

Instructions Manual Multiple Roots Type Dry Pump

GR60 GR90 GR180

 \times IE3 motor adoption

Be sure to read the manual before using this product. In addition, keep it in a safe and readily available place.

ULVAC, INC. Components Division http://www.ulvac.co.jp/

0. Before Use

We are sincerely appreciate your decision to purchase our product.

Upon receipt of the product, please confirm the contents included are the same as you ordered and check the product for any damage attributed to transportation etc. just in case.

This manual describes appropriate ways to handle and maintain the product for the safe use and effective performance. Before using the product, read this instructions manual for the correct use of the pump.

Install and operate this product according to the local and national safety laws and regulations (such as fire laws and electric wiring code). Accordingly, you are required to take classes for general safety that are valid in the country and the local area at the site. No one who hasn't take the classes can handle the product. The operator is required to have taken such trainings. In addition, the operator has expertise, skills, qualifications in electrics, mechanics, cargo handling, vacuum, etc.

This product is designed to follow the current regulations as of the preparation of this manual. If the criteria of the regulations are changed in the future, the compliance is not guaranteed.

If the device with this product built-in doesn't follow the same regulations, or if any changes are made to the product itself, it may not be guaranteed to have its performance and safety. We don't guarantee (have no responsibility for) such performance and safety. Any product modifications you have done are not covered by our warranty and we are not responsible for them.

Before installing/removing this product, keep the product from all the energy sources (such as electricity).

All the parts of this product are not intended for permanent use with the performance at the delivery. Even under the conditions of use expected in light of common sense, the performance inevitably deteriorates with time, which tends to cause trouble on the product. We would like to ask you to grasp your conditions of use and cooperate to provide preventive maintenance to avoid any trouble.

If you cooperate to make preventive maintenance measures, the likelihood of the trouble on this product attributed to malfunctions caused by worn parts will decrease and that of the risk, such as downtime, fire, and influence on other processes, attributed to the trouble on this product will also decrease.

In addition, from the viewpoint of preventive maintenance, you are asked to prepare a maintenance and inspection plan and conduct parts replacement and overhaul accordingly.

If you have any unclear points, please contact the closest sales office, agency, or our Components Division.



In no case, all or part of this instructions manual may be copied for any third party without our permission.

0.1 Safety Symbol Mark

This instructions manual and the product warning labels indicate safety symbol marks for the understanding of compliance rules. The signs for the symbols are classified as follows.

0.2 Definition of Safety Symbol Mark



This indicates an imminently hazardous situation which, if the product is misused, will result in operator's death or serious injury.



This indicates a potentially hazardous situation which, if the product is misused, could result in operator's death or serious injury.



This indicates a potentially hazardous situation which, if the product is misused, may result in operator's moderate injury or serious damage to the machinery. This indicates a potentially hazardous situation which could result in damage to the machinery or malfunctions.

IMPORTANT	"IMPORTANT" is indicated if there is information or content which needs to be known especially for operation and maintenance work of this system.
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Work that needs training on electrical safety due to the risk of an electric shock.



Work that is done after checking that the pump temperature decreases because that part is high in temperature immediately after the pump stops.

0.3 Safety Precautions

This section describes a way to avoid dangers and dangerous behavior to be avoided for each work.

About this product and this instructions manual



To use this product for many years, be sure to read this instructions manual before installation, operation, inspection, or maintenance of this product and fully understand the safety precautions, specifications, and operation method of this product.



This product is supposed to exhaust inactive gas (air, nitrogen, argon) so exhaust of other gas (toxic gas, combustion gas, flammable gas, corrosive gas, explosive gas) is extremely dangerous. Do not exhaust any gas with these properties.



If combustion/flammable/explosive gas is sucked in the vacuum pump, it is extremely dangerous because the residual gas or products may cause ignition/explosion not only in operation but also after a stop. Do not exhaust any gas with these properties.



If toxic gas is sucked in the vacuum pump, it goes without saying that not only the pump body but also the pump oil will be toxic. Take care during the maintenance work.



If the details on the hazardous substances you have used are not disclosed, or if substances that are hard to detoxify are exhausted, we may refuse maintenance and other operations at your site.



Note that the specifications, prices, etc. of the product and the description of the instructions manual are subject to change without prior notice for improvement. When any changes are made, the document number at the upper right of the front cover of the instructions manual is updated and the document is released as a revised version.



Be sure to give this instructions manual to the end user of the product.



Please let us know if you export this product and take necessary procedures according to provisions of export-related laws and regulations.

If there are any unclear points, please contact the sale office where you purchased the product.



Storage/Installation

WARNING

- (1) This product is paced in a wooden crate. Please ask a professional contractor to dismantle it. During the work, there is the risk of cutting your hands by nails or wooden chips used to fix the wooden crate. Therefore, instruct the person who dismantle the crate to wear leather gloves and use an appropriate dismantling tool, such as a crowbar.
 - (2) If the product needs to be taken out from the crate or the pump needs to be lifted, instruct the operator to use cargo handling equipment, such as a crane, and the eye bolts on the pump to lift for transportation. Check the eye bolts for any error.
 - (3) Any person other than those having technical qualifications shall not perform cargo handling operation and operate cargo handling equipment.
 - (4) Unreasonable operation or insufficient maintenance of equipment may cause the pump to fall or turn over. Never get under the pump.

Transportation

- (1) This product has casters. But do not transport it on casters over a long distance.
- (2) The mass of each product is as follows:
 - GR60: 128kg GR90: 188kg GR180: 268kg



- A load over the safety standard value is required for transportation, and therefore you may strain your back. Transport it by hanging with cargo handling equipment (such as a mobile crane), or put and fix it on a pallet and transport it on a pallet track.
- (3) This product uses vinyl tubes as nitrogen gas and cooling water pipes. Transport the product with care not to have it in contact with posts and walls.

Seismic countermeasure



If not securely fixed, it may turn over or move, damaging the peripheral equipment. Vacuum pipes and electric wires shall be structured not to rapture, not to be disconnected, and to absorb vibration by a specified vibration.

Intake and exhaust piping <Mounting>



Before starting work, check that all dangerous energies are shut out.

Nitrogen Gas Piping <Mounting>

- (1) Before starting work, check that all dangerous energies are shut out.
- (2) It is designed to prevent leakage under specified conditions and a leak test is performed. However, any abnormal conditions outside the range of the specifications (such as an abnormal pressure increase) may cause leakage.
 - (3) Nitrogen gas is used as the shaft seal gas. Install in a ventilated room.
 - (4) Attach a feed valve to stop the supply of Nitrogen gas.

Cooling Water Piping <Mounting>

WARNING

- (1) If the operation is continued under the conditions where the cooling water flow is lower than the specified value, the pump may be broken. Using a flow sensor etc, make a system that shuts out the supply of electricity to the pump in the event that the cooling water stops.
 - (2) Before starting work, check that all dangerous energies are shut out.
 - (3) It is designed to prevent leakage under specified conditions and a leak test is performed. However, any abnormal conditions outside the range of the specifications (such as an abnormal pressure increase, condensation etc.) may cause leakage. In such a case, water continues to leak until the supply from the device stops. Do not install electric equipment or wires on the bottom of or the floor surface in the proximity of the pump.
 - (4) During the operation of this product, the vacuum pump body needs to be cooled at all times by supplying a specified amount of flowing water. Install a flow meter that can visually recognize the flow (such as a flow sight) to check that cooling water flows.
 - (5) Install a water leakage sensor on the floor under the pump. If any water leakage is detected, immediately close the feed valve of the cooling water and set up a system to shut out electricity to the pump.
 - (6) Attach a feed valve to stop the supply of cooling water.



Power Cable <Mounting>

WARNING

- (1) Before starting work, check that all dangerous energies are shut out.
- (2) Wiring work shall be performed only by qualified personnel. Wrong wiring work may trigger fire.
- (3) Wiring work shall be performed correctly according to the safety laws and regulations (such as fire laws, electric wiring codes, and indoor wiring regulations) of the country and the local area where you use this product.
- (4) Securely connect to ground.
- (5) We recommend installing a dedicated earth leakage breaker. There is a risk of an electric shock.
- (6) Be sure to attach an overload protective device. If not, it may result in a motor burnout or fire.

Operation

	(1)	During the operation, do not touch the vacuum pump body, motor, and pipes since they are subjected to high temperature. If your body comes into contact with them, you may get burned.
	(2)	Do not operate the vacuum pump with any devices that cause clogging of the exhaust attached on the exhaust port side in such a way that they disturb the gas flow. Otherwise the inner pressure of the vacuum pump may increase and cause a rupture of the casing and the oil level gauge, resulting in oil leakage and an overload of the electric motor.
	(3)	During the operation of this product, the vacuum pump body needs to be cooled at all times by supplying a specified amount of flowing water. Install a flow meter that can visually recognize the flow (such as a flow sight) to check that cooling water flows.
	(1)	Do not use in a hazardous area (where a hazardous atmosphere may occur by explosive gas). Otherwise injury or fire may occur.
	(2)	Do not put your fingers or any objects in the opening of the motor. Otherwise an electric shock, injury, fire, etc. may occur.
	(3)	Never place any flammable object in the area within 1m from the motor or the vacuum pump. Otherwise fire may occur.
	(4)	Do not place walls and obstacles within 0.3m from the ventilator of the motor (from the ends of the electric motor). Otherwise you may get burned or fire may occur.
1		





Stop



For a while after the operation stops, do not touch the vacuum pump, motor, and pipes since they are subjected to high temperature. If your body comes into contact with them, you may get burned. Supply cooling water until the pump temperature becomes low.

Inspection/Repair

(1) Before inspection/repair, be sure to turn off the power switch. Otherwise the vacuum pump suddenly starts to operate and you may get injured.



- (2) Any person other than service engineers is not allowed to disassemble or repair/modify at all. Otherwise ignition or abnormal action may occur and you may get burned or an electric shock.
 - (3) If the product does not work or there is an error, immediately turn off the power switch to prevent any accidents and please always ask the shop you purchased it or the nearest service center to inspect/repair.

Power Cable <Removal>



Before removal, be sure to disconnect it from the power supply.

Cooling Water Piping <Removal>

(1)	For during operation, and for some time after the operation stops, do not touch the vacuum pump, motor, and pipes since they are subjected to high temperature. If your body comes into contact with them, you may get burned. Supply cooling water until the pump temperature becomes low.
(2)	When removing the cooling water joints immediately after the pump operation stops for a model with hermetically sealed connections, the cooling water remaining in the pump may boil with an inner pressure increase, causing damage to the cooling water pipes. Supply cooling water until the pump temperature becomes low.
(3)	Before removal of the cooling water pipes, close the feed valve of cooling water.
(4)	This product uses vinyl tubes as cooling water pipes. If the cooling water inlet or outlet is sealed and compressed air is supplied from the non-sealed port, the cooling water pipes may not be able to withstand the load of the compressed air and be broken. When supplying compressed air into the cooling water pipes, be sure to do that with one port open.



Nitrogen Gas Piping <Removal>

WARNING

WARNING

- (1) Before removal of the nitrogen gas pipes, close the feed valve of nitrogen gas.
- (2) The pipe on the device side has residual pressure. Install a pressure gauge in the nitrogen supply source of the device (on the way to the pump in the pipe) and check that the pressure decreases down to the atmospheric pressure, before removing the nitrogen gas pipes. If the inner pressure is high during the work, there is a risk that the pipes may be disconnected with force and you may get injured.

Intake and exhaust piping <Removal>

- (1) Remove according to the installation manual of the device.
 - (2) For a while after the operation stops, do not touch the intake and exhaust pipes since they are subjected to high temperature. Remove after the pump temperature becomes low.
 - (3) Fully seal the intake and exhaust ports using shutoff flanges etc.

Transportation

- (1) This product has casters. But do not transport it on casters over a long distance.
- (2) The mass of each product is as follows: GR60: 128kg

GR90: 188kg



- GR180: 268kg A load over the safety standard value is required for transportation, and therefore you may strain your back. Transport it by hanging with cargo handling equipment (such as a mobile crane), or put and fix it on a pallet and transport it on a pallet track.
- (3) This product uses vinyl tubes as nitrogen gas and cooling water pipes. Transport the product with care not to have it in contact with posts and walls.

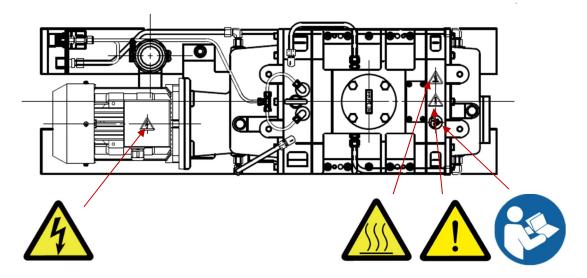
0.4 Type/Description and position of warning label on this machine

On this machine, warning labels are attached to the points to warn. Be sure to check before operating the pump.

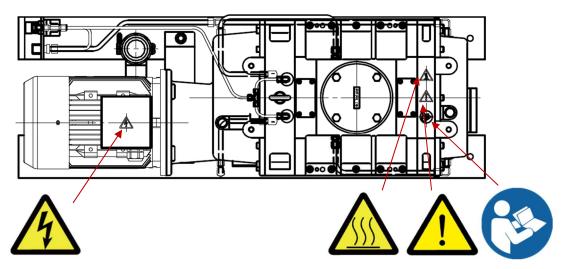
Before use, read through the instruction manual and fully understand its contents.
There is a risk of an electric shock in the area around a point with this warning label. Before the wiring and maintenance work, be sure to turn off the power supply. Be sure to close the cover of the terminal box.
For during operation, and for some time after the operation stops, do not touch the vacuum pump, motor, and pipes since they are subjected to high temperature. If your body comes into contact with them, you may get burned.
If the vacuum pump is not operated and stored for a long period of time, rust formation etc. may cause problems in operation. If it has not been used for a long time, please ask the nearest service center to inspect.



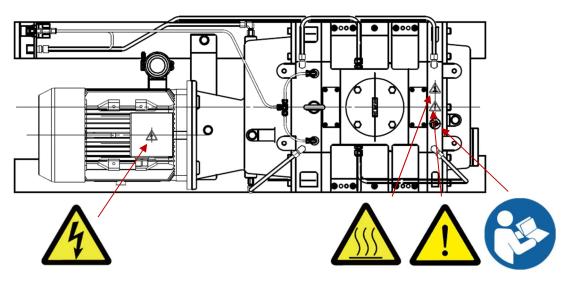
GR60



GR90



GR180



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0.5 Acceptance and storage of pump

0.5.1 Acceptance of unpacked pump

	(1)	This product is paced in a wooden crate. Please ask a professional contractor to dismantle it. During the work, there is the risk of cutting your hands by nails or wooden chips used to fix the wooden crate. Therefore, instruct the person who dismantle the crate to wear leather gloves and use an appropriate dismantling tool, such as a crowbar.	
	(2)	If the product needs to be taken out from the crate or the pump needs to be lifted, instruct the operator to use cargo handling equipment, such as a crane, and the eye bolts on the pump to lift for transportation. Check the eye bolts for any error.	
	(3)	Any person other than those having technical qualifications shall not perform cargo handling operation and operate cargo handling equipment.	
	(4)	Unreasonable operation or insufficient maintenance of equipment may cause the pump to fall or turn over. Never get under the pump.	

Upon receipt of the product, please confirm first the contents included are the same as you ordered and check the product for any damage attributed to transportation etc. If you notify us after the product is used, it may be charged.

The product is shipped with due care but, after you unpacked, please check the following just in case.

Item Name	Specifications	Quantity	Remarks
Instructions Manual	English	One copy	_

0.5.2 Transportation (Carry-in/out)

- (1) This product has casters. But do not transport it on casters over a long distance.
 - (2) The mass of each product is as follows:
 - GR60: 128kg GR90: 188kg



- GR180: 268kg A load over the safety standard value is required for transportation, and therefore you may strain your back. Transport it by hanging with cargo handling equipment (such as a mobile crane), or put and fix it on a pallet and transport it on a pallet track.
- (3) This product uses vinyl tubes as nitrogen gas and cooling water pipes. Transport the product with care not to have it in contact with posts and walls.

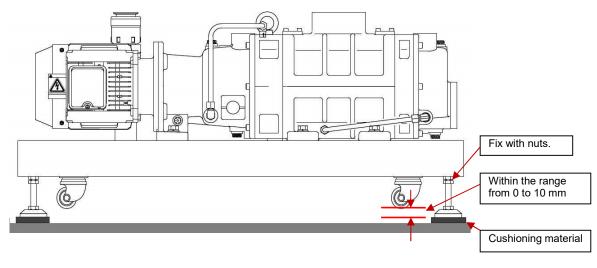
0.5.3 Ambient conditions during storage, installation, and operation

This product is a machine with precision clearances. Therefore satisfy the following conditions during the storage, installation, and operation.

(1) Ambient temperatu	[During ire and storage]	:	-30 to 60 \degree C, 95%RH or lower (No freeze and condensation)
humidity	[During] operation]	:	5 to 40 \degree C, 90%RH or lower (No condensation)
(2) Altitude	[During storage During operation]	:	Altitude: 1,000m or lower
(3) External vibration	[During storage · During operation]	:	Vibration acceleration: 0.5G (114 dB) or lower
(4) Others	[During storage · During operation]	:	a. Corrosive and explosive gas are not allowed.b. Freeze and condensation is not allowed.c. Dust is not allowed.d. The room shall be ventilated.

- e. The pump is not allowed to double stack and turn over, and the motor and the oil level gauge are not allowed to stand with their ends facing down.
- f. Direct sunlight shall be avoided.
- g. Keep away from heat sources.
- h. At the time of storage, be sure to drain.
 - (At 0 $^{\circ}$ C or lower, water is frozen, damaging the cooling water pipes etc.)
- i. After moving to the installation site, adjust the jacks at the four points within the range from 0 to 10 mm to install the pump body horizontally.
- j. Use cushioning materials, such as vibration-proof rubbers, on the installation surface.

Installation of Pump





Do not give a shock to, tilt, turn over, or stand the pump, or make it upside down. Otherwise it affects the pump operation. With the intake port facing upward, install the pump body horizontally.

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0.6 Protective Equipment

This machine is equipped with a three-phase AC motor.

The motor does not have a protective equipment. When connecting the motor to the power supply, set it up via overload protective equipment according to the national and local safety laws and regulations at the site.

When selecting overload protective equipment, see "3.7 Electric Connection."

We recommend installing protective equipment (such as an earth leakage breaker) in addition to overload protective equipment.



Be sure to attach overload protective equipment. If not, it may result in a motor burnout or fire.

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1. For safe use

1.1 Product-specific Risk and Safety Measure

1.1.1 1 Intake and Exhaust of Hazardous Gas/Substance

Factor	How to avoid / Measure
Intake and Exhaust of Hazardous Gas/Substance	Exhaust of toxic gas, combustion gas, flammable gas, corrosive gas, and explosive gas is extremely dangerous. Do not exhaust any gas with these properties.
You get injured by touching	 Wear protective equipment to toxic materials you use, before starting work, such as inspection.
pump oil, pump, products, and aspiration materials which have become toxic at the time of	(2) At the time of overhaul/disposal, please ask a professional contractor for the waste disposal to detoxify.
inspection/disposal.	(3) Ask a waste disposal company with an administrative approval to dispose of the product.
You get injured by ignition/explosion due to residual gas or products.	If combustion/flammable/explosive gas is sucked in the vacuum pump, it is extremely dangerous because the residual gas or products may cause ignition/explosion not only in operation but also after a stop. Do not exhaust any gas with these properties.

1.1.2 Transportation of heavy load items

Factor	How to avoid / Measure
	(1) Any person other than those having technical qualifications shall not perform cargo handling operation and operate cargo handling equipment.
Injury during the pump transportation. Mass of the pump GR 60 : 128kg GR 90 : 188kg GR180: 268kg	(2) Unreasonable operation or insufficient maintenance of equipment may cause the pump to fall or turn over. Never get under the pump.



1.1.3 **Electric shock**

Factor	How to avoid / Measure				
	 Before establishing electrical connections, be sure to turn off the power. Be sure to connect to ground. 				
A	(2) Be sure to close the cover of the motor terminal box first and then operate the pump. Do not open the cover during the operation.				
You get an electric shock by touching a live part of the motor.	(3) Before inspection/relocation, be sure to turn off the power.				
	(4) Do not put your hands, any thin rods, etc. in the opening of the motor.				
The motor terminal burns out.	Securely tighten the terminal. Check the tightened conditions once a month. (See 3.7 Electric				
	Connection.)				

1.1.4 A High temperature

Factor	How to avoid / Measure
Getting burned at high temperature part	 During the operation, do not touch the vacuum pump body, motor, and pipes since they are subjected to high temperature. For a while after the operation stops, do not touch the vacuum pump, motor, and pipes since they are subjected to high temperature. Supply cooling water until the pump temperature becomes low.

1.1.5 A Rupture

Factor	How to avoid / Measure								
The inner pressure in the cooling water pipes increases and the pipes rupture.	 (2) When removing the cooling water joints immediately after the pump operation stops for a model with hermetically sealed connections, the cooling water remaining in the pump may boil with an inner pressure increase, causing damage to the cooling water pipes. Supply cooling water until the pump temperature becomes low. (4) This product uses vinyl tubes as cooling water pipes. If the cooling water inlet or outlet is sealed and compressed air is supplied from the non-sealed port, the cooling water pipes may not be able to withstand the load of the compressed air and be broken. When supplying compressed air into the cooling water pipes, be sure to do that with one port open. 								

1.2 Material Safety Data Sheet

Chemicals used for this pump									
Pump oil	:	BARRIERTA J100 FLUID	(NOK KLUBER)						
		BARRIERTA J100 FLUID E	(NOK KLUBER)						
		FOMBLIN YL-VAC 25/6	(SOLVAY SOLEXIS)						
use or touch o understand ha Sheet, please c	du za on	ring the operation of this	-						



SDS is reference information to ensure safe handling of dangerous and hazardous chemicals. When using the SDS, a person who handles the pump oil needs to understand that it is necessary to get the latest SDS all the times and take measures appropriate to the use of the individual. The SDS itself does not guarantee the safety.

2. Overview of Pump

This instructions manual describes important information to use these items safely and continuously. Before using the product, be sure to read the instructions manual.

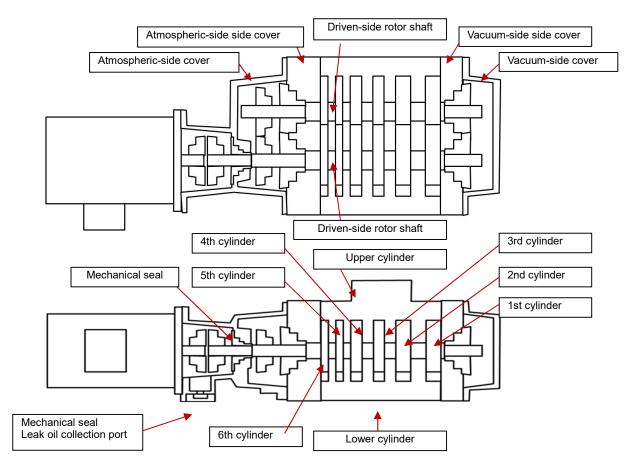
The GR series is a dry vacuum pump with a simple structure having minimum necessary functions for general industry application based on many years of experience in the technology of a root type dry vacuum pump.

The GR series is a water cooling type. (1) If the operation is continued under the conditions where the cooling water flow is lower than the specified value, the pump may be broken. Using a flow sensor etc, be sure to make a system that shuts out the supply of electricity to the pump and protects it in the event that the amount of cooling water becomes lower than the specified value.

2.1 Feature

The GR series is a root type dry vacuum pump.

Two three-lobe rotors (rotating objects) are in a box called a casing and rotate in the opposite direction from each other with the same period by a pair of gears. The rotors or the rotors and the casing do not come into contact with each other, and rotate with a slight clearance there between to convey and compress gas. The rotors are designed to be a multistage structure and its casing volume is gradually reduced on the way to the exhaust port to compress down to the atmospheric pressure and discharge into the atmosphere.





Oil is used on gears and bearings for lubrication but enclosed liquid, such as oil, is not used in the rotor/casing. The special sealing structure keeps oil from entering in the rotor/casing, providing clean exhaust.

This can be used for repeated exhaust at between the atmospheric pressure and a vacuum pressure or for high-load application, such as high-pressure continuous operation. In addition, it is most suitable for load lock operation (loading/unloading) which requires a high throughput. This supports general induction motors and therefore various types of motors can be installed to your purpose of use.

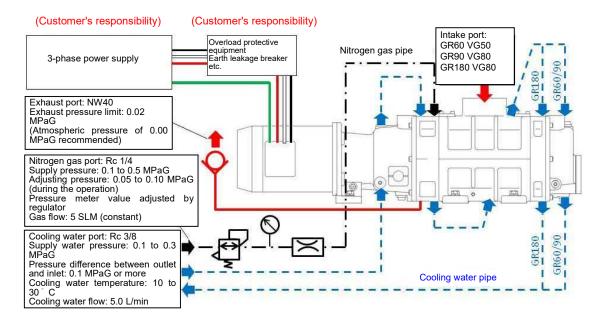
2.2 System Flow

Cooling water, nitrogen gas, and power supply are necessary as utilities.

The cooling water enters from the cooling water inlet of the panel, circulates in the pump body, and then discharges from the cooling water outlet.

Nitrogen gas is used as shaft seal gas that reduces the flow of oil in the lubrication chamber into the casing.

The power supply is a 200V- or 400V-class three-phase power supply. Check the motor specifications.



Be sure to attach overload protective equipment. If not, it may result in a motor burnout or fire.



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Using a flow sensor etc, make a system that shuts out the supply of electricity to the pump in the event that the cooling water stops. If the operation is continued under the conditions where the cooling water flow is lower than the specified value, the pump may be broken.

2.3 Specifications

Motor of the pump, 200V-class (200 ~ 240V 50 / 60Hz) and 400V class (380 ~ 415V 50HZ, 380 ~ 460V 60Hz) is common. However, 200 ~ 240V 50 / 60Hz and 380 ~ 415V 50HZ, 380 requires a change of the connection in ~ 460V 60Hz. be careful.

GR60

Freq	uency	Hz	50	60			
Maximum ex	Maximum exhaust velocity		62 (1033)	80 (1333)			
Maximum int	take pressure	Pa	Atmospher	ic pressure			
Ultimate	pressure	Pa	5.0	※ 1			
Maximum exh	naust pressure	Pa	Atmospher	ic pressure			
	Motor		Totally enclosed fan, Flange type, Three-phase two-pole 2.2 kW AC motor				
Inta	ake port diameter	•	VG50				
Exha	aust port diamete	er	NW40				
	Nam	Э	BARRIERTA J100FLUID(E)	(or FOMBLIN YL-VAC 25/6)			
Lubrication oil	side		0.5				
Vacuum L side		L	0.3				
We	eight	kg	128				

200V/400V compatible motor

Frequency	Hz	50		60			50			60				
Voltage	V	200	220	240	200	208	220	240	380	400	415	380	440	460
Rated current	А	8.3	8.2	9.2	8.0	7.7	7.3	7.0	4.7	4.9	5.2	4.2	4.0	4.2
Wire connect	ction		L	delta) (delta	wire co	nnectio	n			Y (Y or	· Star) w	/ire coni	nection	

GR90

Freq	uency	Hz	50	60			
Maximum ex	Maximum exhaust velocity (I		112 (1860)	126 (2100)			
Maximum inf	take pressure	Ра	Atmospher	ic pressure			
Ultimate	pressure	Pa	5.0	% 1			
Maximum exh	naust pressure	Pa	Atmospher	ic pressure			
	Motor		Totally enclosed fan, Flange type, Three-phase two-pole 3.7 kW AC motor				
Inta	ake port diameter	ſ	VG80				
Exha	aust port diamete	er	NW40				
	Nam	е	BARRIERTA J100FLUID(E) (or FOMBLIN YL-VAC 25/6)				
Lubrication oil	side		0.7				
Vacuum side		L	0.6				
We	eight	kg	18	38			

200V/400V compatible motor

Frequency	Hz	50		60			50							
Voltage	V	200	220	240	200	208	220	240	380	400	415	380	440	460
Rated current	А	12.7	12.0	12.4	12.6	12.2	11.6	10.7	6.9	7.0	7.1	6.6	6.0	6.0
Wire connect	ction		Δ (delta) wire connection							Y (Y or	Star) w	/ire coni	nection	



GR180

Freque	ency	Hz	50	60			
	aximum exhaust m ³ /hr velocity (L/min.)		183 (3100)	237 (3950)			
Maximum press		Ра	Atmospher	ic pressure			
Ultimate p	oressure	Pa	5.0	% 1			
Maximum press		Pa	Atmospher	Atmospheric pressure			
	Motor		Totally enclosed fan, Flange type, Three-phase two-pole 7.5 kW AC motor				
Intal	ke port diamete	er	VG80				
Exha	ust port diamet	ter	NW40				
	Nan	ne	BARRIERTA J100FLUID(E)	(or FOMBLIN YL-VAC 25/6)			
Lubrication oil	Atmospheri c side L		0.6				
01	Vacuum L side		0.8				
Wei	ght	kg	20	68			

200V/400V compatible motor

Frequency	Hz	50		60				50			60			
Voltage	V	200	220	240	200	208	220	240	380	400	415	380	440	460
Rated current	А	25.7	23.9	23.8	25.7	24.4	23.0	21.7	13.8	13.6	13.8	13.5	12.0	11.9
Wire connect	ction		Δ (delta) wire connection						Y (Y or Star) wire connection					

GR compatible

	Supply water pressure	MPaG	0.1 - 0.3
Cooling water	Pressure difference between outlet and inlet	MPaG	0.1
-	Supply cooling water temperature	°C	10 – 30 ^{×2}
	Flow rate	L/min.	5.0
	Supply pressure	MPaG	0.1 - 0.5
Nitrogen gas	Adjusting pressure *4	MPaG	0.05-0.10 (during the operation)
	Gas flow rate	SLM	5.0 ^{×3}

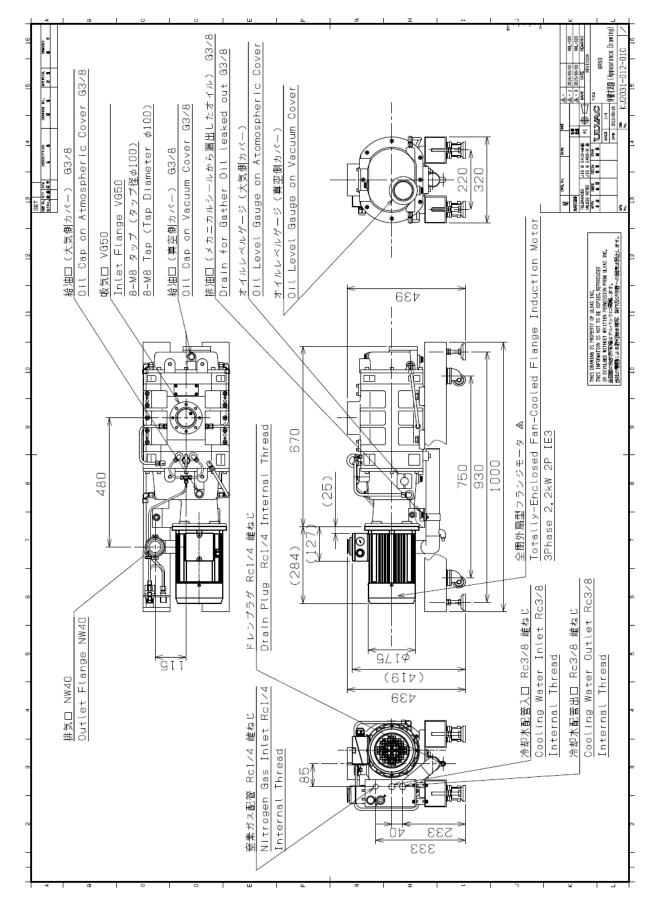
*1: The ultimate pressure is the value where the nitrogen gas (= Shaft seal gas) is 5.0 SLM.

*2: No condensation

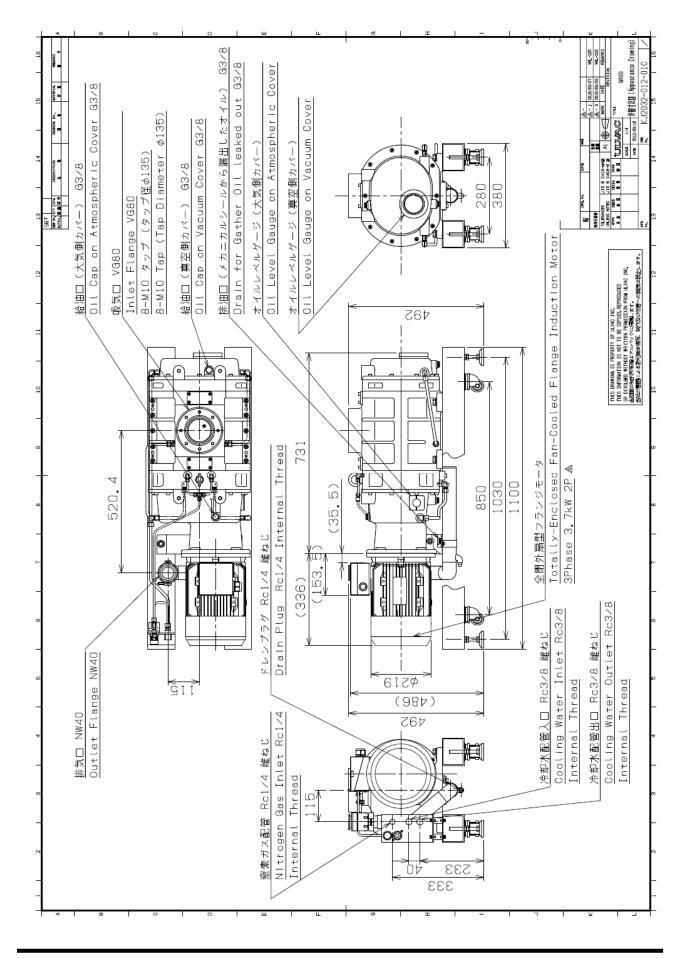
*3: The flow rate of nitrogen gas (= Shaft seal gas) is 5.0 SLM constant.

*4: Pressure meter value adjusted by regulator

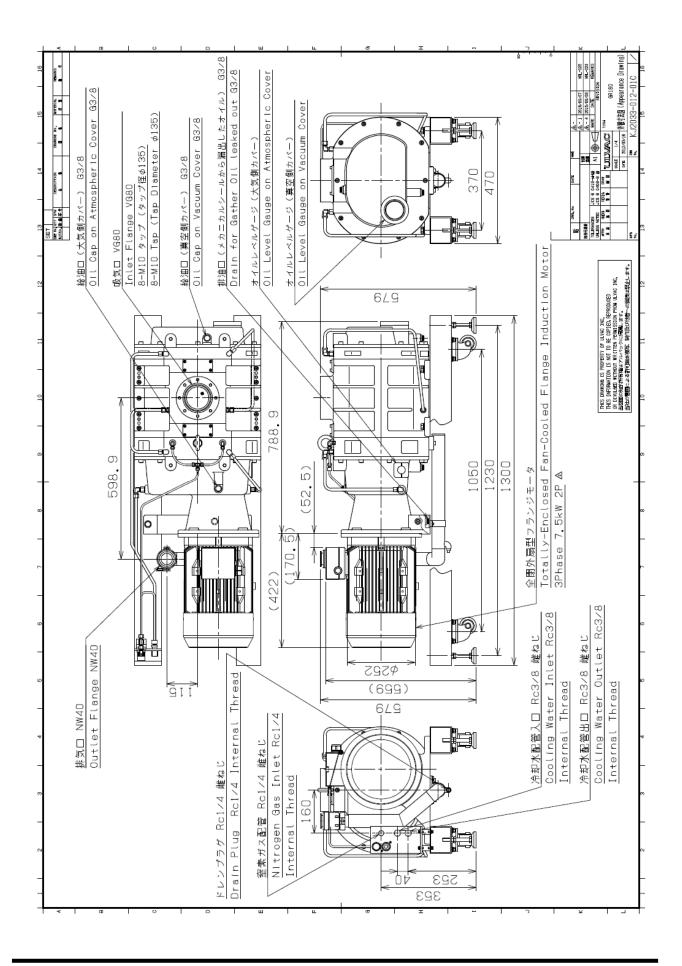
2.4 External Dimensional Drawing GR60



GR90



GR180





3. Mounting

Г

	(1)	Install and operate this product according to the local and national safety laws and regulations (such as fire laws and electric wiring code). Accordingly, you are required to take classes for general safety that are valid in the country and the local area at the site. No one who hasn't take the classes can handle the product. The operator is required to have taken such trainings. In addition, the operator has expertise, skills, qualifications in electrics, mechanics, cargo handling, vacuum, etc.	
	(2)	Before installing/removing, keep the product from all the energy sources (such as electricity).	

3.1 Installation

Install the pump body horizontally in a ventilated room without dust and with low humidity. For the ambient conditions, see "0.5.3 Ambient conditions during storage, installation, and operation."

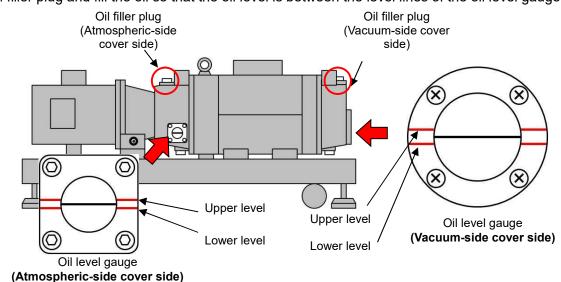


Do not give a shock to, tilt, turn over, or stand the pump, or make it upside down. Otherwise it affects the pump operation. With the intake port facing upward, install the pump body horizontally. ULVAC

3.2 Oil filling

For both the two oil level gauges, check that the oil level is between the upper and lower level lines. If the oil level is between the level lines of the oil level gauges when operation stops, the pump can be operated.

If the oil level is not between the level lines of the oil level gauges when operations stops, check that the pump stops and the inner pressure in the pump is the atmospheric pressure, and then remove the oil filler plug and fill the oil so that the oil level is between the level lines of the oil level gauges.



(1) Before starting work, be sure to turn off the power supply. During the work, never turn on the power supply. Otherwise you may get injured.

(2) Immediately after the operations stops, the pump temperature is high. Wait for a while until the pump temperature becomes low and then perform inspection. Otherwise you may get burned.



WARNING

If it is used to exhaust hazardous gas, it goes without saying that not only the pump body but also the pump oil will be toxic. Take due care.



- (1) After the operation, the oil level decreases by approx. 1 cm. If the operation is started under the conditions where the oil level is between the level lines of the oil level gauge at a stop, there is no problem if the oil level is not between the level lines of the oil level gauge during the operation.
- (2) Do not operate without oil in the pump. Otherwise the pump is broken.



Use our specified vacuum pump oil. If other oil is used, it is not covered by the warranty since the pump performance may deteriorate and its life is shortened.

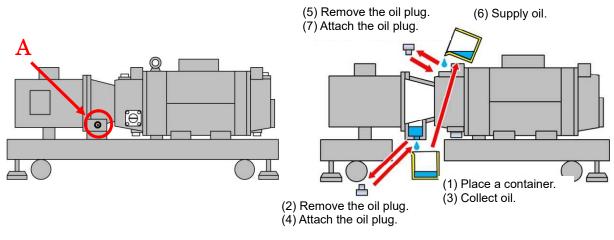




- (1) Wear protective equipment, such as rubber gloves and protective glasses.
- (2) Before starting the oil filling work, read "1.2 Material Safety Data Sheet" in advance. In the event that the vacuum pump oil contacts your hands or enters your eyes, follow the section about emergency measures in the Material Safety Data Sheet.

This product uses mechanical seal. The mechanical seal causes slight oil leakage even under normal conditions due to its mechanism. If the oil level of the cover on the atmospheric side is lower than the lower limit or if you see the oil in the oil level gauge indicated by the A part shown in the lower left figure, the oil may leak from the mechanical seal.

In such a case, it is necessary to collect the leak oil from the mechanical seal and then return it into the cover on the atmospheric side. Check that the pump stops and the pressure in the pump is at the atmospheric pressure, supply oil according to the lower right figure.



- Before starting work, be sure to turn off the power supply. During the work, never turn on the power supply. Otherwise you may get injured.
- (2) Immediately after the operations stops, the pump temperature is high. Wait for a while until the pump temperature becomes low and then perform inspection. Otherwise you may get burned.

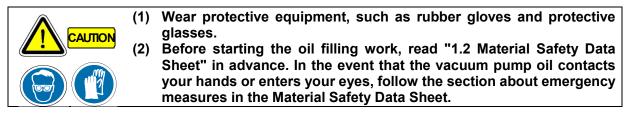


WARNING

AUTION

If it is used to exhaust hazardous gas, it goes without saying that not only the pump body but also the pump oil will be toxic. Take due care.

Use our specified vacuum pump oil. If other oil is used, it is not covered by the warranty since the pump performance may deteriorate and its life is shortened.

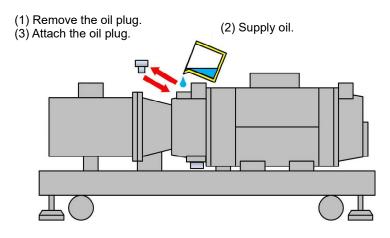


However, if the amount of oil leaking from the mechanical seal is 0.15 ml or more per hour, the

mechanical seal may deteriorate. In such a case, the mechanical seal needs to be replaced. Contact the nearest service center.

This product uses mechanical seal. If the pump needs to be operated after it has been stopped for three months or longer or after it is relocated, the oil film may not be formulated at the sealing part of the mechanical seal and it is not sealed. (If it is operated under this condition, high-frequency metallic noise occurs.)

In such a case, it is necessary to supply the pump oil you are using by approx. 20 ml to the mechanical seal. Check that the pump stops and the pressure in the pump is at the atmospheric pressure, supply oil according to the figure below.



(1) Before starting work, be sure to turn off the power supply. During the work, never turn on the power supply. Otherwise you may get injured.



(2) Immediately after the operations stops, the pump temperature is high. Wait for a while until the pump temperature becomes low and then perform inspection. Otherwise you may get burned.



If it is used to exhaust hazardous gas, it goes without saying that not only the pump body but also the pump oil will be toxic. Take due care.



Use our specified vacuum pump oil. If other oil is used, it is not covered by the warranty since the pump performance may deteriorate and its life is shortened.



- (1) Wear protective equipment, such as rubber gloves and protective glasses.
- (2) Before starting the oil filling work, read "1.2 Material Safety Data Sheet" in advance. In the event that the vacuum pump oil contacts your hands or enters your eyes, follow the section about emergency measures in the Material Safety Data Sheet.

3.3 Intake port pipe

AUTION

Thoroughly clean the inside of the vacuum chamber, piping, vacuum valves, etc. and then connect to the pump. If it is connected under a dirty condition, the ultimate pressure becomes higher or the time required for the pressure to decrease down to a given pressure becomes longer. Wear gloves and do not touch any vacuum parts with your bare hands.

In addition, connect the pump's intake port and the pipe with VF50 (GR60) or VF80 (GR90 and GR180). To prevent the vibration on the pump from propagating to the vacuum chamber, we recommend connecting a bellows pipe.

- (1) If the pump suctions solid substances or moisture, such as dust and fine powder, not only the ultimate pressure may deteriorate but also it is broken down.
- (2) The metal net at the intake port is attached to prevent large foreign objects, such as bolts, from entering the pump unit. Do not remove it unless inspection etc. is necessary. In the event that a foreign object (such as a bolt) falls in the intake port of the pump or a foreign object (such as powder or solid substances smaller than the metal net) is sucked, the pump needs to be disassembled to remove them. Contact your local service station. If the pump continues to operate without any change, it may stop.
- (3) Take care not to damage the seat surface of the gasket. After assembling the piping, conduct a leak test for the entire system.

3.4 Exhaust port pipe

Connect the pump exhaust port and the duct pipe etc. with NW40.

In addition, this has no silencer function by default. In consideration of the work environment, attach the silencer (a paid option) as necessary.



If the pipe diameter is small or any foreign substances adhere to the inside of the pipe in wiring to the exhaust port side, the pump inner pressure increases. As a result, the casing or the oil level gauge may rupture, oil leak may occur, or the electric motor may be overloaded.

- (1) For duct piping, be sure to use conducting materials (electricity can be conducted). If a non conducting material is used, static electricity occurs and static buildup may cause a spark when exhaust gas passes, becoming a source of ignition.
 (2) In the process where combustion or flammable gas flows, use diluent gas. Supply the diluent gas from the intake port so that the exhaust gas concentration is lower than the explosion limit.
 - (3) If the exhaust pipe is a thin metallic pipe, accordion, bellows, etc, the pipe resonates with the exhaust pulse and the noise may become higher than the work environment standard. Use pipes with high pressure resistance.

3.5 Nitrogen gas pipe

AUTION

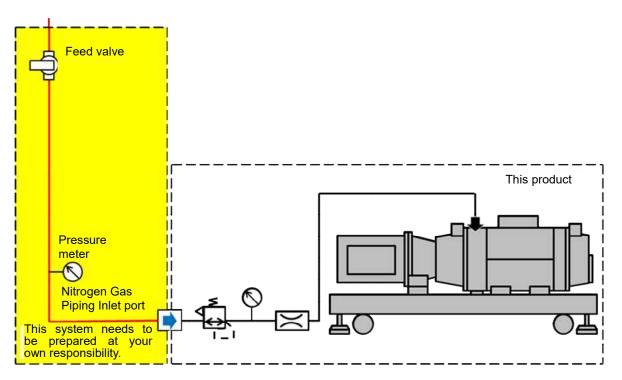
The pump nitrogen gas port is Rc 1/4. Connect to the nitrogen gas pipe using an appropriate joint.

	Supply pressure	MPaG	0.1 - 0.5
Nitrogen gas	Adjusting pressure *2	MPaG	0.05-0.10 (During operation)
-	Gas flow rate	SLM	5.0 ^{*1}

*1: The flow rate of nitrogen gas (= Shaft seal gas) is 5.0 SLM constant.

*2: Pressure meter value adjusted by regulator

- (1) It is designed to prevent leakage under specified conditions and a leak test is performed. However, any abnormal conditions outside the range of the specifications (such as an abnormal pressure increase) may cause leakage.
- (2) Attach a feed valve to stop the supply of Nitrogen gas.
- (3) Before removal of the nitrogen gas pipes, close the feed valve of nitrogen gas.
- (4) The pipe on the device side has residual pressure. Install a pressure gauge in the nitrogen supply source of the device (on the way to the pump in the pipe) and check that the pressure decreases down to the atmospheric pressure, before removing the nitrogen gas pipes. If the inner pressure is high during the work, there is a risk that the pipes may be disconnected with force and you may get injured.



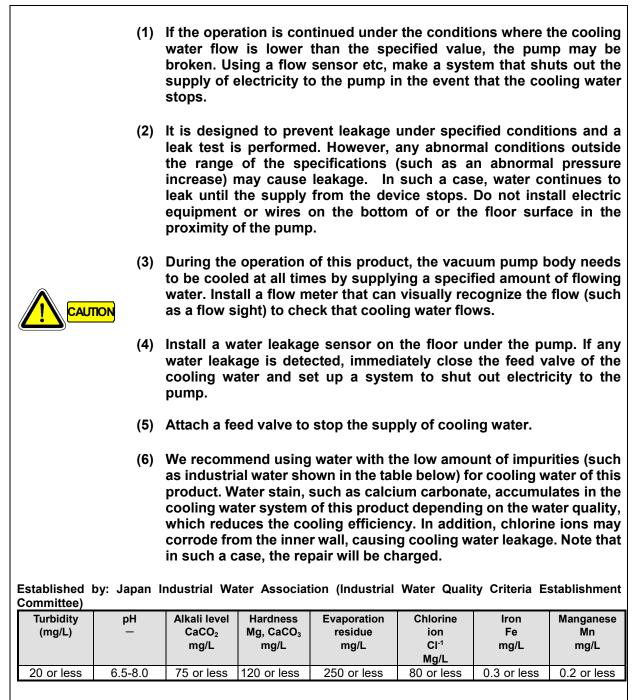
[Reference] Nitrogen Gas Piping Recommended System

3.6 Cooling water pipe

The pump cooling water port is Rc 3/8. Connect to the cooling water pipe using an appropriate joint.

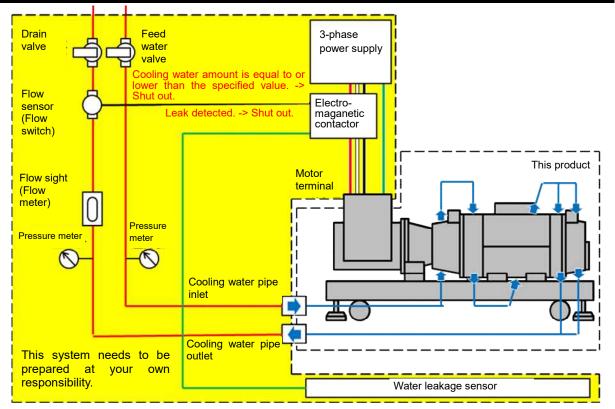
Cooling water	Supply water pressure	MPaG	0.1 - 0.3
	Pressure difference between outlet and inlet	MPaG	0.1
	Supply cooling water temperature	S	10 – 30 *
	Flow rate	L/min.	5.0

* No condensation



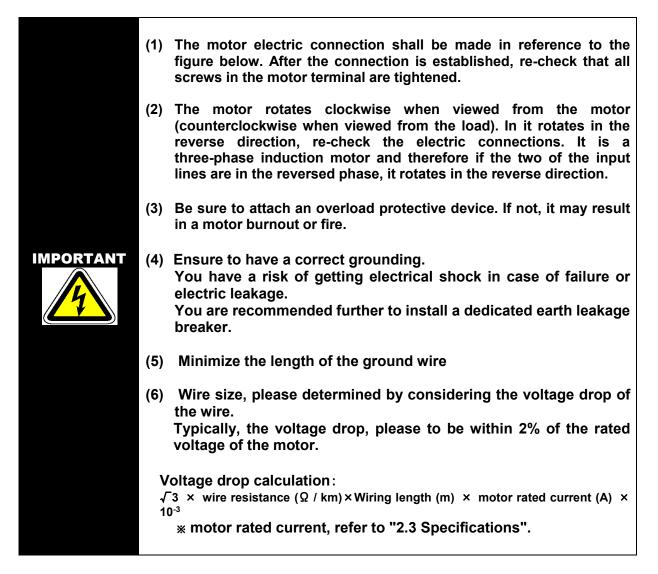
[Reference] Supplied Standard Water in Japanese Industrial Water Service





[Reference] Cooling Water Piping Recommended System

3.7 Electric Connection





Install and operate this product according to the local and national safety laws and regulations (such as fire laws and electric wiring code).

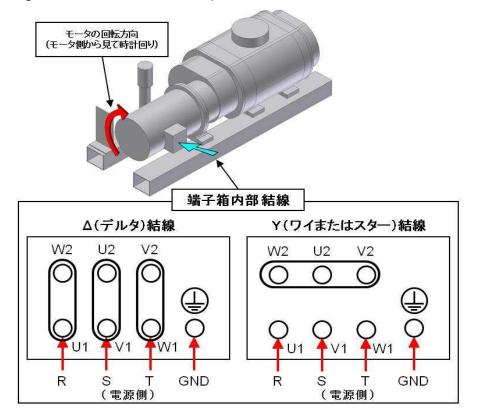


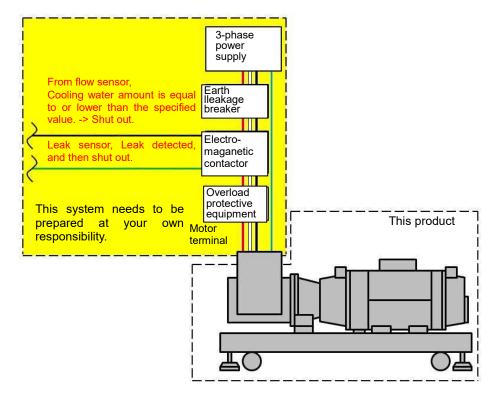
IE3 motor is used for this pump.

Striking current tends to be high because efficiency of IE3 motor is higher than conventional motor. Because of this consequence, there could be momentary operation by striking current of the motor in the case of current set rating of MCCB (Molded Case Circuit Breaker), ELCB (Earth Leakage Circuit Breaker) and THR (Thermal Relay).

It is required to readjust setting of MCCB, ELCB and THR.

Since this pump adopts the 200V class / 400V class sharing motor, by changing the connection of the internal motor terminal box, but you can drive a 200V class and 400V class without motor exchange, 200 to 240V at 50 / 60Hz and 380 ~ 415V 50HZ, 380 ~ 460V 60Hz is required to change the connection. Attention please.





[Reference] Power supply connections, Recommended system





To prevent a motor burnout due to overcurrent, install overload protective equipment in the electric connections. If overload protective equipment is not installed or it is installed but not suitable for the motor capacity, a motor burnout or fire may occur.

(1) Before connecting electric wires, be sure to turn off the power switch.

Never do this work with voltage applied.



- (2) Securely connect to ground. There is a risk of an electric shock in the event of a breakdown or leakage of electricity. The earth terminal on the motor is the screw indicated by the "Earth Mark" in the terminal box. The wire diameters of the power cord for supplying power to the motor and the power cord connected to ground shall be the same.
- (3) Do not use at a voltage other than the motor's rated voltage. Otherwise overload protective equipment does not work correctly, which may result in a motor burnout or fire.
- (1) Be sure to install overload protective equipment suitable for the motor capacity. To prevent a motor burnout, install overload protective equipment in the electric connections. If overload protective equipment is not installed or it is installed but not suitable for the motor capacity, a motor burnout or fire may occur. We recommend installing protective equipment (such as an earth leakage breaker) in addition to overload protective equipment.
- (2) Do correct wiring work according to the electrical equipment technical standards and indoor wiring regulations. Wrong wiring work may trigger fire.
- (3) Use an appropriate electric insulated wire for the power cord which can tolerate the above rated current value.



WARNING

- (1) The motor's rated current value depends on the motor manufacturer. Use overload protective equipment that works at the rated current of the motor you use.
- (2) Make the connections for full-voltage start. Otherwise it may be difficult to start with a star/delta connection.

4. Operation

4.1 Operational Precautions

- (1) Do not operate the vacuum pump with any devices that cause clogging of the exhaust attached on the exhaust port side in such a way that they disturb the gas flow. Otherwise the inner pressure of the vacuum pump may increase and cause a rupture of the casing and the oil level gauge, resulting in oil leakage and an overload of the electric motor.
 - (2) If the valve is installed in a pipe at the latter stage from the exhaust port, check that it opens.



If toxic and combustible/flammable gases other than inactive gas are discharged by the vacuum pump, it cannot be used since leakage may occur from the pump body.



If combustible/flammable gas and materials other than inactive gas are discharged by the vacuum pump, it cannot be used since ignition/explosion may occur in the vacuum pump.



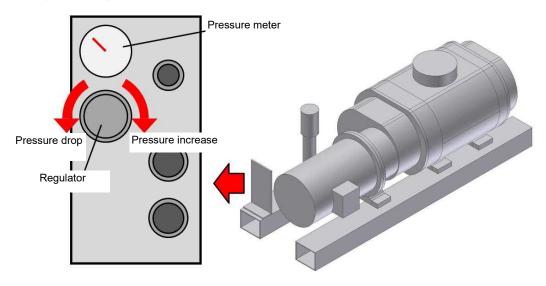
If toxic gas is sucked in the vacuum pump, it goes without saying that not only the pump body but also the pump oil will be toxic. Take care during the maintenance work.

4.2 Operation Start

- (1) Check that piping work and wiring connection work are completed.
- (2) Oil Level Check ("3.2 Oil Filling") For both the two oil level gauges, check that the oil level is between the upper and lower level lines. After the operation, the oil level decreases by approx. 1 cm. If it is at a lower limit level, supply oil.
- (3) Cooling water (See "3.6 Cooling Water Piping.") Open the feed valve for cooling water and, while checking the flow meter, adjust the flow rate so that a specified amount of cooling water flows.
- (4) Direction of rotation check (See "3.3 Intake Pipe" and "3.7 Electric Connection") Operate the pump for approx. 2 to 3 seconds and check the motor's direction of rotation with the fun at the motor end. If the motor correctly rotates (clockwise when viewed from the motor), the pressure decreases. If the motor rotates in the reverse direction, the power phases are opposite from each other. Replace the two of the three connection wires in Fig. 6.
- (5) After the completion of steps (1) to (4), start to operate the pump.
- (6) Nitrogen gas (See "3.5 Nitrogen Gas Pipe.")

Adjust the pressure of nitrogen gas during the operation.

- 1) Open the valve for nitrogen gas to apply pressure to the nitrogen gas pipe.
- 2) The regulator is locked at the time of delivery. Pull the knob until it "clicks" to unlock, and then adjust the pump pressure between 0.05 and 0.10 MPa (Gauge pressure). In addition, the flow rate of nitrogen gas to seal the shaft is controlled by a fixed orifice. 5.0 SLM flows by adjusting the pressure between 0.05 and 0.10 MPa. No need to adjust the flow rate.





During the operation, do not touch the vacuum pump body, motor, and pipes since they are subjected to high temperature. If your body comes into contact with them, you may get burned. Take appropriate protective measures as necessary to avoid surface contact.

4.3 Operation Stop



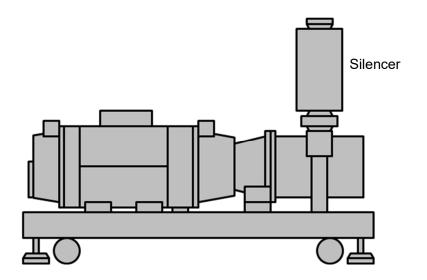
For a while after the operation stops, do not touch the vacuum pump, motor, and pipes since they are subjected to high temperature. If your body comes into contact with them, you may get burned. Supply cooling water until the pump temperature becomes low.



When shutting off the supply of cooling water immediately after the pump operation stops, the cooling water remaining in the pump may boil with an inner pressure increase, causing damage to the cooling water pipes. Supply cooling water until the pump temperature becomes low.

4.4 Installation of Silencer

To reduce the pump exhaust noise, a silencer can be installed. If you use a silencer, read the instructions manual of the silencer too.

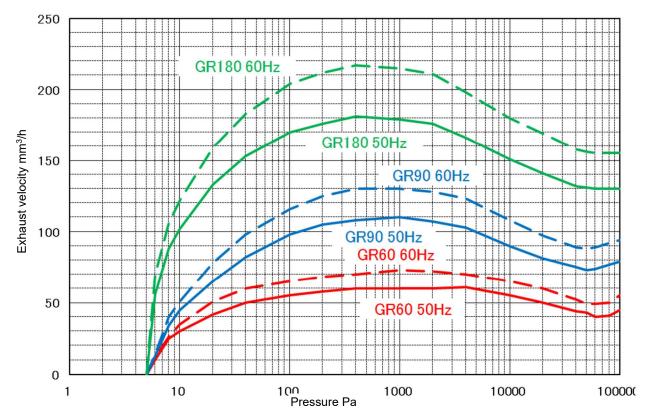


Applicable silencer combination list

	Vacuum pump					
	GR60 GR90 GR180					
Applicable silencer	RS-01	RS-01	RS-02			

5. Pump Performance

5.1 Exhaust velocity

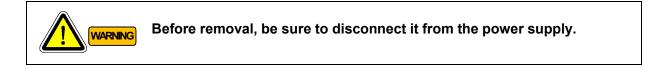


6. Removal

6.1 Electric connection

Install and operate this product according to the local and national safety WARNING laws and regulations (such as fire laws and electric wiring code).

- (1) Check that no current is applied using a tester etc.
- (2) Remove the screws in the motor terminal box and disconnect the pump from the power supply.



6.2 Cooling water pipe

	(1)	When removing the cooling water joints immediately after the pump operation stops for a model with hermetically sealed connections, the cooling water remaining in the pump may boil with an inner pressure increase, causing damage to the cooling water pipes. Supply cooling water until the pump temperature becomes low.		
		(2)	Before removal of the cooling water pipes, close the feed valve of cooling water.	
		(3)	This product uses vinyl tubes as cooling water pipes. If the cooling water inlet or outlet is sealed and compressed air is supplied from the non-sealed port, the cooling water pipes may not be able to withstand the load of the compressed air and be broken. When supplying compressed air into the cooling water pipes, be sure to do that with one port open.	

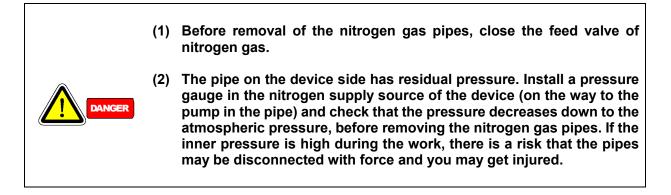
Disconnect the cooling water port from the cooling water pipe.

At 0 °C or lower, water is frozen, damaging the cooling water pipes. At the time of storage, be sure to drain. Drain the pipe following the procedure below.

- (1) Supply compressed air from the cooling water inlet port (at the upper part).
- (2) After the compressed air is discharged from the cooling water outlet port (at the lower part), the drain procedure is completed.

Furthermore, it is not matter if the inlet and the outlet is switched. In addition, pay attention to the release speed of the compressed air. If the release speed is too high, the cooling water accumulated in the cooling water pipe furiously. Pay attention to the peripheral electronic devices etc.

6.3 Nitrogen gas pipe



Disconnect the nitrogen gas port from the nitrogen gas pipe.

6.4 Intake and exhaust pipe

	(1)	Remove according to the installation manual of the device.
	(2)	For a while after the operation stops, do not touch the intake and exhaust pipes since they are subjected to high temperature. Remove after the pump temperature becomes low.
	(3)	Fully seal the intake and exhaust ports using shutoff flanges etc.

7. Maintenance

7.1 Inspection

Check the following items at least once a day. It is effective to avoid a breakdown and extend the lifetime.

- (1) When the operation stops, are the oil levels between the upper and lower level lines at the two oil level gauge?
 - After the operation starts, the oil level decreases by approx. 1 cm. If the operation is started under the conditions where the oil level is between the level lines of the oil level gauge at a stop, there is no problem if the oil level is not between the level lines of the oil level gauge during the operation.
 - When the operation stops, if the oil levels are not between the level lines of the oil level gauge, it is necessary to supply oil or collect the oil leaked from the mechanical seal. Do the work following "3.2 Oil Filling."
- (2) Is there abnormal noise during the operation?
- (3) Is there unusual motor current during the operation?

In addition, if operation at a high load (such as continuous operation with a pressure of 1 kPa or more, repeated operation at between the atmospheric and vacuum pressures, repeated start-and-stop operation) is performed, increase the frequency of inspection.

7.2 Operation after long-term storage

After long-term storage (3 months or longer) or after the equipment has been stopped for a long time (3 months or longer), oil film may not be formulated at the seal part of the mechanical seal, which fails to seal. Supply oil following "3.2 Oil Filling."

If the product is used after long-term storage (6 months or longer) or after the equipment has been stopped for a long time (6 months or longer), the internal parts may be damaged during the operation. Therefore, if it has not been used for a long time, ask the nearest service center to inspect it.

7.3 Overhaul

Overhaul is necessary to maintain the performance (including safety) and also maintain scheduled production.



Do overhaul once a year. In addition, if the pump is extremely polluted or the performance extremely deteriorates under the conditions of use, do an overhaul even within one year.

For overhaul, contact the nearest service center. Note that when you make a request for an overhaul, fill out the pollution notice at the end of this document and submit it.



If the details on the hazardous substances you have used are not disclosed, or if substances that are hard to detoxify are exhausted, we may refuse maintenance and other operations at your site.



The following list shows parts to be replaced at the time of an overhaul. The replacement period depends on the part and the parts in the list are grouped by replacement period (years). However, in some cases, the replacement period depends on the conditions of use.

O Parts to be replaced at the time of an overhaul

Parts Name	Corresponding Model	
Bearing	All models	
Power Lock	All models	
Mechanical seal *2	All models	
Coupling Spider	All models	
O ring	All models	
Teflon seal	All models	
Vacuum pump oil	All models	

O Parts to be replaced every two years

Parts Name	Corresponding Model		
Bearing case	All models		

O Parts to be replaced every three years

Parts Name	Corresponding Model
Seal sleeve	All models
Check valve ball	All models
Pressure meter for nitrogen gas	All models

O Parts to be replaced every five years

Parts Name	Corresponding Model		
Cylinder ^{*1}	All models		
Rotor shaft *1	All models		
Vibration absorbing rubber	All models		

*1: Perform dimensional measurement and, if deformation is found, replace the part.

*2: If abrasion more than the specified amount is found, replace the part.

7.4 Trouble Check List

Trouble	Cause	Disposal method	Remarks
The pump does not rotate.	The motor wire connection is not correct.	Check the wire connections.	3.7
	The safety circuits, such as an overload protective equipment, are not set correctly.	Set the safety circuit to the motor specifications.	3.7
	Foreign substances entered the pump and the rotor etc. were burned.	Overhaul (Replacement of cylinder, rotor, side cover)	7.3
	After the exhaust of reactive gas, the reactive products accumulated in the pump while the pump stops.	Overhaul (Cleaning the inside of the pump, removal of the reactive products)	7.3
	The power supply is not connected.	Connect to the power supply.	3.7
	The power switch is not turned to ON.	Turn the power switch to ON.	3.7
	An voltage error occurs in the input power supply.	The rated voltage ±10%.	3.7
	The overload protective equipment works.	Remove the cause of the activation of the overload protective equipment.	3.7
	Motor failure	Replace the motor.	
	Moisture, solution, etc. were sucked and accumulated in the pump. Rust occurred.	Overhaul (Cleaning the inside of the pump, removal of the reactive products and rust)	7.3
	Other parts in the pump were damaged.	Overhaul (Damaged parts replacement)	7.3
There is unusual sound.	The motor's direction of rotation is opposite.	Make wire connections again to correct the direction of rotation.	3.7
	The cooling water does not circulate.	Overhaul (Replacement of cylinder, rotor, side cover)	3.6
	No oil. Or the oil level is lower than the lower limit of the oil level gauge.	Overhaul (Replacement of cylinder, rotor, side cover)	3.2
	Foreign substances are included in the pump.	Removal of foreign substances, disassembling & repair	3.2, 7.1
	There is noise (rattling noise) in synchronization with the number of revolution per minutes.	Overhaul (Re-adjustment of timing)	
	There is machine noise (rasping noise) all the times.	Overhaul (Replacement of bearings and gears)	
	There is metallic noise of high frequency.	Stop the pump and supply oil to the mechanical seal.	3.2
	Other parts in the pump were damaged.	Overhaul (Damaged parts replacement)	7.3

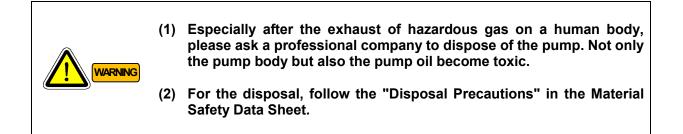


Tuesdale	0		Demesiles
Trouble	Cause	Disposal method	Remarks
The pressure does not decrease.	The exhaust capacity of the pump is low compared to the capacity of the vacuum chamber.	Set up the pump again.	5.1
	The pressure measurement method is wrong.	Measure the pressure correctly.	
	The vacuum meter is not appropriate.	Adjust to the correct measuring pressure range and measure using a correctly calibrated vacuum meter.	
	The pipe connected to the intake port is thin or the distance of the pipe is long.	Connect with a pipe having a diameter more than that of the suction port to shorten the distance to the vacuum chamber.	
	The metal net at the intake port is clogged.	Remove the pipe at the upper part of the intake port and clean the metal net.	
	The amount of oil does not satisfy the specified value.	Supply the specified amount of oil.	3.2, 7.1
	The oil deteriorates.	Replace the oil.	3.2, 7.1
	There is leakage in the pipe to which the pump is connected.	Find the leak point using a device, such as a leak detector, and stop the leak.	
	Our genuine oil is not used.	After an overhaul of the pump, replace with the our genuine oil.	3.2, 7.1, 7.3
	Water enters the pump.	Warm-up operation / Overhaul (Removal of Moisture)	7.3
The pump surface temperature is	The amount of oil does not satisfy the specified value.	Control the oil level or supply the specified amount of oil.	3.2, 7.1
extremely high (70 °C or more).	The aspirating gas temperature is high.	Install a cooling device, such as a gas cooler, to the intake side.	
	The cooling water does not circulate.	Supply cooling water.	3.6
	The pump is surrounded.	Ventilate.	
	The ambient temperature is high.	Use in a ventilated environment.	0.53
The motor current value is extremely	Foreign substances are included in the pump.	Overhaul (Remove the foreign substances in the pump.)	7.3
high.	Continuously operated at a high inlet pressure.	Adjust the pressure.	
	The motor's direction of rotation is opposite.	Make wire connections again to correct the direction of rotation.	3.7

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8. Disposal

When disposing of the vacuum pump, follow the laws and the regulations of local government. Especially after the exhaust of toxic gas, please ask a professional company to dispose of the pump. Note that the disposal cost shall be borne by the customer.



9. Warranty Clause

This product is shipped after strict internal inspection. If you find any manufacturing defects, accidents during the transportation, or other defects attributed to our responsibility, please contact our Components Division at headquarters or the nearest sales office or agency. The repair/replacement is free of charge.

9.1 Warranty Product

(1) Multiple Roots Type Dry Pump GR60/GR90/GR180

9.2 Warranty Period

- (1) Domestic: 1 year from the date of delivery
- (2) Direct export: 1 year from the date of B/L

9.3 Warranty Coverage

(1) Warranty coverage and disclaimer

The warranty covers the pump only. In the event of failures and accidents related to exhaust of air or nitrogen which are attributed to our defects in design or manufacturing, the product is repaired free of charge within 1 year from the date of delivery.

Any failures attributed to the following cause are not covered by the warranty and charged even within the warranty period.

- Failures and defects due to exhaust of gas other than air or nitrogen, or materials
- Failures and defects attributed to consumables
- If the product is used with a power supply other than that with power supply voltage and frequency you ordered.
- Failures and defects caused by natural disasters including fire, wind and flood, earthquake and thunderbolt, and unavoidable disasters including war
- Failures and defects caused by careless handling or misuse
- Products modified/disassembled/repaired without our permission
- Failures and defects under an abnormal environment (strong electromagnetic field, radiation environment, high temperature, high humidity, inflammable gas atmosphere, corrosive gas atmosphere, dust)
- Failures and defects due to noise
- Product failure or indirect damage to your company in the event of a claim by a third party to us on violation of patents
- When our engineers judge that the failures or defects are caused under the conditions of use inappropriate to this product

9.4 How to Respond

(1) Domestic:

An alternative is delivered or the product is sent back to us or the nearest our service center for repair. If it is necessary to respond on site, contact our Components Division, or the nearest sales office or agency for assistance.

(2) Direct export:

An alternative is delivered or the product is sent back to us or the nearest our service center for repair. The return cost shall be borne by the customer.

9.5 Others

- (1) If there are individual contracts and memorandum related to specifications in addition to this document, the contents in those documents prevail.
- (2) Please let us know if you export this product from Japan and take necessary procedures according to the provisions of export-related laws and regulations, such as foreign exchange laws and foreign trade laws.
- (3) For any questions and consultation on this product, check the model/serial number and then contact the nearest sales office or agency, or our Components Division.

https://www.ulvac.co.jp/support_info/

(4) Note that the contents in this document is subject to change without prior notice.



This mark is applied to the electronic information product sold in the People's Republic of China. The figure at the center of the mark is the validity date of environmental protection. This product does not influence the environment, the human body and the property during the period reckoning the manufacturing date as long as the caution for safe use regarding the products are observed. *The environmental protection validity date is not the product warranty period.

Table. Making format for names and contents of hazardous substances or elements

Name of parts	Hazardous substances or elements					
Name of parts	Pb	Hg	Cd	Cr ⁶⁺	PBB	PBDE
Body	0	0	0	0	0	0

 indicating that content of the hazardous substance or element in all homogeneous materials of the part does not exceed the requirements for concentration limits specified by SJ/T11363-2006.

x: indicating that content of the hazardous substance or element in, at least one kind of, homogeneous materials of the part exceeds the requirements for concentration limits specified by SJ/T11363-2006. Producer may further explain the technical excuse to the items marked with "X" perspecific conditions here.