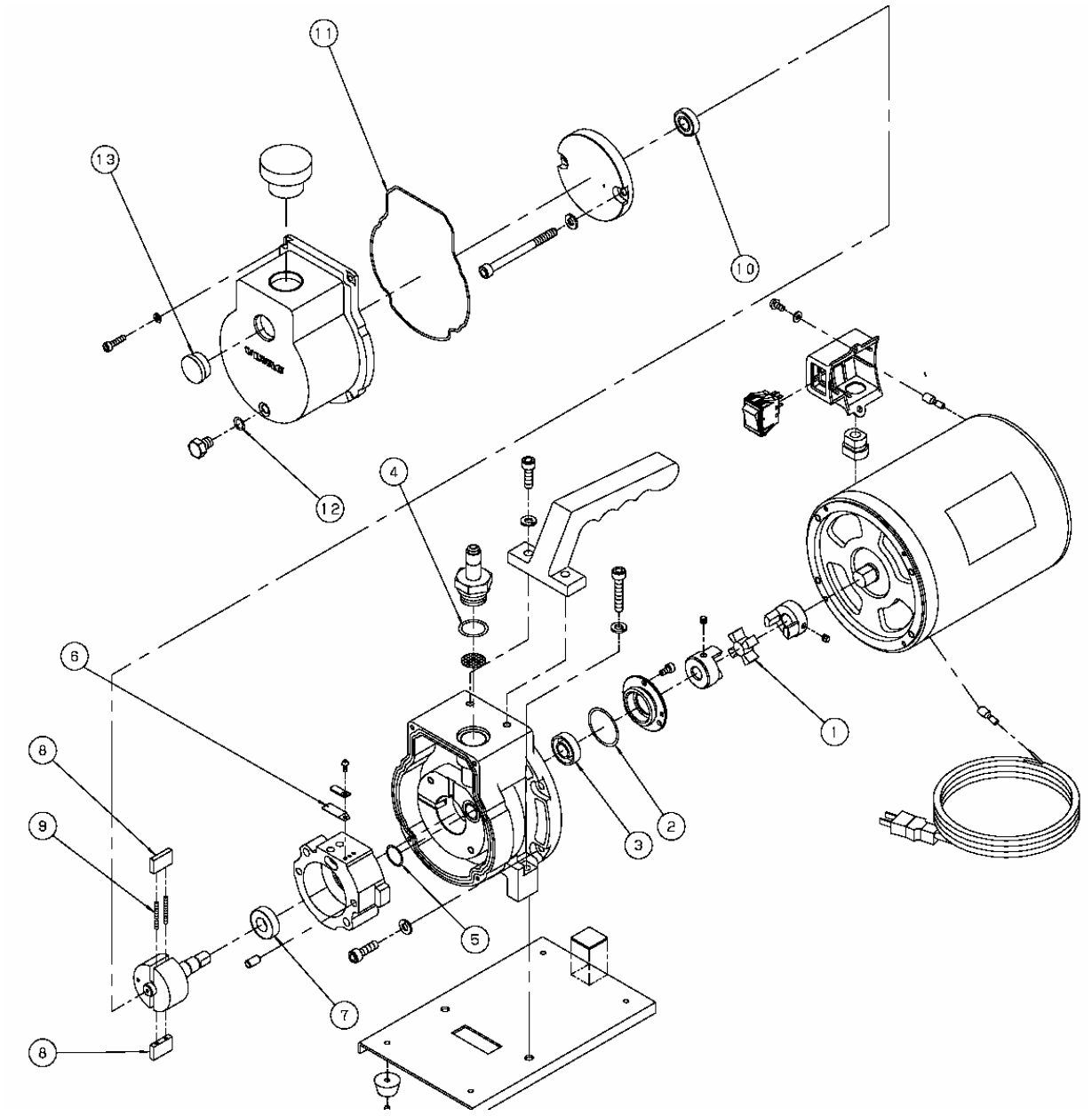


Fig-8 Disassembly Drawing of GC-25Sa、GC-50Sa

(Attached paper) Material Safety Data Sheet (MSDS)

The chemical material, which is applied or possible to contact when operating this pump are described. Read this manual carefully to understand characteristics of the chemical material (vacuum pump oil) which is described on MSDS sheet. When applying other vacuum pump oils besides the description in this manual, contact your local ULVAC SINKU-KIKO Co., LTD Sales and Service Center.

⚠ CAUTION

MSDS presents the reference information of hazardous chemical material to keep safety precautions. When handling the pump oil, it is necessary to take proper and practical treatments which are adapted handling the oil. After understanding the above mention, these treatments must be done. Therefore, MSDS is a not safety warranty.

Attached Table Material Safety Data Sheet Vacuum Pump Oil SMR-100

Section Ⅰ- Hazardous Ingredients/ Identity Information			
Hazardous Components (Specific Chemical Identity; Common Name(S))	OSHA PEL	ACGIH TLV	Other Limits Recommended %(optional)
*Mineral oil(Highly-refined oil) (*Hazardous Components)	n/e (n/e = not established)	n/e	n/e 100%
Section Ⅱ- Physical/ Chemical Characteristics			
Boiling Point (°C/ mmHg)	165°C/0.1mmHg 165°C/13Pa	Specific Gravity (H_2O=1)	0.88(15/4°C)
Vapor Pressure (mmHg/°C)	1.0×10^{-4}mmHg/50°C 1.3×10^{-2}/50	Pour Point (°C)	-15.0°Cmax.
Vapor Density (Air=1)	>1	Evaporation Rate (Butyl Acetate=1)	<1
Solubility in Water	Negligible		
Appearance and Odor	Light yellow, viscous liquid with slight oily odor		
Section Ⅲ- Fire and Explosion Hazard Data			
Flash Point(Method Used)	(°C) 200min. (COC)	Flammable Limits	LEL UEL 1.0%
Extinguishing Media	Dry chemical, CO_2, Foam		

Special Fire Fighting Procedures Fire fighters or others exposed to products of combustion should wear protective clothing including self-containing breathing apparatus.			
Usual Fire and Explosion Hazard None			
Section Ⅳ- Reactivity Data			
Stability	Unstable		Condition to Avoid
	Stable	×	High temperature exceeding 100°C in storing
Incompatibility (Materials to Avoid)			Strong oxidizing agents.
Hazardous Decomposition or Byproducts			none
Hazardous Polymerization	May occur		Condition to Avoid.
	Will not occur	×	High temperature exceeding 100°C in storing

Section Ⅴ- Health Hazard Data			
Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	No	Yes(Slightly)	Unlikely
Health Hazards(Acute and Chronic) Acute Oral Toxicity; No information Skin irritation ; Mildly irritating Eye irritation ; Mildly irritating			
Carcinogen city:	NTP ?	IARC Monographs?	OSHA Regulated?
	Not listed	Group 3	Not regulated

Signs and Symptoms of Exposure

None normally encountered.

Medical Conditions Generally Aggravated by Exposure

Unknown

Emergency First Aid Procedures

Skin : Wash with mild soap and water. If irritation persists, seek medical attention.

Eye : Immediately flush eyes with plenty of water for at least 15 minutes. If irritation persists, get medical attention.

Inhalation : Remove to outside air.

Ingestion : Do not induce vomiting. Get medical attention.

Section VI- Precautions for Safe Handling and use

Steps to Be Taken in Case Material is Released or Spilled

Eliminate ignition sources.

Remove free liquid into an empty container. Use suitable absorbents for the un-recovered fluid.

In case of a large amount of leak or spill, lead the flow of the liquid to a safety place by means of banking with sand or any other appropriate materials. Then recover it.

Waste Disposal Method

Dispose the waste according to federal, state and local regulations.

Precautions to Be Taken in Handling and Storing

Use with adequate ventilation.

Wear safety gloves and glasses.

Store indoors and close tightly with cap.

Keep the storage temperature in the range from 0°C to 40°C.

Keep away from heat, open flame, sparks and other possible ignition sources.

Prevent accumulation of static electricity.

Keep away from halogens, strong acids, alkaline agents and oxidizing agents, and do not store the product in the same place.

Other Precautions

Avoid contact with eyes, skin and clothing.

Section VII- Control Measures

Respiratory Protection (Specific Type)

Not normally required.

Ventilation	Local Exhaust Not normally required.	Special None
	Mechanical (General) Recommended.	Other None

Protective Gloves Rubber	Eye Protection Goggles

Other Protective Clothing or Equipment

None

Work/ Hygienic Practices

Wash hands thoroughly after handling.

CHECK SHEET FOR REPAIR

Please inform the following items completely for safety precautions against our maintenance staff.

Date of issue _____

Customers name _____

Person in charge _____

TEL No. _____ — _____ — _____ Ext. _____

FAX No. _____ — _____ — _____

Representative Distributor _____

Person in charge _____

TEL No. _____ — _____ — _____ Ext. _____

FAX No. _____ — _____ — _____

Product Name _____ Serial No. _____

1. Request item

(1) Trouble

situation: ☐ Unusual sound ☐ Pressure degradation

☐ Irregular action ☐ Others

(2) Scheduled inspection ・repairing

(3) Others _____

_____

2. Evacuated gas

(1) Hazardous situations for injury YES NONE

(2) Sort of gas _____

3. Operational elapsed time Approx. _____ Hr

4. Miscerenous Information

_____

_____

<NOTICE>

Please use this paper by recopying for every information. When sending your information without this check sheet, repairing may not be acceptable.

< ULVAC KIKO,Inc. >

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(3F Tenko Bldg. 50)
Tel: 045-474-2011 Fax: 045-474-2010

ULVAC

Inspection Certificate

Product: Oil sealed rotary vacuum pump
Model: GC-25Sa
GC-50Sa
Inspected by: