

# **Instruction Manual**

## **Mechanical Booster Pump**

Model

*PRC-003A*

*PRC-006A*

*PRC-012A*

*PRC-018A*

Before using this product, be sure to read this operation manual.

Keep this manual with care to use at any time.

**ULVAC, Inc.**

**Components Division**

<http://www.ulvac.co.jp/>

## 0. Before Using This Product

We thank you very much for purchasing our product.

You are kindly requested, upon delivery of the product, to check that the delivered product is exactly what you have ordered and it has no damage caused by transport or the like.

This manual gives description on operation and maintenance procedure appropriate to use the product in safe and effective way. Please read this manual beforehand to correctly use the Pump.

You are requested to install and operate the product in compliance with the laws and regulations relating to the safety, e.g. Fire Defense Law, Electric wiring regulation and so on in the country and region you use the product. Consequently you shall be requested to attend general safety lectures officially effective in the area, such as electrical safety, Cargo handling safety and so on. Note that any person not attended such lectures shall be restricted from handling the product. Operators shall need to attend such kind of training and have special knowledge, skill and title regarding the electricity, machinery, cargo, vacuum and so on.

This product is designed to conform to regulations valid at the time of issue of this manual and its conformity is not ensured if any of regulations shall be changed in the future.

The performance and safety of the product might not be ensured if any of the devices put together did not conform to same regulations or the product itself was modified. ULVAC shall be not liable to guarantee performance and safety in such cases above. Any modification of the product by the user is out of the scope of guarantee by us and not be guaranteed in any manner.

Be sure to clear any energy sources, e.g. electricity, coolant and so on of the product before installing or removing the product.

Please note that any of the parts used in this product shall keep the performance at the time of the shipment but shall not survive eternally. Any of the parts cannot, under any application supposed under socially-accepted idea, help but inevitably deteriorate its performance and get easily result in causing trouble of the product. You are kindly requested consequently to take your application situation into consideration and help yourself to implement the protective maintenance so as to avoid troubles.

Through implementation of the protective maintenance, you shall reduce occurrence of the trouble due to wear and/or failure of the part and bring reducing the occurrence of the downtime caused by the product trouble and fire as well as a risk of affecting the another process.

Please do not hesitate to contact our sales office or agency closest to you or the Components Division if you had any question or unclear on the use.

## 0.1 Safety Symbol Marks

We display symbol marks regarding the safety in this manual and on the product to make clear items to observe. Descriptions attached to the symbol are classified as illustrated below;

## 0.2 Meanings of Safety Symbol Marks



If the user makes a mistake in handling, it indicates an imminent possibility that the user is subject to death or heavy injury.



If the user makes a mistake in handling, it indicates a possibility that the user is subject to death or heavy injury.



If the user makes a mistake in handling, it indicates a possibility that the user is subject to moderate injury or it leads to significant damage of the machine. It indicates a possibility that damage of the machine is caused and the normal operation is impaired.

**IMPORTANT**

[IMPORTANT] description shall be given where there is particular information to notice for the operation or maintenance work of the product.



Training for the electrical safety is required as there is a risk of electrical shock.



Check and ensure that the pump is sufficiently cooled down as this section keeps high temperature after having stopped the pump.

## 0.3 Safety Precautions

Descriptions are given as the method to keep away from danger and actions that must be restricted on the use of the product.

Use of this product and this Instruction Manual.



Please read this Instruction Manual before starting installation, operation check or maintenance of this product to use it in long term. You are requested to fully understand the safety precautions, specifications and operation methods of the product.



Pump oil as well as the Pump unit becomes toxic should the toxic gas was sucked in the vacuum pump. Pay attention to execute maintenance work.



Use of the toxic, combustible or combustion susceptible gas other than inactive gas is not allowed as there is a risk of leakage of the gas from the Pump unit if it was exhausted by the vacuum pump.



Use of the toxic, combustible or combustion susceptible gas and substance other than inactive gas is not allowed as there is a risk of causing fire or explosion inside the Pump unit if it was exhausted by the vacuum pump.



We would be obliged to refrain from handling and/or executing maintenance of the product if the detail of used hazardous substance was not disclosed or the product has exhausted such substance that the detoxification process is hardly conducted.



You are kindly requested to acknowledge that specifications and/or price of the product and description of the Instruction Manual are subject to change without prior notice for improvement.

Any change shall update the version number at the top right of the Instruction Manual cover and issue the revised version.

**WARNING**

To export this product abroad, you have to clear the examination in accordance with the Foreign Exchange law, Foreign Trade law and relevant decree, ordinance and order.

Please feel free to contact our sales office or agency closest to you or our Components Division.

**WARNING**

This Instruction Manual shall absolutely need to be delivered to the last user that uses the product.

**CAUTION**

Any part of this Instruction Manual shall be in no manner reproduced for the third party without our approval.

## Installation and storage

**WARNING**

- (1) This product is packed with the wooden frame. Please ask the special agency for dismantling it.  
Advise the dismantling agent to wear leather gloves and use appropriate tools such as pinch bar as they have a risk of cutting the hand by nail or chip.
- (2) Give the instruction them further to use the unloading machinery such as crane to take out the product of the wooded frame, lift it up with its top eyebolt and transfer it on lifting. Check the eyebolt whether it has no error before use.
- (3) Only the technically entitled person should be in charge of conducting the unloading operation and operating the unloading machinery.
- (4) There is a risk that the Pump might drop or lay down when attempted unreasonable operation or machinery setup was not sufficient. You are strictly restricted to enter beneath the Pump.
- (5) Advise the dismantling agent to wear leather gloves and use appropriate tools such as pinch bar as they have a risk of cutting the hand by nail or chip.

## Transfer



You have a risk of giving damage to your back as the load larger than safety standard shall be required to transfer the product.

Be sure to use the loading machinery (such as mobile crane) to lift up the Pump or load it on the pallet and fix it with Jack and run the Pallet truck for its transfer.

## Countermeasure to the earthquake



There is a risk that the Pump lays down or slides and breaks peripheral units if it was not correctly fixed. Be sure to give allowances to the vacuum piping, cooling piping, and electric cables so that they absorber vibrations to prevent them from breaking and/or dismantling.

## Inlet piping <Mounting>



- Check and ensure that any of hazardous energy is blocked before starting the operation.

## Coolant piping <Mounting>



- Check and ensure that any of hazardous energy is blocked before starting the operation.

## Power Supply wiring <Mounting>



- Check and ensure that any of hazardous energy is blocked before starting the operation.
- Entitled staff should conduct the wiring operation. Erroneous wiring work might cause a fire.
- Conduct the wiring operation correctly in compliance with laws and rules concerning the safety (e.g. Fire Defense Law, Electric Equipment Technology standard, Internal line cord) in the country and region you use the product.
- Ensure to have a correct grounding.
- You are recommended further to install a dedicated Leak breaker. You have a risk of getting electrical shock in case of failure or electric leakage.
- It is imperative to put the Overload protection device. Otherwise it would cause the motor burn out and/or fire.

Voltage drop calculation :

$$\sqrt{3} \times \text{wire resistance } (\Omega / \text{km}) \times \text{Wiring length (m)} \times \text{motor rated current (A)} \times 10^{-3}$$

※ motor rated current, refer to "Table 3 Performance specifications "

## Operation



- Do not run the Pump on blocking the exhaust outlet or putting any device that might hamper gas passage onto the outlet. There is a risk that the pressure inside the Vacuum pump rises up to cause break or oil leak of the casing or Oil level gauge resulting in overload of the motor.
- This product is not made as the withstand pressure structure. Ensured pressure value of the Pump shall be 0.03MPa (0.3kgf/cm<sup>2</sup>) (Gauge pressure).



- Do not operate the Pump in hazardous area (where there is a risk of creating hazardous atmosphere by explosive gas). It might cause injury and/or fire.



- Be sure to turn OFF the Power Supply to execute check and repair. You have a risk of getting electrical shock or injury by accidental sudden move.
- Person other than Repair technician should not be in charge of dismantling, repairing or remodeling the product.
- You have a risk of getting injured or electrical shock by a fire or erroneous move.
- Do not touch the Motor, vacuum pump or piping during the pump operation and just after stopped it while the pump unit keeps high temperature. You have a risk of getting burned.
- Should you found any malfunction or error, just turn OFF the Power Supply to prevent accident and ask the agency or closest Service Center for check and repair.



- Ensure to flow the Coolant during operation. Required Coolant volumes shall be;
  - Coolant volume PRC-003A: 2.0 L/min or more  
PRC-006A: 2.0 L/min or more  
PRC-012A: 3.0 L/min or more  
PRC-018A: 3.0 L/min or more
  - Outlet/inlet differential pressure: 0.1MPa (Gauge pressure) or more
  - Coolant temperature: 5°C ~ 30°C



- Do not attempt to put your hand or article in the opening of the motor; you have a risk of getting electrical shock, injury or causing a fire.
- Do not touch any rotary section such as the main spindle during operation of the Vacuum pump; it shall bring in injuries.
- Strictly refrain from putting any combustible substance in and around 1m of the motor and Vacuum pump; there is a risk of getting a fire.

**CAUTION**

The water included little impurities (ex. Industrial Water) is recommended for cooling water.

Depending on the water quality, the inside wall of cooling water tube is covered with water scale ( $\text{CaCO}_3$  etc.) and cooling water flow rate may be decreased. Cooling water tube is corroded by Chlorine ion ( $\text{Cl}^-$ ) and cooling water leak may be caused. In case of using pure water, cooling water leak may be caused by metal component dissolution, too.

In these cases, the repair service may be for a fee.

[Reference] Standard Water Quality of Industrial Water

Turbidity mg/L	pH –	Alkalinity $\text{CaCO}_3$ mg/L	Hardness Mg, $\text{CaCO}_3$ mg/L	Evaporation residue mg/L	Chlorine ion $\text{Cl}^-$ mg/L	Iron Fe mg/L	Manganese Mn mg/L
20 max.	6.5–8.0	75 max.	120 max.	250 max.	80 max.	0.3 max.	0.2 max.

Establishment: Japan Industrial Water Association

## Power Supply wiring <Dismantling>

**WARNING**

- Be sure to cut off the electricity before starting install or dismantling operation.

## Coolant piping <Dismantling>

**WARNING**

- Should you remove the Coolant joint immediately after having stopped the Pump, there is a risk that the coolant remained inside the Pump comes to a boil and jets out. Keep flowing the Coolant as far as the Pump temperature cools down.
- The Pump is and remains very hot during and while after having stopped operation. You have a risk of getting burned if a part of the body touched it. Keep flowing the Coolant as far as the Pump temperature cools down.
- Use a flow meter (HWFM: for example Flow sight) applicable to visually check the Coolant supply source that no water is flowing.

## Inlet piping <Dismantling>

**WARNING**

- Take off the piping following the Install Manual of the system.
- The Inlet piping remains very hot while after having stopped the Pump. Be sure to take it off after the Pump has sufficiently cooled down.
- Make airtight completely the Pump exhaust outlet with a blank flange.



## Transfer






You have a risk of giving damage to your back as the load larger than safety standard shall be required to transfer the product.

Be sure to use the loading machinery (such as mobile crane) to lift up the Pump or load it on the pallet and fix it with Jack and run the Pallet truck for its transfer.

## 0.4 Types and Descriptions of Warning Labels Displayed on This Machine and Displayed Positions

Warning labels are attached on the warning locations in this system.

Be sure to check them before starting operation of the Pump.

1		Before use, read through the instruction manual and fully understand its contents.
2		<ul style="list-style-type: none"> <li>• You may get an electric shock in the area around a portion with this warning label. Before maintenance or wiring, be sure to turn off the primary power supply.</li> <li>• Be sure to close the lid of the terminal box before operating this unit. Never open it during operation.</li> </ul>
3		During operation or for a while after operation stops, do not touch the unit as each portion is at a very high temperature. - If a human body touches the unit, it may get burned.

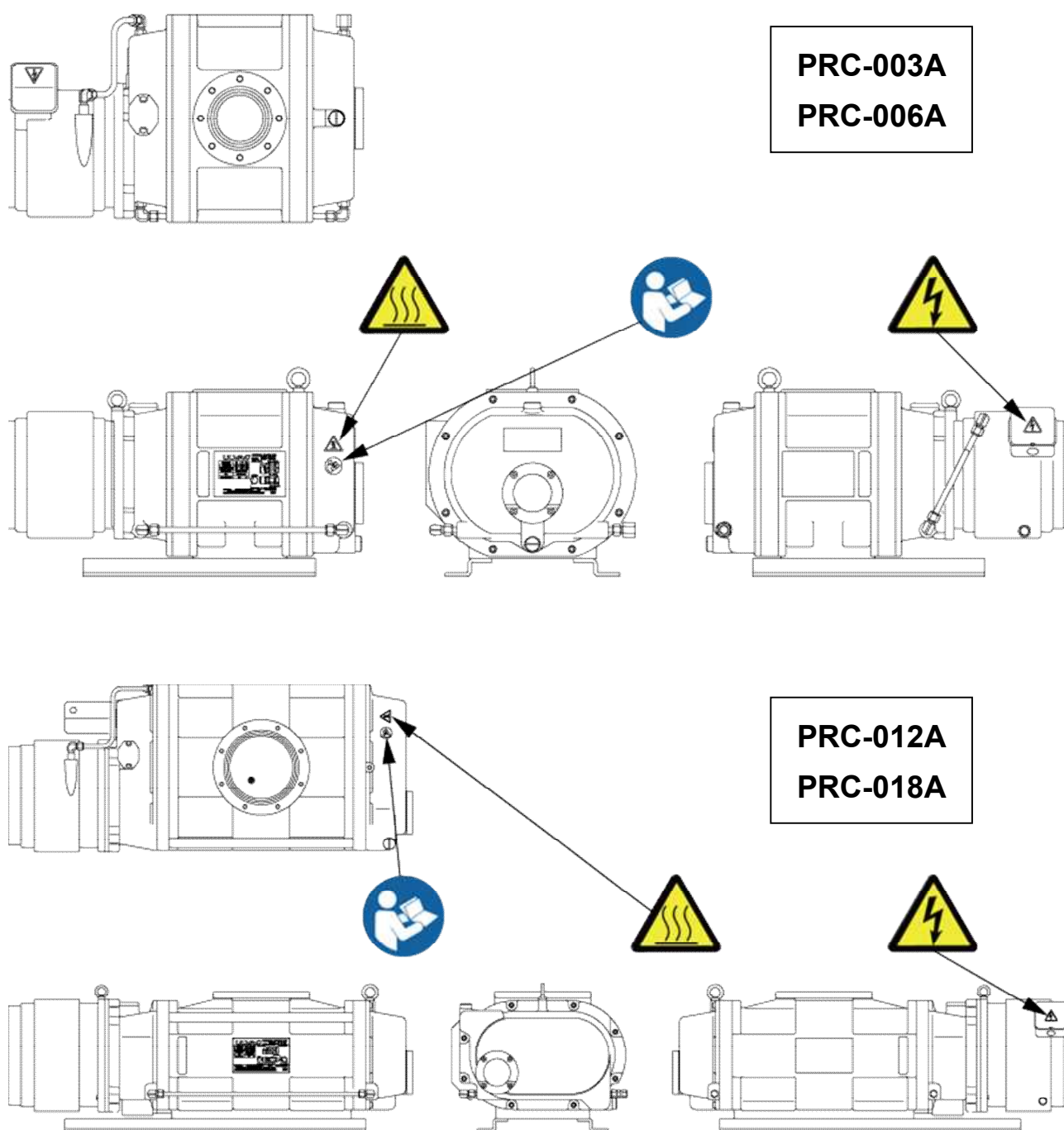


Fig. 1 Warning Label

## 0.5 Acceptance and Storage of The Pump

### 0.5.1 Unpacking/Acceptance of The Pump



- (1) This product is packed with the wooden frame. Please ask the special agency for dismantling it.  
Advise the dismantling agent to wear leather gloves and use appropriate tools such as pinch bar as they have a risk of cutting the hand by nail or chip.
- (2) Give the instruction them further to use the unloading machinery such as crane to take out the product of the wooded frame, lift it up with its top eyebolt and transfer it on lifting. Check the eyebolt whether it has no error before use.
- (3) Only the technically entitled person should be in charge of conducting the unloading operation and operating the unloading machinery.
- (4) There is a risk that the Pump might drop or lay down when attempted unreasonable operation or machinery setup was not sufficient. You are strictly restricted to enter beneath the Pump.
- (5) Advise the dismantling agent to wear leather gloves and use appropriate tools such as pinch bar as they have a risk of cutting the hand by nail or chip.

Upon delivery of the product, check first that the delivered is exactly what you have ordered and there is no break or damage through transport or the like. Claim after use of the product might be resolved with a charge.

Although we pay full attention on shipping, you are kindly requested to check the following upon unpacked the product.

#### IMPORTANT

- (1) Whether the delivered is exactly the one you have ordered.
- (2) Whether accessories (Pump oil for one lubrication, optional parts) are attached or not.
- (3) Whether there is no break or damage through transport or not.
- (4) Whether any bolt or nut got loose or taken off through transport or not.

Should you found any trouble, please do not hesitate to contact our Sales division or your agency.

Table. 1 standard accessories

Part name	Specification	Quantity	Remarks
Oil one time portion	ULVOIL R-42	1 set	For the consumed amount, refer to the specification table.
Quick Start Manual	Japanese/English	1 copy	—

※Fluorine oil is not included in the shipment in the case of selected fluorine oil. If fluorine oil is required, it must be ordered separately.

## 0.5.2 Transfer



You have a risk of giving damage to your back as the load larger than safety standard shall be required to transfer the product.

Be sure to use the loading machinery (such as mobile crane) to lift up the Pump or load it on the pallet and fix it with Jack and run the Pallet truck for its transfer.

## 0.5.3 Ambient Condition for Storage, Install and Operation

As precise clearances are provided with this machine, be sure to fulfill the following for its storage, install and operation;

- (1) Ambient temperature and humidity for storage : -30°C to 60°C, less than 95%RH
- (2) Ambient temperature and humidity for operation : 10°C to 40°C, less than 80%RH
- (3) Height (for both storage and operation) : Lower than el. 1,000m.
- (4) External vibration (for both storage and operation) : Vibration acceleration less than 114dB (0.5G)
- (5) Miscellaneous (for both storage and operation) :
  - a. There shall be no corrosion behavior or explosive gas.
  - b. There shall be no freeze or dew formation.
  - c. There shall be no dust.
  - d. It shall be in house.
  - e. Another pump shall not be put on the Pump.
  - f. The Pump shall not be laid down nor put touching its motor edge face or oil gauge edge face with the ground.
  - g. There shall be no direct sun beam.
  - h. Heat source shall be put away from the Pump.



Do not give the Pump a shock or lay it down. It might impair the Pump operation.

Fix the Pump on tightening bolts the mount to install it. Be sure to use the anti-vibration rubber bumper so as to insulate the mount.

## 0.6 Protective Device

This machine is equipped with the Three-phase AC200V 50/60Hz, AC220V 60Hz motor.

This motor is not equipped with the protective device. Put an overload protective device to connect through the motor with the Power Supply. It is imperative to put the overload protective device under direction of the Electrical Installation Technical Standard (1965, Department of Trade and Industry decree No. 61). Refer to “3.6 Electric connection” to select the overload protective device. It is recommended to put together another protective device such as a leakage breaker.



**Be sure to put an overload protective device. Otherwise it would cause a burn out and/or fire of the motor.**

## Table of Contents

0. Before Using This Product .....	i
0.1 Safety Symbol Marks.....	ii
0.2 Meanings of Safety Symbol Marks.....	ii
0.3 Safety Precautions.....	iii
0.4 Types and Descriptions of Warning Labels Displayed on This Machine and Displayed Positions .....	viii
0.5 Acceptance and Storage of The Pump.....	x
0.5.1 Unpacking/Acceptance of The Pump.....	x
0.5.2 Transfer .....	xi
0.5.3 Ambient Condition for Storage, Install and Operation.....	xi
0.6 Protective Device.....	xii
1. For Your Safety Use .....	1
1.1 This Product Intrinsic Hazardous Nature and Safety Measures .....	1
1.1.1 Danger Leakage of dangerous gas and dangerous materials .....	1
1.1.2 Warning Transfer of heavy material.....	1
1.1.3 Warning Electric shock .....	2
1.1.4 Warning Explosion.....	2
1.1.5 Caution High temperature .....	3
1.1.6 Caution Leakage of hot coolant.....	3
1.2 Chemical Material Safety Data Sheet (SDS) .....	4
2. Pump Outline.....	5
2.1 Total configuration.....	5
2.2 Performance Specifications .....	6
2.3 System Flow .....	7
2.4 Dimensional drawing .....	8
2.5 Pump Performance.....	12
2.5.1 Ultimate pressure .....	12
2.5.2 Pumping speed .....	12
2.5.3 Power consumption.....	14
2.6 Designing Pumping System .....	15
2.7 Automatic Operation .....	16
2.8 Setting of Motor Controller (Atmospheric Pressure Actuating Type.With the inverter. ) .....	17
3. Mounting.....	18
3.1 Storage/ Installation .....	18
3.2 Installation.....	18
3.3 Lubrication .....	19
3.3.1 Lubrication to the Lubrication chamber. ....	19
3.4 InletportPiping/ Outlet port Piping.....	21
3.4.1 Inlet port Piping.....	21
3.4.2 Outlet port Piping.....	22
3.5 Water Piping .....	24
3.6 Electrical Connection.....	26

4. Operation .....	28
4.1 Test run .....	28
4.2 Operation .....	30
4.2.1 Exhaust start.....	30
4.2.2 Exhaust stop.....	30
5. Option .....	32
5.1 Special motors.....	32
5.2 Inlet and outlet flange .....	32
5.3 Oil type .....	32
5.4 Motor control equipment .....	32
5.4.1 Setting of Motor Controller (Atmospheric Pressure Actuating Type) .....	33
5.5 Separate Evacuation of Lubricating Chamber .....	37
5.5.1 Preparation .....	38
5.5.2 Water Piping, Electrical Connection and Lubrication.....	38
5.5.3 Checking lubricating oil level .....	38
5.5.4 Pumping .....	38
5.5.5 Checking rotational direction .....	38
5.5.6 Operation.....	39
5.5.7 Pumping start operation .....	39
5.5.8 Shutdown operation .....	39
5.6 Optional attachment figure .....	40
6. Maintenance and Check.....	44
6.1 Maintenance .....	44
6.2 Inspection Items.....	45
6.3 Checkup after storage for a long period .....	47
6.4 Overhaul .....	47
6.5 Troubleshooting .....	48
7. Removal / transport .....	50
7.1 Operation procedure.....	50
8. Disposal.....	51
9. Warranty Clauses .....	52
9.1 Warrantable Items.....	52
9.2 Duration of guarantee .....	52
9.3 Warrantee scope.....	52
9.4 Response procedure .....	52
9.5 Disclaimer .....	53
9.6 Others .....	53
10. Main Displacement Parts .....	54

Request Form for Repair/Inspection of ULVAC Components /Certificate of Contamination  
SERVICE CENTER

## Table of Contents

Fig. 1 Warning Label .....	ix
Fig. 2 Location of vacuum pump in host device.....	7
Fig. 3 PRC-003A Dimensional drawing.....	8
Fig. 4 PRC-006A Dimensional drawing.....	9
Fig. 5 PRC-012A Dimensional drawing.....	10
Fig. 6 PRC-018A Dimensional drawing.....	11
Fig. 7 Pumping Speed (PRC-003A/006A) .....	13
Fig. 8 Pumping Speed (PRC-012A/018A) .....	13
Fig. 9 Evacuation by mechanical booster pump (example).....	15
Fig. 10 Oil level gauge.....	19
Fig. 11 Gear rotation direction.....	29
Fig. 12 Separate evacuation of lubricating chamber .....	37
Fig. 13 Separate evacuation of lubricating chamber (example) .....	37
Fig. 14 PRC-003A    Optional attachment figure .....	40
Fig. 15 PRC-006A    Optional attachment figure .....	41
Fig. 16 PRC-012A    Optional attachment figure .....	42
Fig. 17 PRC-018A    Optional attachment figure .....	43
Table. 1 standard accessories.....	x
Table. 2 Details model list.....	5
Table. 3 Performance specifications .....	6
Table. 4 Oil level gauge .....	19
Table. 5 Electrical connection.....	26
Table. 6 Rated current value of the PRC series standard motor .....	26
Table. 7 Parameter setting: Mitsubishi FR-E520 series.....	34
Table. 8 Parameter setting: Mitsubishi FR-F520J series .....	35
Table. 9 Parameter setting: Mitsubishi FR-D720 series.....	36
Table. 10 Optional parts.....	37
Table. 11 Maintenance list.....	45
Table. 12 Troubleshooting .....	48
Table. 13 PRC-003A Main displacement parts list.....	54
Table. 14 PRC-006A Main displacement parts list.....	55
Table. 15 PRC-012A Main displacement parts list.....	56
Table. 16 PRC-018A Main displacement parts list.....	57





# 1. For Your Safety Use


## 1.1 This Product Intrinsic Hazardous Nature and Safety Measures

Before operating or checking this machine, thoroughly read this paragraph, and after fully understanding about latent danger and on how to avoid danger, perform the work.


### 1.1.1 **Danger** Leakage of dangerous gas and dangerous materials

Factors	Avoidance methods and measures
  <p>Leakage of poisonous and combustible gas.</p> <p>Getting injured on touching any toxic pump oil, pump, generated material or sucked substance at the occasion of check or disposal.</p>	<p>Do not exhaust any hazardous gas such as toxic and combustible.</p> <p>(1) To overhaul or dispose, ask the special agency to do the detoxification process.</p> <p>(2) Ask the disposal agency licensed by the administration for disposal.</p>


### 1.1.2 **Warning** Transfer of heavy material

Factors	Avoidance methods and measures
 <p>Getting injured on transferring the pump.</p> <p>Pump weight</p> <p>PRC-003A : 51 kg</p> <p>PRC-006A : 86 kg</p> <p>PRC-012A : 118 kg</p> <p>PRC-018A : 150 kg</p>	<p>(1) Only technically entitled person should be in charge of loading/unloading and operating machines.</p> <p>(2) There is a risk that the Pump might drop or lay down when attempted unreasonable operation or machinery setup was not sufficient. You are strictly restricted from entering beneath the Pump.</p>


### 1.1.3 Warning Electric shock

Factors	Avoidance methods and measures
 Getting electrical shock on touching the current-carrying part of the motor.	(1) Be sure to cut the electricity to do electrical connection. Never fail to take the grounding.
	(2) Ensure to close the cover of motor terminal box and never open it during operation.
	(3) Be sure to cut the electricity to do checking or installation.
	(4) Never attempt to put in the hand or bar into the opening of the Motor.
Motor terminal mount gets burnt.	Tighten close the terminal. Check the tightening once a month. (Refer to “3.6 Electrical Connection”)


### 1.1.4 Warning Explosion

Factors	Avoidance methods and measures
 Pressure inside the pump rises up and the pump explodes.	Ensured pressure value of the Pump is 0.03MPaG (0.3 kg/ cm <sup>2</sup> G) (Gauge pressure). Check the Exhaust side pressure of the pump. If it was over 0.03 MPaG (0.3 kg/cm <sup>2</sup> G) (Gauge pressure) take away anything in and around the exhaust outlet that hampers gas passage. If you used the Oil mist trap, replace or clean it so that it does not hamper the gas passage.

### 1.1.5 Caution High temperature

Factors	Avoidance methods and measures
 <p>Getting burnt on touching the high temperature part.</p>	(1) The Pump gets high temperature during operation.
	(2) As the surface temperature is high, you have a risk of getting burnt by accidentally touching it with the hand or the like. Refrain from touching the pump during operation. Wait until the temperature sufficiently cools down after having stopped the pump to conduct check or something.

### 1.1.6 Caution Leakage of hot coolant

Factors	Avoidance methods and measures
 <p>Kept operating without supplying the Coolant. Boiled hot vapor jet out the Coolant outlet.</p>	(1) Put a Flow meter in the line to set the interlock so that the Pump stops when Coolant was blocked out.
	(2) If you kept operating without supplying the water, immediately stop the Pump and keep away from it.
	(3) Stop the Pump and ensure that the Pump temperature got cooled down to take out the Pump and check it.

## 1.2 Chemical Material Safety Data Sheet (SDS)

<b>IMPORTANT</b>	<p>Chemical material used for this Pump;</p> <p>(1) ULVOIL <b>R-42</b>(Mineral oil)</p> <p>Standard oil for our products is either ULVOIL <b>R-42</b> its combined use is not allowed.</p> <p>The Chemical Material Safety Data Sheet introduces the chemical material potential to use or touch on operating this machine. Please contact our Sales division if you are in need.</p> <p>Read it with attention to acknowledge the toxic characteristics described on the SDS.</p> <p>Please contact us separately if you want to use any chemical material (Vacuum pump oil) other than described on the</p>
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SDS is posted as referential to ensure safe operation of the hazardous and/or toxic chemical material. Any person in charge of operating the Pump oil shall be requested to be responsible to cause means appropriate to actual operation of the machine referring to it. Note that the SDS itself shall be never a safety certificate in any manner.

## 2. Pump Outline

### 2.1 Total configuration

The Mechanical booster pump is used combined with the Supplementary pump to enhance the exhaust speed around the pressure range  $1.3 \times 10^3$  -  $1.3 \times 10^{-1}$  Pa where the Supplementary pump exhaust speed is likely to lower.

The mechanical booster pump includes two rotors having a cocoon-shaped cross section and a casing that encloses them. These rotors are designed to rotate in the opposite directions without contacting each other while maintaining a very small clearance between them by a timing gear. The rotors and the casing are constructed in such a manner that the rotors can rotate while maintaining a small clearance between the rotor and the casing.

The pump can be actuated from atmospheric pressure using an optional motor controller. The pumping speed is normally stepwise when changed over from the fore pump, but this pump automatically detects the load applied to the pump and runs at the maximum capacity in that condition, resulting in a smooth throughput characteristic curve. Especially in an application where pumping and venting are repeated, the pumping speed can be shortened as compared with startup using a pressure switch or timer.

**Table. 2 Details model list**

Model	Revision	Naming		
PRC-003	A	-		
		(1)	(2)	(3)

<b>Model : Maximum pumping speed</b> PRC-003 : 280m <sup>3</sup> /hr(50Hz), 330m <sup>3</sup> /hr(60Hz) PRC-006 : 500m <sup>3</sup> /hr(50Hz), 600m <sup>3</sup> /hr(60Hz) PRC-012 : 1000m <sup>3</sup> /hr(50Hz), 1200m <sup>3</sup> /hr(60Hz) PRC-018 : 1500m <sup>3</sup> /hr(50Hz), 1800m <sup>3</sup> /hr(60Hz)	<b>Naming</b> <b>(1) Surface treatment</b> None : Surface treatment [Std.] X : Without <b>(2) Oil</b> None : Mineral oil (ULVOIL R-42) [Std.] F : Fluorinated oil (BARRIERTA J25F) <b>(3) Inverter</b> None : Without [Std.] (I2) : 200V class (I4) : 400V class
<b>Revision</b> A : Latest revision code	

#### Surface treatment

- Anodic oxide coating for surface hardness and corrosive resistance on main parts can prevent scratch and corrosion inside the pump.
- Because of moisture adhering inside the pumps with Surface treatment, their ultimate pressure may not drop to the specified value immediately after the startup.

#### Fluorinated oil

- Extremely chemically stable and inert fluorine oil is used, as a countermeasure against oil deterioration caused by corrosive, combustible, and oxidizing gases.
- Fluorinated oil cannot be replaced with mineral oil (ULVOIL R-42).
- At the factory, assembly inspection is performed using fluorinated oil, but we do not ship products with fluorinated oil. Please order separately if necessary.

#### Inverter

- The pump can be actuated from atmospheric pressure using an optional motor controller.
- In an application where pumping and venting are repeated, the pumping speed can be shortened as compared with startup using a pressure switch or timer.

## 2.2 Performance Specifications

Table. 3 Performance specifications

Item		Model	PRC-003A	PRC-006A	PRC-012A	PRC-018A
Maximum pumping speed 50/60 Hz (m³/h)			280/330 <sup>*2</sup>	500/600 <sup>*2</sup>	1000/1200 <sup>*2</sup>	1500/1800 <sup>*2</sup>
Ultimate pressure (Pa)			0.4 <sup>*1</sup>		0.67 <sup>*1</sup>	
Max. intake pressure (Pa)	50Hz	1.2 x 10³	1.3 x 10³	1.3 x 10³	1.2 x 10³	
	60Hz	9.3 x 10²	1.1 x 10³	1.1 x 10³	9.3 x 10²	
Max. allowable pressure difference (exhaust pressure -intakepressure) (Pa)	50Hz	4.0 x 10³	7.3 x 10³	7.3 x 10³	4.3 x 10³	
	60Hz	3.3 x 10³	6.0 x 10³	6.0 x 10³	3.2 x 10³	
Allowable drive pressure (Pa)			to 1.0 x 10 <sup>5</sup> (Atmospheric pressure operation type) <sup>*4</sup>			
Standard fore pump			VD601	VD901	VS1501	VS2401
Motor output (number of poles) (kW)			0.75(2)	2.2(2)	3.7(2)	5.5(2)
Intake port (JIS B 2290)			VG80 or equivalent		VG100 or equivalent	VG150 or equivalent
Exhaust port (JIS B 2290)			VF80 or equivalent			VG100 or equivalent
Lubricating oil	Genuine oil		ULVOIL <b>R-42</b> (Mineral oil)			
	Oil requirement (ℓ)		0.7	1.5	1.9	1.9
Weight (kg)			51	86	118	150

### Utilities

Model		PRC-003A	PRC-006A	PRC-012A	PRC-018A
Power requirements		three phase, 200VAC, 50/60 Hz, 220VAC 60 Hz			
Cooling water	Primary side pressure (MPa)	0.3			
	Inlet/outlet differential pressure (MPa)	0.01 or more			
	Volume (ℓ/min)	2.0 or more		3.0 or more	
	Water temperature (°C)	5 to 30			

CAUTION: If cooling water temperature is low, use the pump in an environment where dew does not condense.

- \*1 This value is measured by using a Pirani vacuum gauge.
- \*2 This value changes depending on the performance of the fore pump. The above data is obtained when the pump is used in combination with a standard fore pump.
- \*3 Please use it in the environment of no be dewy when the temperature of cooling water is low.
- \*4 PRC-018A is only atmospheric pressure operation type.
- Pressure/explosion proof and increased safety explosion motors are not available for the PRC-A series.

## 2.3 System Flow

Cooling water and power supply is required.

And you prepare wiring, safety circuit and exhaust processing equipment, etc.

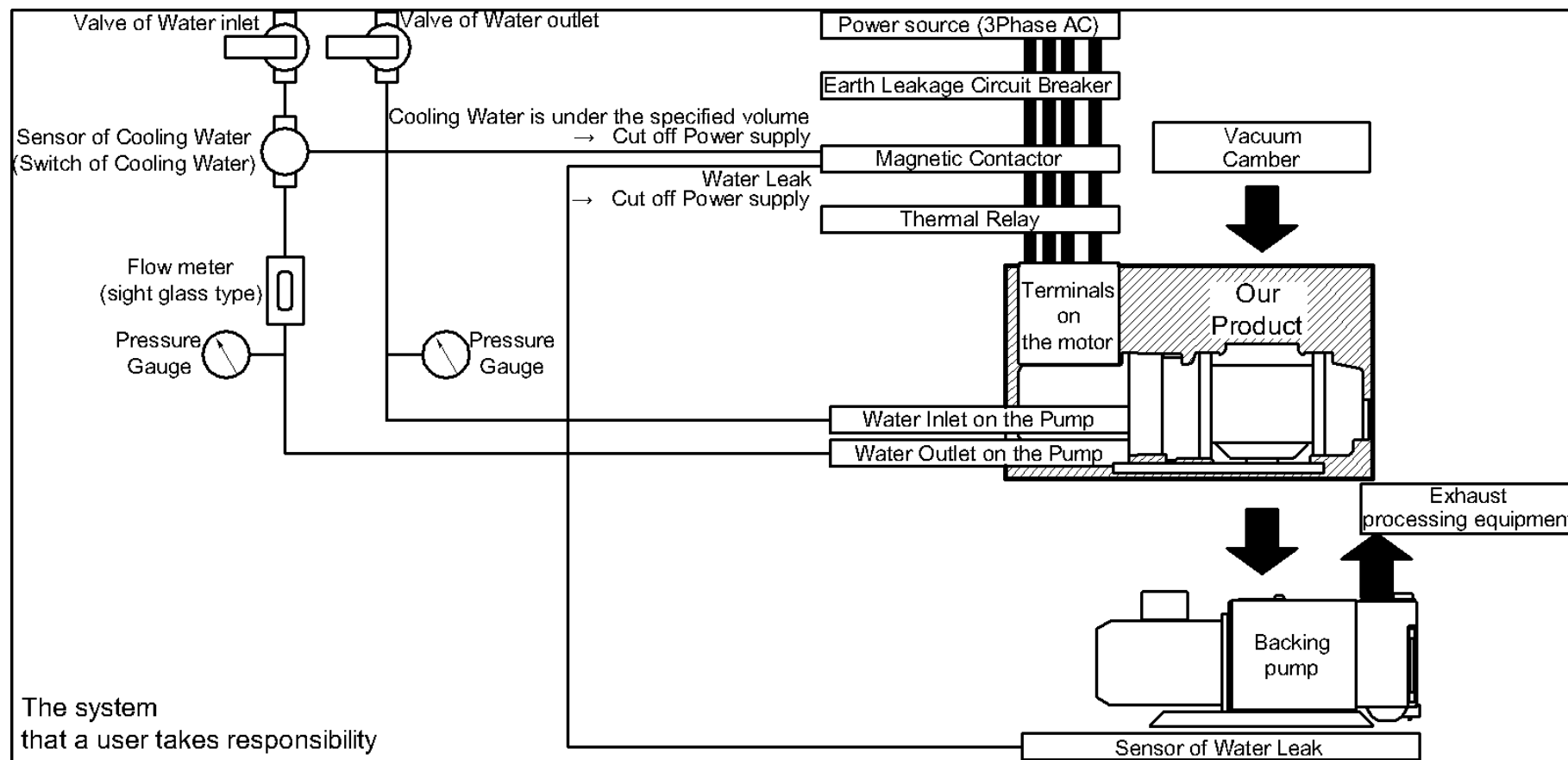


Fig. 2 Location of vacuum pump in host device

2.4 Dimensional drawing

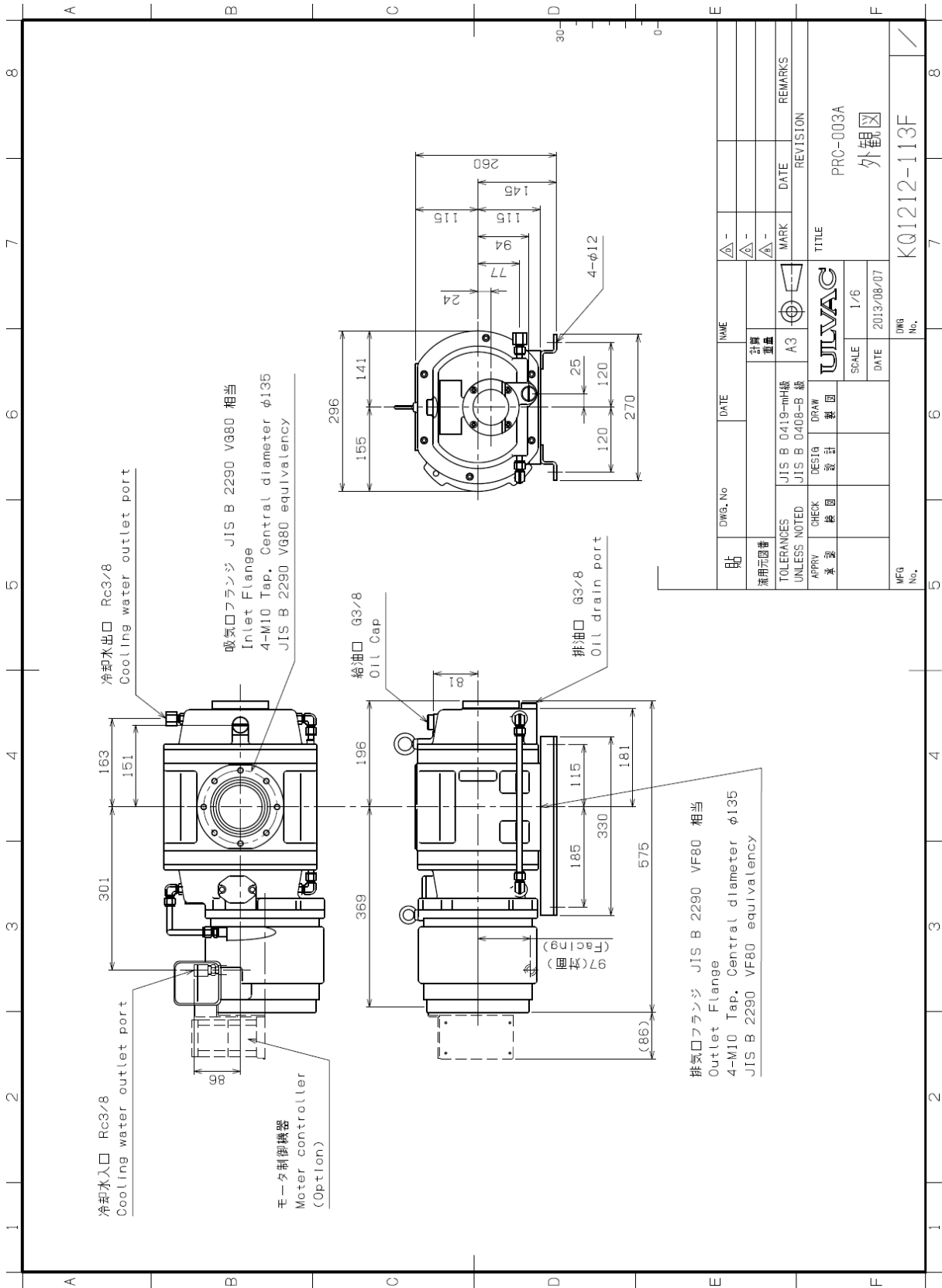


Fig. 3 PRC-003A Dimensional drawing



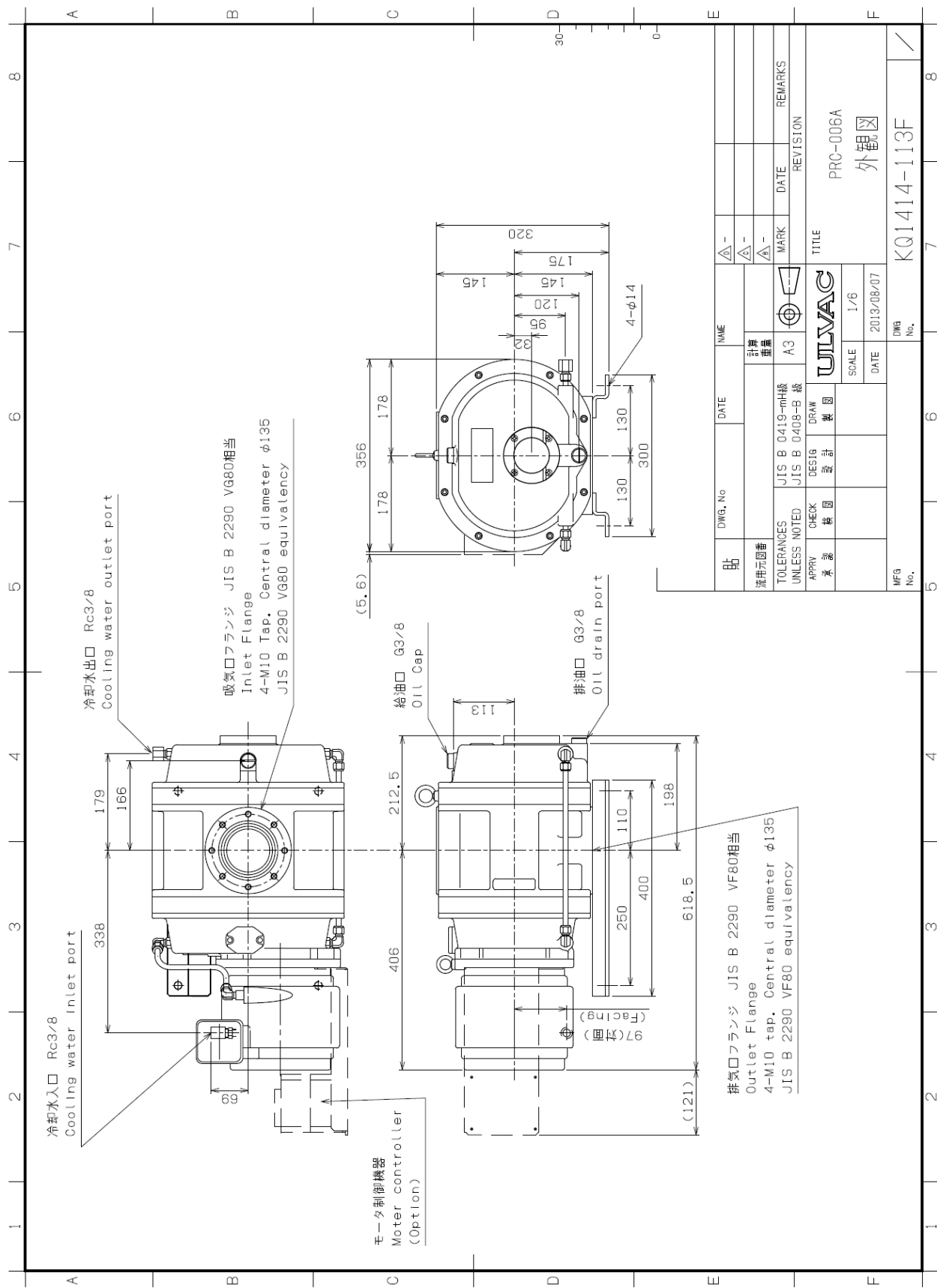


Fig. 4 PRC-006A Dimensional drawing

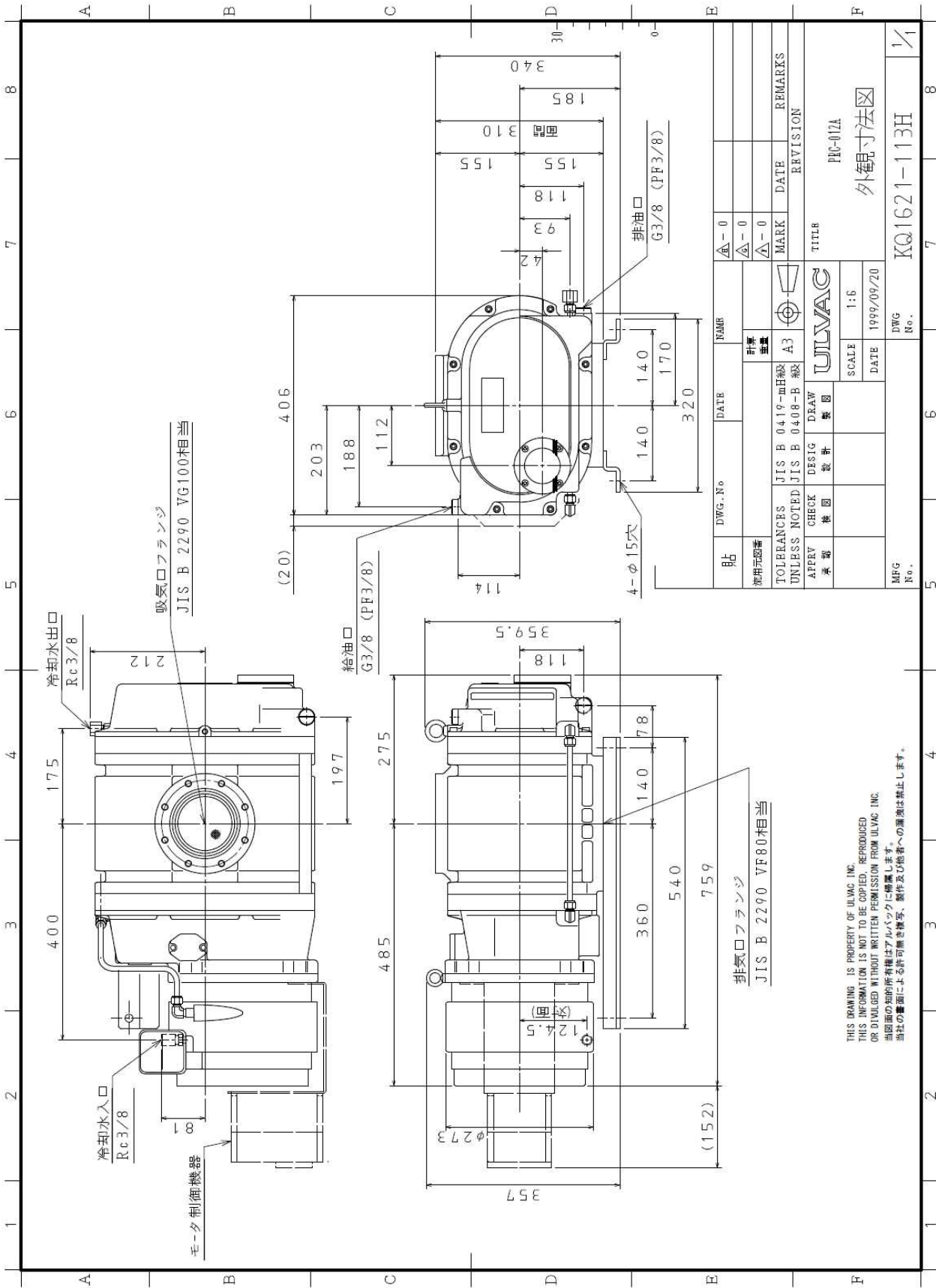


Fig. 5 PRC-012A Dimensional drawing

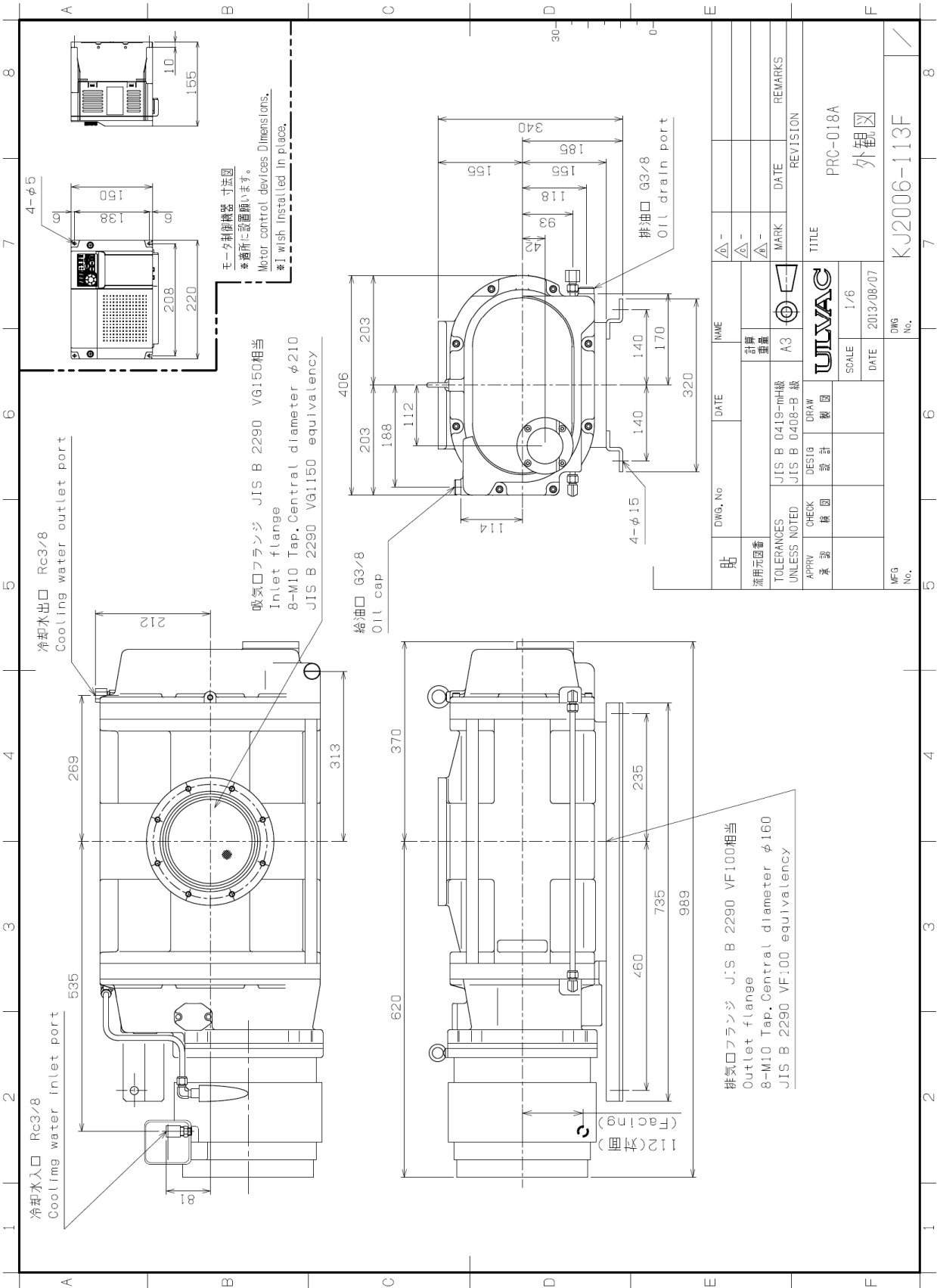


Fig. 6 PRC-018A Dimensional drawing

## **2.5 Pump Performance**

### **2.5.1 Ultimate pressure**

The ultimate pressure of the mechanical booster pump varies with the ultimate pressure of the fore pump. If the ultimate pressure becomes high, it is necessary to check the ultimate pressure of the fore pump too.

If the pump was used to pump a large quantity of moisture or was left with the intake and exhaust ports opened to atmosphere for a long period, the ultimate pressure may not lower to the prescribed value immediately after pump startup due to moisture absorption in the pump. In most cases, no-load run of the pump for about 24 hours will evaporate the adsorbed substance and restore the pump to normal.

### **2.5.2 Pumping speed**

The pumping speed varies with the pressure difference between the intake and exhaust ports and rotating speed. Even if the intake pressure is the same, the difference pressure between the intake and exhaust ports can be reduced by increasing the pumping speed of the fore pump, so that the pumping speed increases in a pressure range higher than the pressure at which the maximum pumping speed can be attained. Conversely, the pumping speed of the mechanical booster pump also lowers if the pumping speed of the fore pump is low.

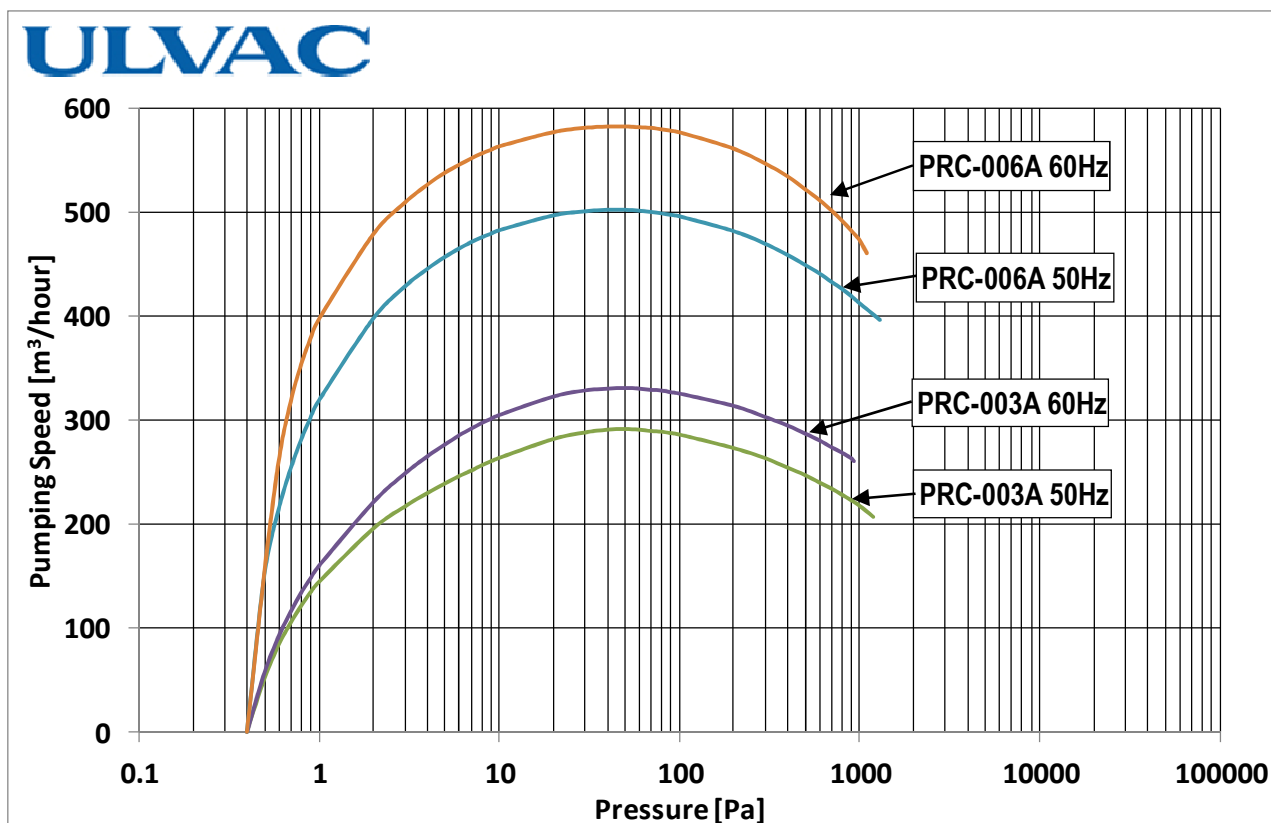


Fig. 7 Pumping Speed (PRC-003A/006A)

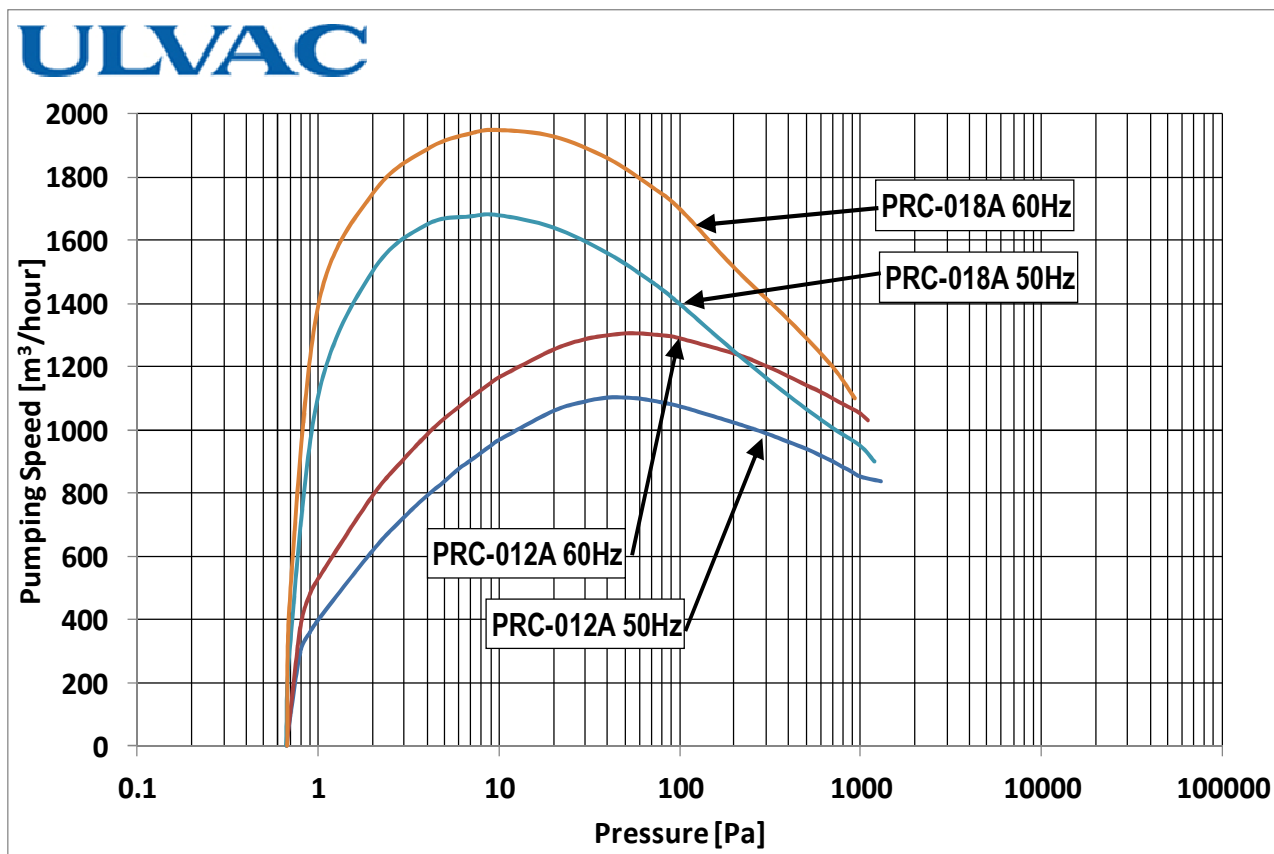


Fig. 8 Pumping Speed (PRC-012A/018A)

### 2.5.3 Power consumption

If the intake pressure exceeds the maximum intake pressure (refer to “Table. 3 Performance specifications”) when the standard fore pump is used, the motor will be under overload and the pump will be overheated, leading to burnt motor or seized pump. Use a fore pump with which the difference in intake pressure between the mechanical booster pump and the fore pump is smaller than the maximum permissible difference pressure (pump having a higher performance than the standard fore pump in terms of pumping speed and ultimate pressure).

Since the performance of the mechanical booster pump largely depends on the performance of the fore pump as described above, use care in selecting the fore pump.

The basic performance curve for this pump using the standard fore pump is shown on the next page.

## 2.6 Designing Pumping System

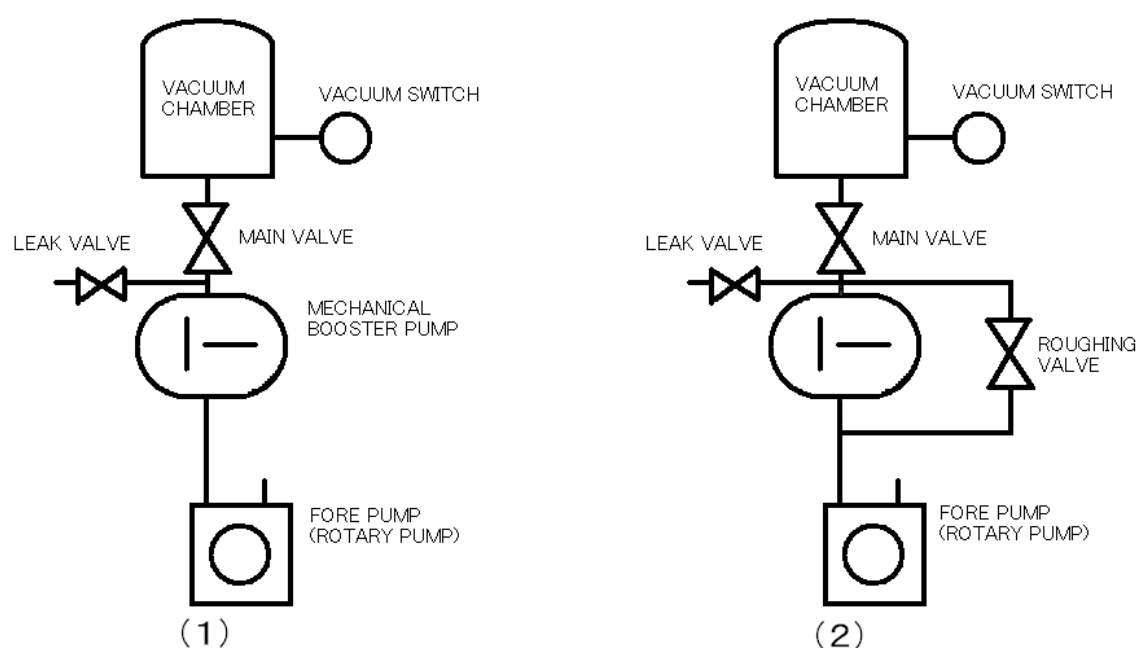
The following is a short note of the knowledge required in using a mechanical booster pump.

The mechanical booster pump cannot be started at the atmospheric pressure and must always be used in combination with a backing pump (dry pump/rotary pump). Therefore, the vacuum chamber and the piping must be rough-pumped by the methods shown in the “Fig. 9” and the mechanical booster pump must be started after the pressure has lowered to its operating range. The rough-pumping methods include those shown by ① and ② in Fig. 9.

The method ① carries out rough-pumping through the mechanical booster pump. This method is used when the vacuum chamber is small in size, that is, when a long time can be spent for rough-pumping. Since the mechanical booster pump does not operate when rough-pumping is under way, the gas to be exhausted is discharged through the clearances between the rotors in the mechanical booster pump. This increases the pumping resistance (decreases conductance) and a long rough-pumping time is required.

In the method ②, a rough-pumping circuit is provided for the mechanical booster pump. This method is used when the vacuum chamber is large in size, that is, when it is desired to shorten the rough-pumping time.

Rough-pumping is carried out with the main valve and the roughing valve opened and, when the specified pressure is attained, the mechanical booster pump is actuated and the roughing valve is closed for high vacuum pumping.



**Fig. 9 Evacuation by mechanical booster pump (example)**

## 2.7 Automatic Operation

This pump has a certain operating pressure range. When starting it, therefore, it is necessary to monitor the vacuum gauge.

In automatic operation, it is necessary to install a vacuum switch for pressure detection. When the pressure on the intake side becomes lower than the maximum intake pressure, the vacuum switch is actuated to start the mechanical booster pump. In the method ② in Fig. 9, a pneumatically controlled roughing valve is used which can be interlocked with a vacuum switch.

The vacuum switch is available in two types: mechanical and electrical. It is installed on the vacuum chamber or near the intake port of the mechanical booster pump.



**CAUTION**

**When using the vacuum pump other than the standard backing pump as the backing pump, since the maximum intake pressure becomes different from the described value, be careful for it.**



**CAUTION**

**When the difference is not available in between the pressure in the vacuum chamber and the pressure of inlet port of the mechanical booster pump, it is okayed to mount the vacuum switch on the vacuum chamber.**



## 2.8 Setting of Motor Controller (Atmospheric Pressure Actuating Type.With the inverter. )

Please refer to Section 5.4.



**WARNING**

- ① For the operation of the controller and electrical wiring, refer to the instruction manual for the inverter.
- ② Troubles imputable to control by other than the standard controller and to change of setting are not covered by this warranty.  
Do not change the factory setting and starting control wiring.
- ③ When starting the pump by remote operation, however, disconnect the control wiring for the start-up and turn ON/OFF the mechanical no-voltage contact to start/stop.
- ④ When you use the atmospheric actuation specification, in the control equipment used in the PMB-D series, an appropriate setting for each pump operation is performed. If you examine the special use method (When changing the parameter of the control equipment), consult with our company.  
Furthermore, this pump guarantees reliability by the operation frequency 50Hz~60Hz.

### 3. Mounting



*You are requested to install and operate the product in compliance with the laws and regulations relating to the safety, e.g. Fire Defense Law, Electric wiring regulation and so on in the country and region you use the product. Consequently you shall be requested to attend general safety lectures officially effective in the area, such as electrical safety, Cargo handling safety and so on. Note that any person not attended such lectures shall be restricted from handling the product. Operators shall need to attend such kind of training and have special knowledge, skill and title regarding the electricity, machinery, cargo, vacuum and so on. Be sure to clear any energy sources, e.g. electricity, coolant and so on of the product before installing or removing the product.*

#### 3.1 Storage/ Installation

Install the machine horizontal to a place where there are less dust and humidity. Make a layout taking into consideration of works such as setting, removal, check, cleaning and so on.

Refer to “0.5 Acceptance and Storage of The Pump” as for the detail.



**Operating the pump on laying it down or putting it reverse would give damage to the pump. Ensure to install the pump horizontal to the ground level as illustrated on the Fig. 3 ~ 6.**

**Be careful not to tilt the unit 10° or more.**

#### 3.2 Installation

Put the Pump on the frame mount and fix four fixing holes on the base with the bolts.



**The frame mount might cause the Pump vibration and/or resonance, incidentally remarkably depending upon its shape. In such a case use the anti-vibration rubber insulator to fix the unit rather than to fix it directly with bolts or the like.**

## 3.3 Lubrication

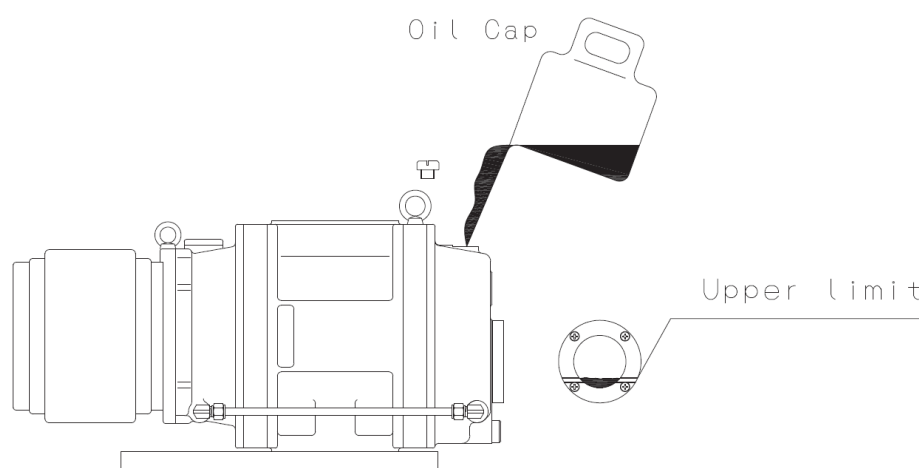
### 3.3.1 Lubrication to the Lubrication chamber.

Supply the lubrication oil by specified volume through the oiling port on the Gear cover .

It takes approximately one minute that the lubrication oil fully spreads out. Check the oil volume by the Oil level gauge after the lubrication got stabled and add the oil if it was under the specified level as far as the oil gets stabled on the upper limit level.

**Table. 4 Oil level gauge**

MODEL	Place	In oiling	During operating
PRC-A Series	Oil level gauge on the Cover of gear side	Put the oil up to the upper limit level.	Oil level shall be available between level lines of 2 pieces of the oil gauge.



**Fig. 10 Oil level gauge**



**Ensure to use the vacuum pump oil designated by ULVAC.**

**Operation using oil other than designated shall be out of our scope of guarantee as it might impair the pump performance and shorten the life cycle.**



- ① **Read “1. 2 Chemical Material Safety Data Sheet” previously before starting lubrication.**
- ② **Weal protective gears such as rubber gloves, protective goggle and so on. Should the oil touched to your hand are entered in your eye, immediately follow the emergency treatment described on the SDS.**

**CAUTION**

Oil for the mechanical booster pump is the same base of oil for the backing pump.

Standard oil for our products is either ULVOIL **R-42** ; its combined use is not allowed.

Be sure to refill the same oil as before.

**CAUTION**

Running the unit with the lubrication filled over the upper limit on the room temperature (around 20 °C) might cause the oil flowing in the casing. Discharge the oil if over lubricated so as to match the upper level.

Be sure to check the oil level under operation stop on the room temperature (around 20°C.)

Oil level might get higher during operation due to the oil temperature rise and oil rowing, but it makes no problem.

**CAUTION**

To lubricate, be sure to stop running the Pump and return the Mechanical booster inside to the atmospheric pressure.

Chamber containing the oil becomes vacuum during operation. Taking off the plug during operation would cause a large leak and give damage to the Pump unit.

**CAUTION**

Be sure to lubricate the machine. If the lubrication oil came down lower than limit level during operation, it might give damage on the bearing, gear and shaft sealing and result in leak, noise, motor overload and operation stop.

### 3.4 InletportPiping/ Outlet port Piping

#### 3.4.1 Inlet port Piping



- ① Wash sufficiently inside the Vacuum chamber, pipes, Vacuum valve and so on to connect them to the Pump. If dirty unit were connected, it would cause a trouble such like raise the ultimate pressure or extend the depression time to the specified pressure. Wear a pair of gloves to touch any vacuum section. Do not touch with the bare hand.
- ② Pay a full attention to completely clear the welding scale and/or rust inside the pipe. If obliged to conduct a welding work close to or on the inlet, take a measure such as to remove the pump unit or put a cover sheet on the inlet in order not to allow any foreign substance enter inside.
- ③ Should the Pump sucked the water or substance such as dust, powder and so on, it would impair the ultimate pressure and further cause a trouble.  
The pump has a really slight clearance to keep rotation and easily gets impossible to rotate by any foreign substance entered inside.
- ④ Clear the sand completely after having sand blasted the vacuum chamber.
- ⑤ Pay attention not to give damage to the Flange sheet face, Gasket slot or gasket itself.
- ⑥ Check inside the casing before mounting the Pump unit to ensure no dust is attached to the Rotor, casing or elsewhere.
- ⑦ Metal mesh on the Suction inlet is put to keep foreign substances away from the Pump unit.  
Be sure not to take it off unless necessitated so to check it.
- ⑧ Use a pipe having bellows between the Vacuum chamber and inlet of the Mechanical Booster Pump so as to avoid any direct load to the Pump flange and not to transfer the pump vibration to the Vacuum chamber.
- ⑨ Put the Vacuum valve, Vacuum gauge and Leak valve between the Vacuum chamber and the Pump
- ⑩ You should put the Leak valve closer as possible to the Vacuum valve in order to prevent the oil from rising up to the Vacuum chamber when the Pump stopped.  
Be sure to mount the Leak valve above the Mechanical booster pump.

Use the flange for connection between the pump Inlet and the piping.

Provide a vacuum valve, vacuum gauge and vent valve between the vacuum chamber and pump, as shown in Fig. 9.

MODEL	Flange at the pipe	
PRC-003A	VF80	JIS B 2290:1998 Vacuum technology-Flange dimensions; Attachment book (Reference) Flange dimensions for maintenance
PRC-006A	VF80	
PRC-012A	VF100	
PRC-018A	VF150	

### 3.4.2 Outlet port Piping

Use the flange for connection between the pump Outlet and the piping.

MODEL	Flange at the pipe	
PRC-003A	VG80	JIS B 2290:1998 Vacuum technology-Flange dimensions; Attachment book (Reference) Flange dimensions for maintenance
PRC-006A	VG80	
PRC-012A	VG80	
PRC-018A	VG100	

- (1) Put a pipe having bellows between the Supplementary pump and outlet of the PRC-003A/PRC-006A/PRC-012A/PRC-018A.
- (2) Do not connect directly the Supplementary pump inlet with the outlet of the PRC-003A/ PRC-006A/ PRC-012A/PRC-018A.



- ① Use of the toxic, combustible or combustion susceptible gas other than inactive gas is not allowed as there is a risk of leakage of the gas from the Pump unit if it was exhausted by the vacuum pump.
- ② Use of the toxic, combustible or combustion susceptible gas and substance other than inactive gas is not allowed as there is a risk of causing fire or explosion inside the Pump unit if it was exhausted by the vacuum pump.
- ③ It is not allowed to use any corrosive gas other than inactive gas as it might cause corrosion and/or give damage on pump parts when discharged through vacuum pump.
- ④ Be sure to use pipes made of metal (electricity-conducting material). Ensure also to take a grounding
- ⑤ If to exhaust any combustible, combustion susceptible or corrosive gas, be sure to use pipes made of high pressure withstanding and corrosion resistant metal. Ensure also to take a grounding.

- ⑥ In the case of the process flowing combustible gas/susceptibility of substances to burn gas, you are requested to introduce the diluent gas.  
Flow the diluent gas from the intake side so that the gas concentration to be exhausted becomes lower than the explosion limit.



If the pipe connected to the outlet had a small diameter or attached foreign substance inside, it might raise the pressure inside the pipe and impair the pump operation. A caution shall be required.

There is a risk that the pressure inside the Vacuum pump rises up to cause break or oil leak of the casing or Oil level gauge resulting in overload of the motor.



- ① Wash sufficiently inside the Vacuum chamber, pipes, Vacuum valve and so on to connect them to the Pump. If dirty unit were connected, it would cause a trouble such like raise the ultimate pressure or extend the depression time to the specified pressure. Wear a pair of gloves to touch any vacuum section. Do not touch with the bare hand.
- ② Pay attention not to give damage to the Flange sheet face, Gasket slot or gasket itself.
- ③ Use a pipe having bellows between the backing pump and outlet of the Mechanical Booster Pump so as to avoid any direct load to the Pump flange.
- ④ Do not connect directly the backing pump inlet with the outlet of the Mechanical Booster Pump.

### 3.5 Water Piping

Connect piping 9.52 mm in diameter or more to the Coolant inlet / outlet using care not to mistake the ports (Refer to Fig. 3~6.)



- (1) Be sure to flow the Coolant with the volume indicated on “**Table. 3 Performance specifications**” or more. The pump temperature would rise up if the water volume becomes less than specified particularly on high suction pressure operation and cause the pump failure.
- (2) You are recommended to put a Flow meter for the Coolant and cause the interlock so that the Pump stops if the coolant flows less than specified volume.
- (3) When the operation stopped in winter, the water piping and the pump have a risk of breaking by freeze-up of the water inside. Open the Coolant outlet during operation stop and storage to discharge the water inside by blowing in the pneumatic air through the water inlet.



**CAUTION**

The water included little impurities (ex. Industrial Water) is recommended for cooling water.

Depending on the water quality, the inside wall of cooling water tube is covered with water scale ( $\text{CaCO}_3$  etc.) and cooling water flow rate may be decreased. Cooling water tube is corroded by Chlorine ion ( $\text{Cl}^-$ ) and cooling water leak may be caused. In case of using pure water, cooling water leak may be caused by metal component dissolution, too.

In these cases, the repair service may be for a fee.

[Reference] Standard Water Quality of Industrial Water

Turbidity mg/L	pH —	Alkalinity $\text{CaCO}_3$ mg/L	Hardness Mg, $\text{CaCO}_3$ mg/L	Evaporation residue mg/L	Chlorine ion $\text{Cl}^-$ mg/L	Iron Fe mg/L	Manganese Mn mg/L
20 max.	6.5–8.0	75 max.	120 max.	250 max.	80 max.	0.3 max.	0.2 max.

Establishment: Japan Industrial Water Association





- (1) The machine is designed not to cause any leakage under restricted condition and demonstrated by the Leak test. However, it still has a risk of leaking under any abnormal condition other than specified, for example abnormal water pressure rise. In such a case, the leakage shall remain unstopped unless the supply from the system stops. You should refrain from installing electrical equipment or wiring beneath the Pump and on the floor around the Pump.
- (2) We recommend you to put the Leak sensor on the floor beneath the Pump and engage it with the interlock system of the equipment. Close the Coolant supply valve (HWSV) immediately you noticed the leakage. Put the [Closed] tag onto the handle after having closed the valve.
- (3) Put a Flow meter (HWFM: for example Flow sight) applicable to visually check the flow onto the Coolant supply source to make it possible to check the flow.



- (1) If you use several pumps, be sure to connect the Coolant pipes parallel. Cooling capacity might come down if connected them serial and cause the failure.
- (2) You should put a filter at the front stage if you are obliged to use the water containing much impurity such like water stain, iron and the like.
- (3) Appropriate flow might not be ensured when the supply source and discharge outlet were apart or there was level difference in the piping (discharge outlet was elevated higher than the Pump). In such a case, cause a measure to ensure the flow volume, such as to change the piping layout, put a larger pipe or raise the supply pressure within the specification range.
- (4) Use the soft water as the cooling water.



- (1) Be sure to put in the Insert if you use any plastic made product such as nylon tube. Such a tube is likely to cause deformation or get rigid as secular distortion and might cause a water leakage.
- (2) Keep the environment that does not cause dew formation when the cooling water temperature was lower.

### 3.6 Electrical Connection

#### IMPORTANT



Refer to "**Table. 5 Electrical connection**" to conduct the motor wiring.

Use crimping terminals for the connection and tighten screws. Check also any loose on screws on the Motor.

Rotation direction is as shown in the Fig. 11.

Be sure also to put a safety circuit such as Electromagnetic breaker for the electrical connection.



(1) Rated current value of the Motor shall vary subject to its mechanism. Use the Electromagnetic breaker applicable to operate by the rated current value of the applicable motor.

(2) Do the Direct-in start connection. The Star delta connection might have a trouble in starting.

**Table. 5 Electrical connection**

Motor terminal board	Standard	U	V	W	E
Motor controller terminal board	Option	R	S	T	GND
		↑	↑	↑	↑
Power		R	S	T	GND

Motor controller : refer to "APPENDIX 2 Option List"

**Table. 6 Rated current value of the PRC series standard motor**

Model	Motor output (kW)	Rated current value (A)		
		200V, 50Hz	200V, 60Hz	220V, 60Hz
PRC-003A	0.75	3.5	3.3	3.2
PRC-006A	2.2	9.9	9.3	8.7
PRC-012A	3.7	15.5	14.9	13.8
PRC-018A	5.5	22.0	21.0	20.0



Install and operate the product in compliance with the laws and regulations relating to the safety, e.g. Fire Defense Law, Electric wiring regulation and so on. In the country and region you use the product.



(1) Turn OFF the Power Supply to do the electrical connection.

Never try to work on it on keeping the electricity turned ON.

(2) Make sure to have the steady grounding. You have a risk of getting electrical shock when the machine caused a failure or electrical leakage. You are also recommended to put a dedicated ground-fault interrupter.

(3) Never fail to put the Terminal cover after completed the wiring.



(1) Be sure to put an overload protective device conforming to the motor capacity.

You have a risk that the Motor burns out or causes a fire if you have not put such an overload protective device or put a device not conforming to the motor capacity.

(2) Do the correct wiring work conforming to the Electrical Installation Technical Standard and Internal line cord. Wrong wiring work might cause a fire.

---

## 4. Operation

### 4.1 Test run

Follow the procedure (1) – (4) below to start operation of the Pump unit.

(1) Check the piping.

Check and ensure that the piping and cable connection is completed (Refer to the “3.4 Air Suction Piping/Exhaust Piping” and “3.6 Electrical Connection”).

(2) Check the lubrication oil level (Refer to “3.3 Lubrication”).

(3) Check the Cooling water level (Refer to “3.5 Water Piping”).

Ensure that the Cooling water is flowing.

PRC-003A → Flow rate 2.0L/min or more

PRC-006A → Flow rate 2.0L/min or more

PRC-012A → Flow rate 3.0L/min or more

PRC-018A → Flow rate 3.0L/min or more

Check and ensure also that there is no cooling water leakage.

(4) Check the lubrication oil discharge operation and rotation direction.

a. Close the Suction valve of the Mechanical booster pump or put a Blind flange to the Suction inlet to block it.

b. Run the Supplementary pump to exhaust inside the Mechanical booster pump. This time, confirm that the pressure of the suction inlet or outlet of the booster pump comes down around the ultimate pressure of the Supplementary pump (13.0-1.3Pa for the standard supplementary pump) and keep exhausting three minutes or more only by the Supplementary pump under that state. Exhausting three minutes shall deaerate the air component in the lubrication oil in the Mechanical booster pump.

c. Flow the Cooling water and run the Pump around three seconds on keeping watching the Oil level gauge to check the rotation direction.

Gear rotation shown in the Fig. 11 is correct.

If it rotated reverse, check the motor wire connection. The Motor is a three-phase induction motor that would rotate reverse if two of three input wires were connected reverse.

d. Upon checked the rotation direction, run the Mechanical booster pump three minutes or more to conduct the lubrication deaeration and lubrication circulation inside the Pump unit.

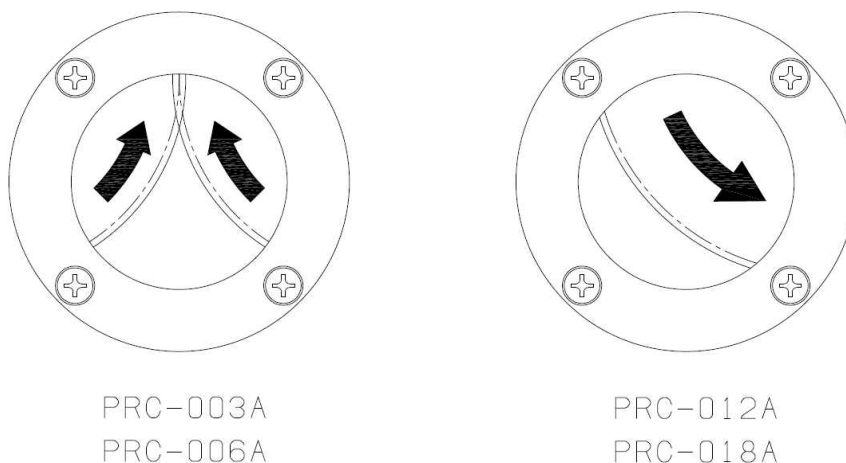


Fig. 11 Gear rotation direction



Never fail to flow the coolant during operation, Required coolant volume shall be;

PRC-003A→2.0 L/min or more  
 PRC-006A→2.0 L/min or more  
 PRC-012AC→3.0 L/min or more  
 PRC-018AC→3.0 L/min or more



Never run the Vacuum pump on blocking up the exhaust outlet, putting any device that hampers the gas passage or putting any oil mist trap not conforming to the ULVAC pump. There is a risk that the pressure inside the rises up as far as the Pump unit and/or Oil level gauge breaks or the Motor gets overloaded.

This product is not made as the withstand pressure structure. Ensured pressure value of the Pump shall be 0.03MPa (0.3kgf/cm<sup>2</sup>) (Gauge pressure).

If any valve was put to a pipe after the Exhaust outlet, check and ensure that it is open.



Never fail to conduct the lubrication oil deaeration before starting operation when lubricated anew the Mechanical booster pump or left it a long time after lubrication.

Starting operation without deaeration might generate a lot f bubbles and cause them flow in the Rotor chamber.



The Pump oil might deteriorate in a shorter time depending on the use.

It is recommended to replace the first Pump oil within ten days after operation start and see how it got dirty to determine the oil replacement cycle.

## 4.2 Operation

### 4.2.1 Exhaust start

- (1) Flow the Cooling water.
- (2) Close the main valve of the Mechanical booster pump and start running the Supplementary pump to exhaust inside pipes.
- (3) Start the operation upon the vacuum container was exhausted to the pressure lower than the maximum suction pressure of the Mechanical booster pump.
- (4) Start the mechanical booster pump when the vacuum chamber is pumped to below the maximum intake pressure of the mechanical booster pump.

### 4.2.2 Exhaust stop

- (1) Close the main valve of the Mechanical booster pump and stop it.
- (2) The Mechanical booster pump shall keep running a while by the Rotor inertia. Check and ensure that the rotation stopped through the Oil level gauge to stop the Supplementary pump.
- (3) Open the Suction leak valve upon stopped the Supplementary pump to make atmospheric pressure inside the Mechanical booster pump and Supplementary pump.
- (4) Wait until the Pump cools down as far as you can touch by hand to stop flowing the Cooling water.
- (5) Discharge the water in the Pump unit and Cooling water piping in case where the environment temperature comes down below 5°C under the state that the operation is stopped (Supply the compressed air of 0.3MPaG (gauge pressure) through the Cooling water inlet without closing the outlet.). Residual water, if any, might freeze up and cause crack of the Pump unit and/or Cooling water pipe.



**WARNING**

The vacuum pump becomes high temperature during operation (70°C to 80°C). Do not touch the Motor and/or Pump unit until the Pump cools down after having stopped operation. Apply an appropriate protection to avoid to touch the surface as necessary.



However, if the environment was highly humid, keep the Mechanical booster pump warmer than the room temperature after having stopped it and make the atmospheric pressure inside the Pump. Water in the air might condense in the Pump and worsen the ultimate pressure and/or exhaust speed.



**CAUTION**

Be sure to close the Vacuum valve and stop the Pump operation to open the Leak valve. Failure to follow this operation might cause the oil invasion in the casing from the Lubrication chamber or otherwise give damage to the Pump. Further the oil might flow back to the Vacuum tank if used the Oil rotation pump as the Supplementary pump.

If failed in closing the Vacuum valve, the vacuum might leak from the Exhaust system through the Pump.



To restart the Pump operation after once turned OFF the Power Supply, ensure to check that the Rotor is stopped to turn it ON again.

Repeating turning ON/OFF the electricity supply to the Motor control equipment in a short interval, particularly of the atmospheric pressure operation specification, might cause a trouble.



Ensure to flow the Coolant with the specified volume. Lack of the Coolant might give damage to the Pump unit or evaporate the water remained in the Pump to raise the pressure inside the Cooling system resulting in accidentally jetting out the hot steam.

## 5. Option

### 5.1 Special motors

The motor can be mounted explosion-proof increased safety explosion-proof motor is possible. For mounting dimensions, please contact us.



The increased safety explosion-proof motor voltage explosion-proof motor, it can not respond.

### 5.2 Inlet and outlet flange

By attaching the adapter flange, you will be able to transform into various standard flange. For mounting dimensions, refer to Section 5.6 Optional attachment figure.

### 5.3 Oil type

Depending on the process that is going to use, select the type of oil that I can be.

#### Guide for selecting

Model	Type	Comment
R-42 (Standard)	Petroleum-based mineral oil	Pure oil for vacuum pump
J25F	Fluorine-based synthetic oil	Chemically stable and resistant to heat, I will not produce a solid, such as degradation products

### 5.4 Motor control equipment

By using an Motor control equipment , this pump, can be operated from atmospheric pressure. You can while constantly monitoring the shaft power, minimum power supply ideal. Also, if you have a heavy load, by feeding back the state to immediately adjust the rotation speed, can drive overheating, without becoming overloaded, continuous operation from atmospheric pressure it is possible.

Normally, the pumping speed and the pressure of the staircase switch with auxiliary pump, operating at maximum capacity in terms of auto-detection of the load that is applied to the pump, exhaust characteristics is operated in a smooth curve. In particular, in applications where atmospheric and vacuum evacuation repeatedly, you will be able to shorten the exhaust time as compared to activation by the pressure switch and timer.

Mounting dimensions, refer to Section 5.6 Optional attachment figure.

If you put in another inverter, placed far from the pump, wire size, please determined by



considering the voltage drop.



Wiring is long, please check the voltage drop across the wire, or conform to the following calculated value. If there is a risk of the voltage drop, please increase the size depending on the length of the cable wire.

Motor rated voltage (V)  $\times 0.02 \geq$

Wiring distance  $\sqrt{3} \times$  wire resistance ( $\Omega / \text{km}$ )  $\times$  wire length (m)  $\times$  motor rated current(A)  $\times 10^{-3}$

※ Motor rated current, refer to "Table 6 Rated current value of the PRC series standard motor "

※ The wiring distance between the inverter and the motor, please be less than or equal to 50 m.

### 5.4.1 Setting of Motor Controller (Atmospheric Pressure Actuating Type)

There are Three kinds of inverters [FR-ER520 Series (Manufacturing before December,2004) and FR-F520J Series (Manufacturing after December,2004) and FR-D720 Series (Manufacturing after April,2009)] which use it by PRC Series. Please set it after confirming the model of the control equipment. For the operation of the controller and electrical wiring, refer to the instruction manual for the inverter.



Troubles imputable to control by other than the standard controller and to change of setting are not covered by this warranty.

Do not change the factory setting and starting control wiring (STF). When starting the pump by remote operation, however, disconnect the shorting wire of (STF) and turn ON/OFF the mechanical no-voltage contact to start/stop.



When you use the atmospheric actuation specification, in the control equipment used in the PRC series, an appropriate setting for each pump operation is performed. If you examine the special use method (When changing the parameter of the control equipment), consult with our company.

Furthermore, this pump guarantees reliability by the operation frequency 50Hz~60Hz.

Setting of operating frequency (in Mitsubishi FR-E520 series and Mitsubishi FR-F520J series and Mitsubishi FR-D720 series)

Operating frequency: 60 Hz

**Table. 7 Parameter setting: Mitsubishi FR-E520 series**

Parameter No.	Parameter	PRC-003A	PRC-006A	PRC-012A	PRC-018A
9	Electronic thermal O/L relay	3.6	9.3	15.1	21.0
19	Base frequency voltage	200			
22	Stall prevention operation level	70.0	82.5	84.5	75.0
57	Restart casting time	0			
58	Restart cushion time	1			
65	Retry selection	0			
67	Number of retries at alarm occurrence	10			
68	Retry waiting time	6.0			
75	Reset selection/ disconnected PU detection/ PU stop selection	1			
78	Reverse rotation prevention selection	1			
79	Operation mode selection	3			
80	Motor capacity	0.75	2.2	3.7	5.5
96	Auto-tuning setting/ status	0			
146	Frequency setting command selection	1			
250	Stop selection	0			

**Table. 8 Parameter setting: Mitsubishi FR-F520J series**

Parameter No.	Parameter	PRC-003A	PRC-006A	PRC-012A	PRC-018A
n6	Communication check interval time	999			
P9	Electronic thermal O/L relay	3.6	9.3	15.1	21.0
P19	Base frequency voltage	200			
P22	Stall prevention operation level	70.0	83.0	85.0	75.0
P30	Enhanced function display selection	1			
P53	Frequency setting operation selection	0			
P57	Restart casting time	0			
P58	Restart cushion time	1			
P60	AU terminal selection	10			
P66	Retry selection	0			
P67	Number of retries at alarm occurrence	10			
P68	Retry waiting time	6			
P75	Reset selection/ disconnected PU detection/ PU stop selection	1			
P78	Reverse rotation prevention selection	1			
P79	Operation mode selection	3			
P98	Auto-torque boost selection	0.75	2.2	3.7	5.5

**Table. 9 Parameter setting: Mitsubishi FR-D720 series**

Parameter No.	Parameter	PRC-003A	PRC-006A	PRC-012A	PRC-018A
P1	Maximum frequency	60			
P9	Electronic thermal O/L relay	3.6	9.3	15.1	21.0
P19	Base frequency voltage	200			
P22	Stall prevention operation level	58.5	75.5	80.1	72.3
P57	Restart casting time	0			
P67	Number of retries at alarm occurrence	10			
P68	Retry waiting time	6			
P75	Reset selection/ disconnected PU detection/ PU stop selection	1			
P77	Parameter write selection	1			
P78	Reverse rotation prevention selection	1			
P79	Operation mode selection	3			
P80	Motor capacity	0.75	2.2	3.7	5.5
P122	PU communication check interval time	9999			
P160	Extended function selection	0			
P161	Frequency setting/key lock operation selection	10			
P180	RL terminal function selection	62			

### Mitsubishi FR-D720 series parameter settings Note

- ※ doing all parameter clear the ALLC] to 1. Parameter settings before
- ※ 2.Pr77 to be set after the parameter settings of the other all over
- ※ that the settings after the 3.Pr77, to perform and hold the key lock the [MODE] button

## 5.5 Separate Evacuation of Lubricating Chamber

The oil flow from the lubricating chamber into the rotor chamber is reduced by the employment of a special shaft seal in the PRC-A series mechanical booster pumps. The oil flow can be minimized by evacuating the lubricating chamber by another vacuum pump.

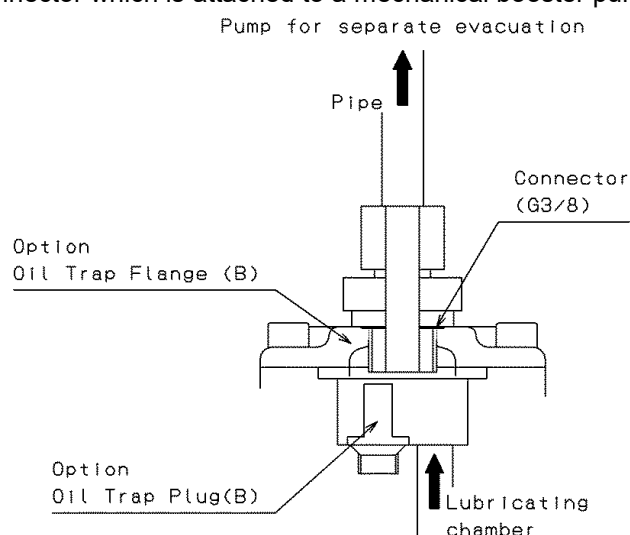
Position of the exhaust port of rooms lubrication, refer to Section 5.6 Optional attachment figure.

**Table. 10 Optional parts**

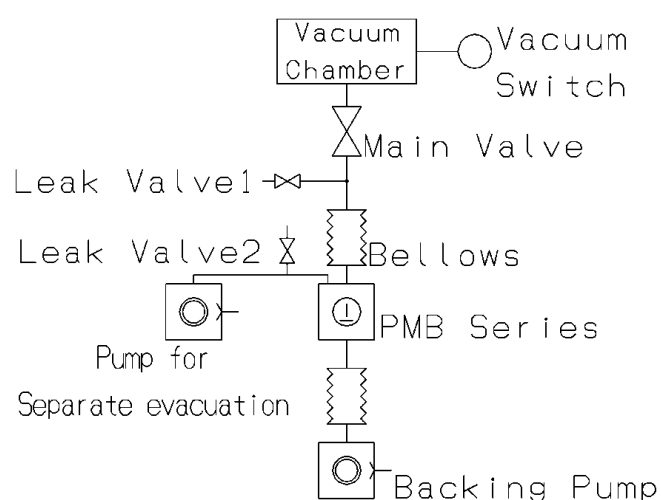
Description	Function
Oil trap flange(B)	Allows pumping of the lubricating chamber by a separate system.
Oil trap plug(B)	

※Please prepare:

1. A pump which exhausts mainly a lubrication room.
2. The pipe between a mechanical booster pump and the pump.
3. A connector which is attached to a mechanical booster pump.



**Fig. 12 Separate evacuation of lubricating chamber**



**Fig. 13 Separate evacuation of lubricating chamber (example)**

### 5.5.1 Preparation

The separate exhaust port of the lubricating chamber is at the center of the oil trap flange (B) on the top on the motor-side cover. It is covered with a plug to keep off foreign matter on delivery.

- (1) Remove the plug from the separate exhaust port of the lubricating chamber.
- (2) Arrange the piping to the separate exhaust port and the inlet port of the lubricating chamber.



**CAUTION**

The ultimate pressure of the pump for separate evacuation of the lubricating chamber should be equivalent to that of the fore pump.

### 5.5.2 Water Piping, Electrical Connection and Lubrication.

Follow the procedure in the “3.3”, “3.5”, “3.6”.

### 5.5.3 Checking lubricating oil level

Follow the procedure in the “3.3”, “4.1”, “4.2”.

### 5.5.4 Pumping

- (1) Close the inlet port either by closing the valve above the inlet side of the mechanical booster pump or by providing a blind flange to the intake port.
- (2) Run the pump for evacuating the lubricating chamber to evacuate the lubricating chamber of the mechanical booster pump.

Then run the backing pump to evacuate the mechanical booster pump.

Here, make sure that the pressure at the inlet port or exhaust port of the mechanical booster pump lowers to near the ultimate pressure of the backing pump (13 to 1.3 Pa with the standard backing pump).

If the pressure does not lower, check the piping for leakage or the backing pump for defect.

Follow the procedure in the “4.1”, “4.2”.

### 5.5.5 Checking rotational direction

After completion of evacuation check the rotational direction.

Run the pump for approximately three second while looking through the viewing port.

If the gears rotate in the direction shown in the “Fig. 11”, it is running in the normal direction.

If the rotation is reversed, interchange the two wires of the three input wires to the motor.

If there is a vacuum gauge on the inlet side of the mechanical booster pump, the rotational direction can be checked by running the mechanical booster pump to see if the pressure lowers.

Follow the procedure in the “4.1”, “4.2”.

### 5.5.6 Operation

When the preparations for operation are completed, make a test run.

Supply cooling water and put the pump into operation. The oil in the viewing window will bubble immediately after the start of pump operation, but the bubbles will soon disappear.

During operation, check the following.

- (1) Recheck the rotational direction of the pump.
- (2) Make sure that the cooling water is flowing.
- (3) Make sure that the oil level is between the two level lines.

Follow the procedure in the “4.1”, “4.2”.

### 5.5.7 Pumping start operation

Refer to the “Fig. 8”.

- (1) Close the main valve above the inlet side of the mechanical booster pump and start the pump for separate evacuation to evacuate the lubricating chamber of the mechanical booster pump.  
Then start the backing pump to evacuate the mechanical booster pump and piping.
- (2) Open the main valve above the inlet side of the mechanical booster pump to evacuate the vacuum chamber.
- (3) When the vacuum chamber is evacuated to a pressure lower than the maximum intake pressure (Refer to the “**Table. 3** Performance specifications”), start the mechanical booster pump.

Follow the procedure in the “4.1”, “4.2”.

### 5.5.8 Shutdown operation

Refer to the “Fig. 8”.

- (1) Close the main valve between the vacuum chamber and the inlet side of the mechanical booster pump.
- (2) Stop the mechanical booster pump.
- (3) Stop the backing pump.
- (4) Stop the pump for separate evacuation.
- (5) Open the leak valve 1 to vent the mechanical booster pump and the backing pump to the atmospheric pressure.
- (6) Open the leak valve 2 to vent the lubricating chamber to the atmospheric pressure.
- (7) Stop the cooling water supply.

Follow the procedure in the “4.1”, “4.2”.

## 5.6 Optional attachment figure

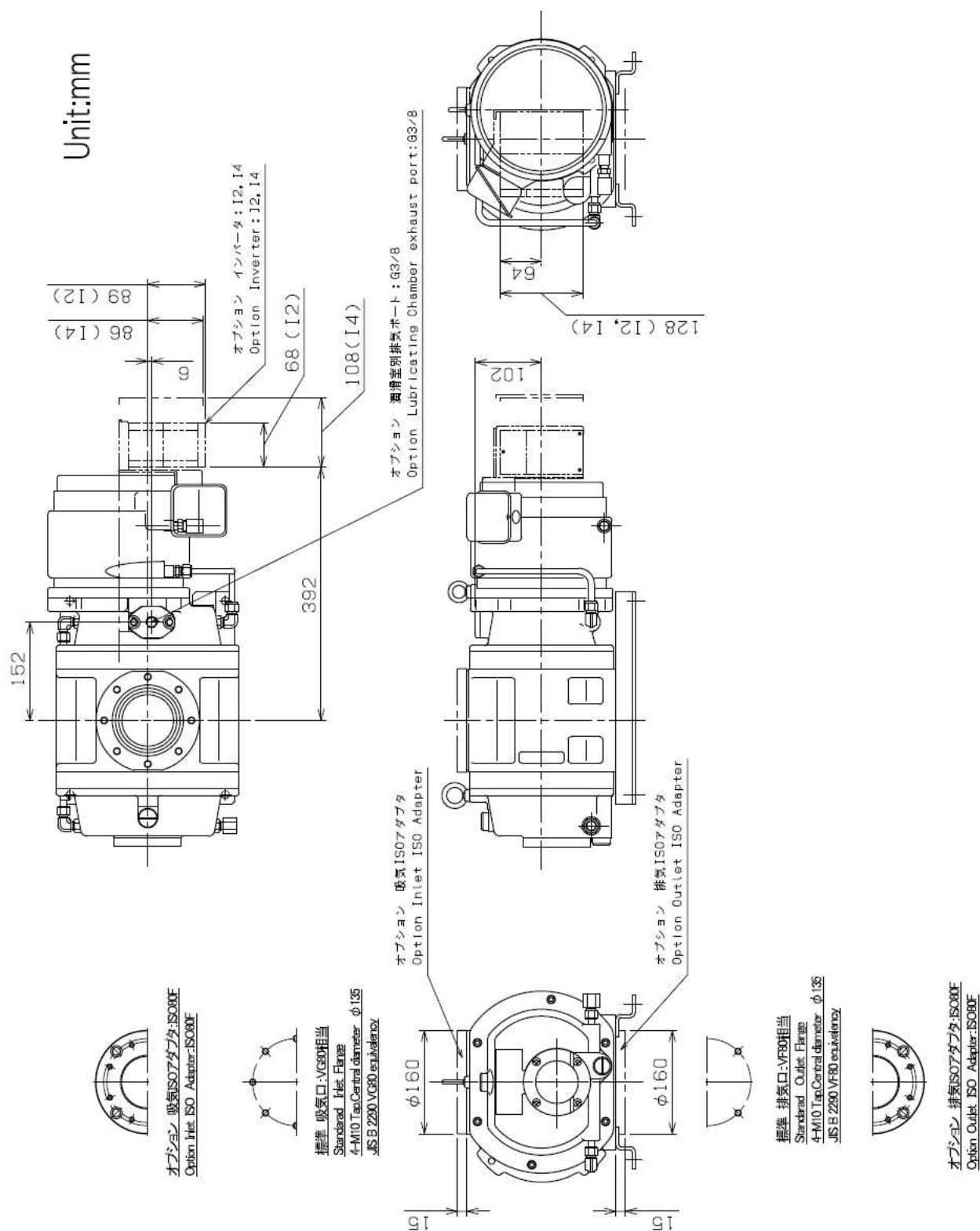


Fig. 14 PRC-003A Optional attachment figure



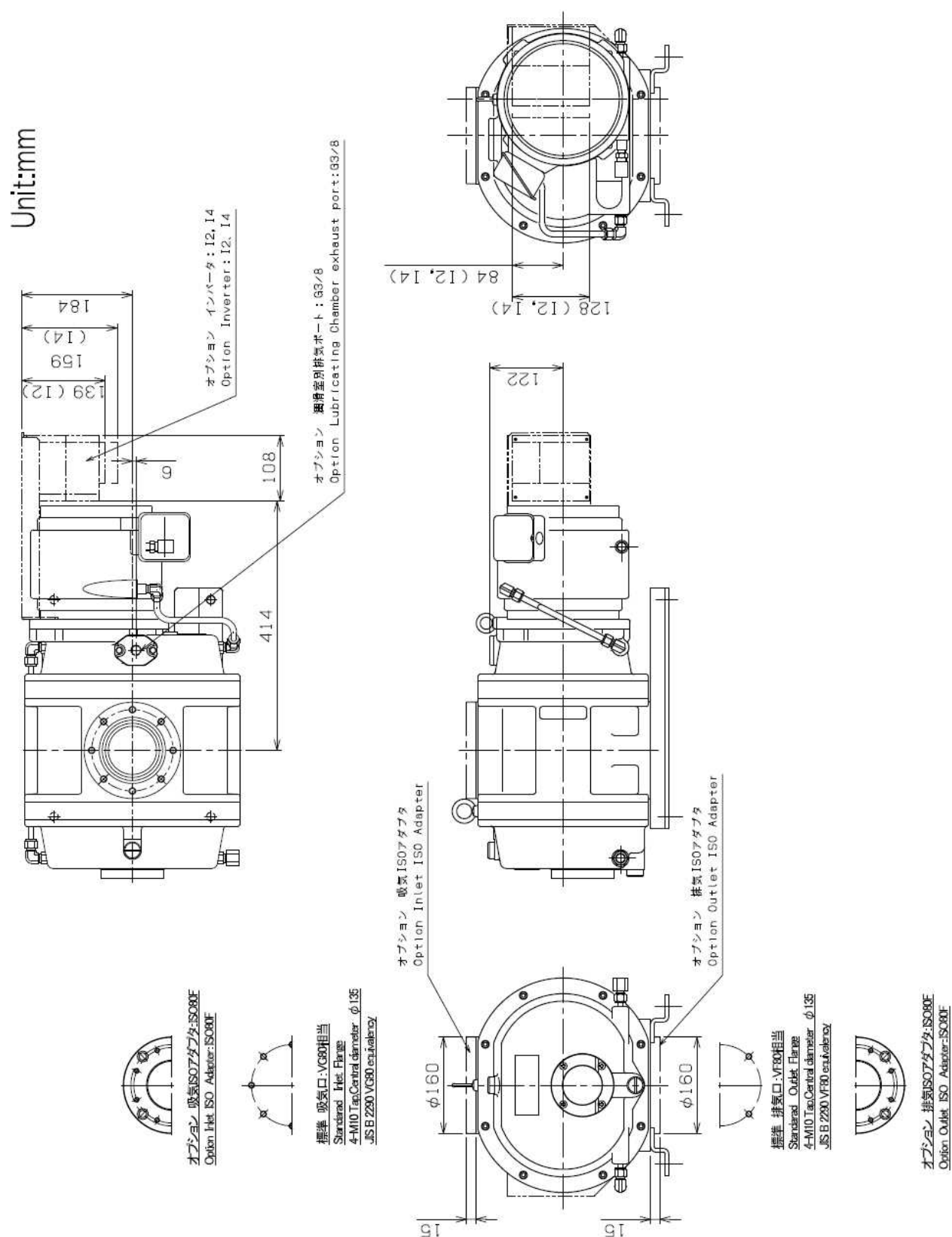


Fig. 15 PRC-006A Optional attachment figure

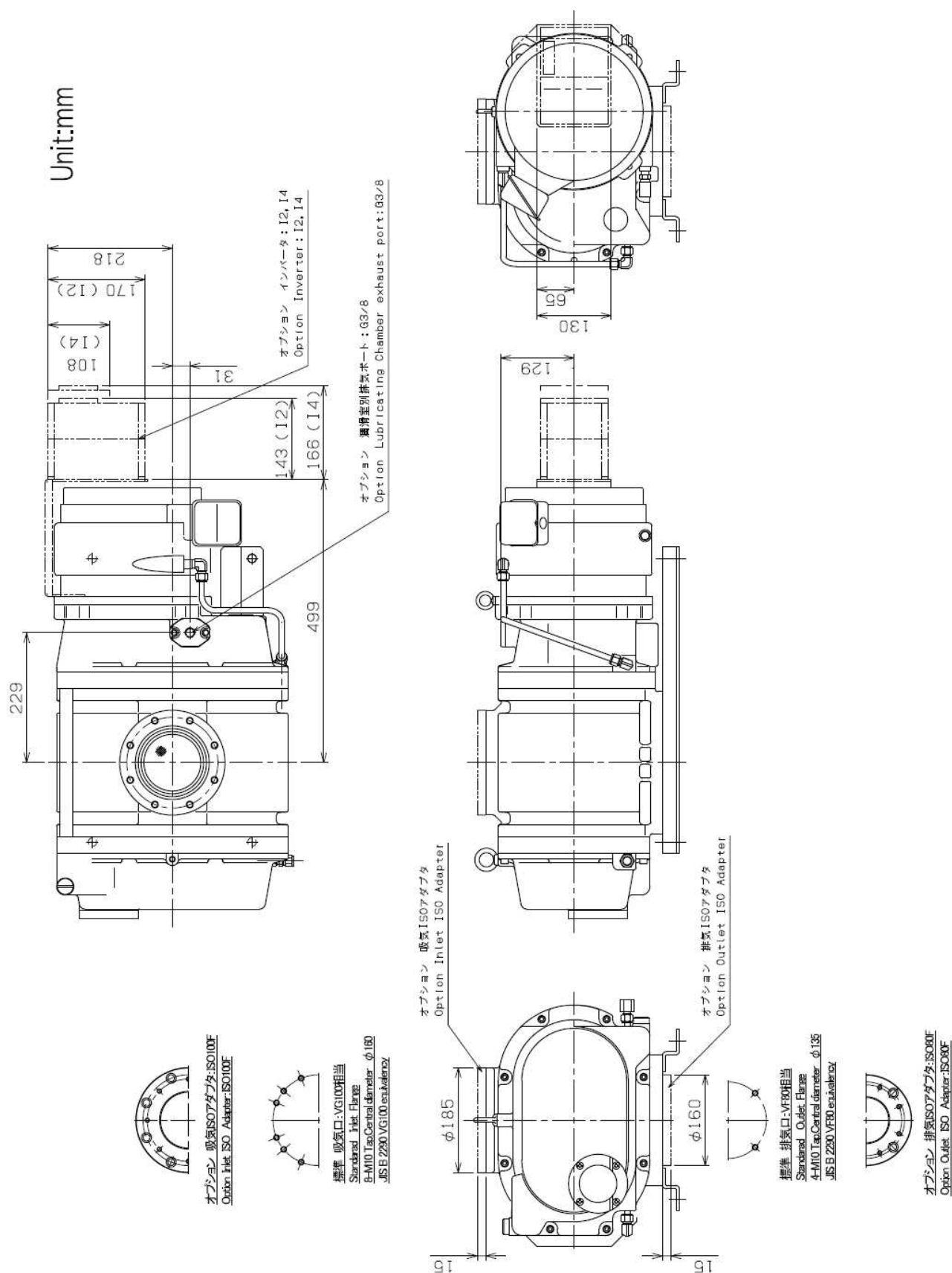
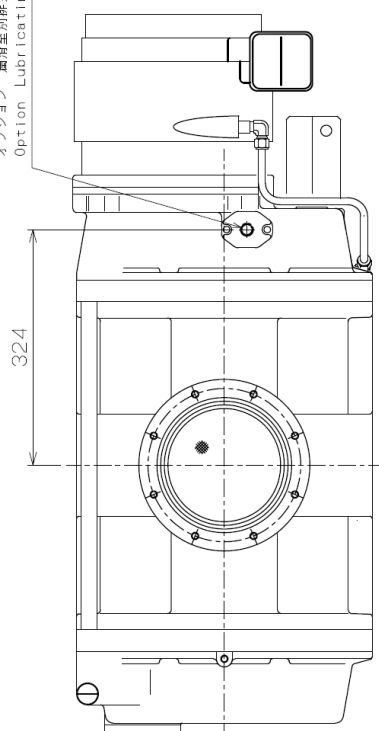


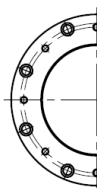
Fig. 16 PRC-012A Optional attachment figure

Unit:mm

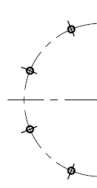
オプション 潤滑室別排気ポート：G3/8  
Option Lubricating Chamber exhaust port:G3/8



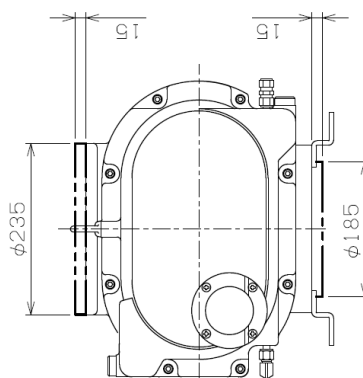
324



オプション 排気ISOアダプタ:ISO100F  
Option Inlet ISO Adapter:ISO100F

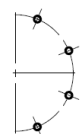


標準 排気口:VG150相当  
Standard Inlet Flange  
8-M10 Tap/Central diameter  $\phi 210$   
JIS B 2290 VG150 eq. & vicinity

 $\phi 235$ 

15

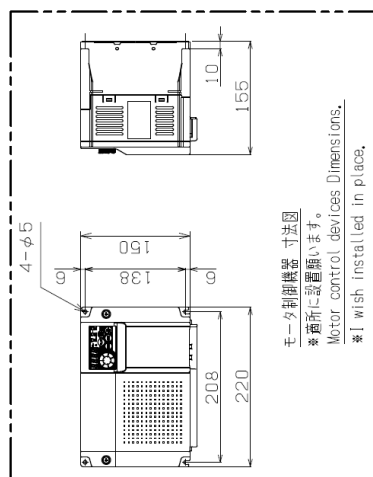
15

 $\phi 185$ 

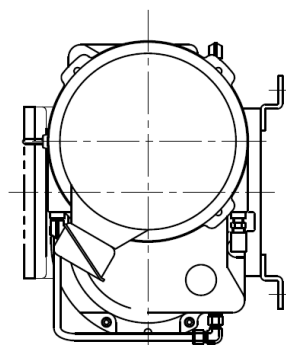
標準 排気口:VF100相当  
Standard Outlet Flange  
8-M10 Tap/Central diameter  $\phi 135$   
JIS B 2290 VF100 eq. & vicinity



オプション 排気ISOアダプタ:ISO100F  
Option Outlet ISO Adapter:ISO100F



モータ制御機器 寸法図  
※ 右図に設置願います。  
Motor control devices Dimensions,  
\* I wish installed in place.



129

Fig. 17 PRC-018A Optional attachment figure

## 6. Maintenance and Check

### 6.1 Maintenance

Conduct the maintenance regularly in appropriate check interval. Maintenance period shall differ depending on the operation purpose. Set the interval once a day at first. Once a week from next week if you had no problem, then conduct once a month for example. We recommend you, however, to conduct visual checks and check on the utility every day to see the system condition.

- (1) You should check following points at least once per three days while you continue operation.
- (2) Whether the Vacuum oil pump oil volume is between two level lines or not.
- (3) Check the machine much more frequently during high overload operation (continuous operation 1kPa or more, repeated exhaust atmospheric pressure – vacuum).
- (4) Whether the Vacuum pump oil is discolored or not.
- (5) Whether the Coolant flows by specified volume.
- (6) Whether there is no foreign noise.
- (7) Whether there is anything strange in the Motor current value.
- (8) Whether there is no water leak.

## 6.2 Inspection Items

Refer to the "Table. 11 Maintenance list" below.

**Table. 11 Maintenance list**

No.	Inspection item	Check	Possible cause	Corrective action
1	Oil level	To be within the level lines.	Oil flowed into pump casing.	Visual check of casing interior.
2	Cooling water flow rate	Is the flow rate more than the prescribed rate?	Clogged cooling water piping. Drop of supply pressure.	Check cooling water piping.
3	Oil color	Whitish (turbid).  Discolored to brown.   Discolored to black.	Mixing of water. Contamination with product or acid.  Contamination with abrasion powder of bearing or other.	Change oil.
4	Abnormal sound	Check by hearing. Measurement of sound pressure level by noise meter.	Worn bearing or gear.	Refer to "Table. 12 Troubleshooting".
			Mismatching of timing. Motor is faulty.	
5	Abnormal Heating	Check by hand. Temperature measurement by surface temperature gauge.	Insufficient cooling water. Leak. Overload.	
6	Motor current	Measure by ammeter.	Leak. High intake pressure.	

## (1) Pump chamber inside



Stop running the Mechanical booster pump around once per three month and conduct the inside check on removing the Inlet pipe. Confirm that there are no adherents inside the casing (Rotor surface, casing surface). Substance in the gas might condense and attach to the Rotor surface, particularly when exhausted any organic gas, and make the clearance narrower and result in rotation failure.



If the Pump was used to exhaust the toxic gas, the Pump oil as well as the Pump unit shall become toxic. Pay a full attention.



Wear protective gear such as rubber gloves, protective goggles and the like.

Be sure to look through the “1. 2 Chemical Material Safety Data Sheet” before the lubrication.

Should the Vacuum pump oil touched to your hand or entered in your eye, immediately follow the emergency treatment described on the SDS.



Ensure to use the vacuum pump oil designated by ULVAC. Operation using oil other than designated shall be out of our guarantee as it might impair the pump performance and shorten the life cycle.

### 6.3 Checkup after storage for a long period

Long term storage of the Vacuum pump without operation might possibly cause trouble in operation caused by rust.

If you kept the Pump long time without operating it, ask a closest Service Center for the check.

### 6.4 Overhaul

If there found remarkable Pump contamination or performance deterioration due to the operation condition, you are recommended to conduct regular overhaul regardless of the check items described above.

Overhaul shall be required to keep the performance as well as the safety and further to continue the production on forecast.

Please contact the Service Center close to you listed at the end of the document as for the overhaul.

Do not remember to fill and submit the Contamination certificate enclosed in the end of the document.



**You are requested to conduct the overhaul once a year.**

**If there found remarkable Pump contamination or performance deterioration due to the operation condition, you are recommended to conduct the overhaul earlier than one year period.**

**You shall be in need of replacing such parts as listed on the “10. Main Displacement parts” at minimum.**

## 6.5 Troubleshooting

**Table. 12 Troubleshooting**

Trouble symptom	Check item		Criteria	Corrective action
Pump does not start.  Circuit breaker is actuated.	1	Are the no-fuse breaker and electromagnetic switch normal?	Failure of components. Trip.	Check the no-fuse breaker and electromagnetic switch. Reset the thermal relay.
	2	Are all three phases of power supply normal?	Abnormal phase voltage.	Check the power supply.
	3	Is the rotor rotation resisted?	Rotors do not rotate by inertia.	Disassemble and repair the pump. (Cleaning and clearance adjustment)
	4	Any deposits on the rotor surface?	No clearance due to deposits.	
	5	Any scar on the rotor surface?	Scar on the rotor Surface	
	6	Is operating pressure appropriate?	Pressure is above the maximum pumping pressure.	Check pressure on intake and exhaust sides. Check the fore pump.
	7	Is the oil level within the level lines?	Oil level is below the level line.	Check for oil flow into the pump casing. Replenish oil.
	8	Is the oil clear? Oil viscosity increased?	Oil is opaque and like thick syrup.	Change oil.



Trouble symptom	Check item		Criteria	Corrective action
Pressure does not lower.	1	Is motor rotating direction normal?	Reverse rotation.	Check power cable and connecting terminals.
	2	Is the ultimate pressure of fore pump normal?	Pressure is above the prescribed value.	Change the fore pump oil.
	3	Is there any leak in system and piping?	In normal operation.	Leak test of piping.
	4	Is the oil clean?	Oil color is opaque and whitish (turbid).	Change oil.
	5	Casing inside and/or the Rotor surface is dirty / wet.	There are attached substances, or wet.	Overhaul (Cleaning, clearance adjustment)
Abnormal sound	1	Is the oil level within the level lines?	Oil level is below the level line.	Replenish oil.
	2	Any sound (clattering) synchronized with rotating speed?	Clattering is heard.	Disassemble and repair the pump. (Re-adjust timing.)
	3	Is roaring machine noise always heard?	Roaring noise is heard.	Disassemble and repair the pump. (Replace bearing and gear.)
Abnormal heating	1	Is cooling water flowing?	Flow rate is below the prescribed value.	Check cooling water piping.
	2	Is the operating pressure normal?	Pressure is above the maximum pumping pressure.	Check pressure on intake and exhaust sides. Check the fore pump.
	3	Is discharge pressure normal?	Discharge pressure is above the specified value.	Check the fore pump.
	4	Is rotor rotation resisted?	Rotors do not rotate by inertia.	Overhaul.

## 7. Removal / transport

### 7.1 Operation procedure

- (1) Stop the Pump operation and replace the gas completely with the nitrogen gas (to be required only in the case used any special gas).
- (2) Shut the electricity supply and remove the cable connection.
- (3) Remove the Cooling water piping.
- (4) Take off the Drain plug on the Gear cover and discharge the lubrication oil. Transport keeping the oil inside might cause the oil flow back in the casing if tilted the unit.
- (5) Remove the Suction/exhaust piping and put Blind flanges to the Pump inlet and outlet to seal them up.



**You should replace with the nitrogen gas completely the Pump that exhausted any special gas.**

**Note further that only the entitled person for special gas handling should be in charge of the removal work.**

**Keep applying a plate displaying the name of exhausted gas on a place easily seen on the Pump.**



**You have a risk of giving damage to your back as the load larger than safety standard shall be required to transfer the product.**

**Be sure to use the loading machinery (such as mobile crane) to lift up the Pump or load it on the pallet and fix it with Jack and run the Pallet truck for its transfer.**

**Never try to enter beneath the Pump unit when lifted it up.**

**Use the accessory eyebolt to load/unload the unit.**

**Do not put the folk of the Fork lift or the like in the Pump bottom (exhaust outlet) to lift it.**

## 8. Disposal

Make sure to keep in compliance with the laws and regulations established by the local governments to dispose the Vacuum pump. You should ask the dedicated disposal agency for the disposal particularly if the Pump has exhausted any toxic gas.

Note that you are requested to bear the cost and charges relating to the disposal.



**You should ask a special disposal agency for the disposal particularly if the Pump has exhausted any toxic gas hazardous to the human body. The Pump oil as well as the Pump unit gets hazardous.**

**Dispose the vacuum pump oil following the description of the [Caution on disposal] in the Chemical Material Safety Data Sheet. Contact our Sales division as for the SDS.**

## 9. Warranty Clauses

This product was shipped after rigid company inspection. However, in case any failure occurs under ULVAC's responsibility, such as defect in manufacturing and damage during transportation, Buyer shall inform ULVAC, Inc. or the local ULVAC representatives. ULVAC will repair or exchange it at free of charge.

### 9.1 Warrantable Items

- (1) MECHANICAL BOOSTER PUMP  
PRC-003A, PRC-006A, PRC-012A , PRC-018A

### 9.2 Duration of guarantee

- (1) Domestic business in Japan: one year after shipping date from ULVAC.
- (2) Direct export transaction: one year after date of B/L

### 9.3 Warrantee scope

- (1) Domestic business in Japan:
  - Product, which has damage, caused by a failure on delivery.
  - Products not satisfying the standard specifications although the product is used under the service conditions described in this document such as temperature range and power etc.
- (2) Direct export transaction:
  - Product, which has damage, caused by a failure on delivery.  
The warrantee scope shall confirm to INCOTERMS2000.
  - Products not satisfying the standard specifications although the product is used under the service conditions described in this document such as temperature range and power etc.

### 9.4 Response procedure

- (1) Domestic business in Japan:  
ULVAC send a replacement or Buyer return the defective items to ULVAC, Inc. or to the local ULVAC representatives for repair. If field service is required, Buyer shall ask ULVAC, Inc. or the local ULVAC representatives.
- (2) Direct export transaction:  
ULVAC send a replacement or Buyer return the defective items to ULVAC, Inc. or to the local ULVAC representatives for repair. Return charge shall be paid by Buyer.

## 9.5 Disclaimer

- (1) Failure occurred after expiration of warranty period
- (2) Failure caused by force majeure, such as fire, storm and flood damage, earthquake, lightning strike, war etc.
- (3) Failure occurred due to carelessness handling or faulty usage.
- (4) Products remodeled, disassembled or repaired without ULVAC's acceptance
- (5) Failure occurred under abnormal environment, such as intense electromagnetic field, radiation, high-temperature, high-humidity, flammable gases, corrosive gases, dust etc.
- (6) Failure occurred by noise.
- (7) Product deficiency or secondary damnification occurred to Buyer.
- (8) Product deficiency or secondary damnification occurred to Buyer, from law suit to ULVAC by third party for patent infringement.
- (9) The reason of the failure deemed below the specified usage condition by ULVAC technical staff.
- (10) Consumable parts (refer to "10. Main Displacement Parts")

## 9.6 Others

- (1) In case, special agreement or memorandum for specifications is made individually.
- (2) Buyer shall inform ULVAC when this product is exported out of Japan. In the meantime, Buyer shall take necessary procedures according to Foreign Exchange and Foreign Trade Law.
- (3) As for the question and consultation, Buyer shall check the model and serial number and ask the local representative or ULVAC, Inc.  
<http://www.ulvac.co.jp/eng/support/index.html>
- (4) The contents of this document is subject to change without notice in future.

## 10. Main Displacement Parts

Table. 13 PRC-003A Main displacement parts list

No.	Description	Specification	Material	Q'ty	Location
1	Teflon seal	VCF30405	Special rubber	4	Side cover
2	Ball bearing	6205-P5	SUJ	4	Bearing case
3	Coupling spider	Hs76 for M-74	FPM	1	Motor coupling section
4	O-ring	AS568-268	FPM	4	Casing, side cover
5	O-ring	V100	FPM	1	Intake port
6	O-ring	S12	FPM	5	Communicating port
7	O-ring	S22	FPM	4	Rotor shaft
8	O-ring	P32	FPM	1	Separate exhaust port
9	O-ring	P18	FPM	2	Seal plug
10	O-ring	P9	FPM	1	Separate exhaust plug
11	O-ring	G70	FPM	1	Level gauge
12	O-ring	G130	FPM		Motor flange
13	Motor maintenance kit	For CAND motor 0.75 kW	FPM	1 set	Motor
14	Pump oil ※1	ULVOIL R-42	Mineral oil	0.9 L	
15	Power lock	PL022X026E	Special steel	2	Gear

※1. After confirming oil kind plaque of a real machine when you exchange oil, Please go.

**Table. 14 PRC-006A Main displacement parts list**

No.	Description	Specification	Material	Q'ty	Location
1	Teflon seal	VCF36506	Special rubber	4	Side cover
2	Ball bearing	6206-P5	SUJ	4	Bearing case
3	Coupling spider	Hs76 for M-74	FPM	1	Motor coupling section
4	O-ring	AS568-276	FPM	4	Casing, side cover
5	O-ring	V100	FPM	1	Intake port
6	O-ring	S12	FPM	5	Communicating port
7	O-ring	S26	FPM	4	Rotor shaft
8	O-ring	P32	FPM	1	Separate exhaust port
9	O-ring	P18	FPM	2	Seal plug
10	O-ring	P9	FPM	1	Separate exhaust plug
11	O-ring	G70	FPM	1	Level gauge
12	O-ring	G130	FPM		Motor flange
13	Motor maintenance kit	For CAND motor 2.2 kW		1 set	Motor
14	Pump oil ※1	ULVOIL R-42	Mineral oil	1.5 L	
15	Power lock	PL030X035E	Special steel	4	Gear

※1. After confirming oil kind plaque of a real machine when you exchange oil, Please go.

**Table. 15 PRC-012A Main displacement parts list**

No.	Description	Specification	Material	Q'ty	Location
1	Teflon seal	VCF44607	Special rubber	4	Side cover
2	Ball bearing	6207-P5	SUJ	4	Bearing case
3	Coupling spider	Hs76 for M-84	FPM	1	Motor coupling section
4	O-ring	AS568-278	FPM	4	Casing, side cover
5	O-ring	V120	FPM	1	Intake port
6	O-ring	P16	FPM	6	Communicating port
7	O-ring	S32	FPM	4	Rotor shaft
8	O-ring	P32	FPM	1	Separate exhaust port
9	O-ring	P18	FPM	2	Seal plug
10	O-ring	P9	FPM	1	Separate exhaust plug
11	O-ring	G70	FPM	1	Level gauge
12	O-ring	G160	FPM	1	Motor flange
13	Motor maintenance kit	For CAND motor 3.7 kW		1 set	Motor
14	Pump oil ※1	ULVOIL R-42	Mineral oil	1.9 L	
15	Power lock	PL030X035E	Special steel	4	Gear

※1. After confirming oil kind plaque of a real machine when you exchange oil, Please go.



**Table. 16 PRC-018A Main displacement parts list**

No.	Description	Specification	Material	Q'ty	Location
1	Teflon seal	VCF44607	Special rubber	4	Side cover
2	Ball bearing	6207-P5	SUJ	4	Bearing case
3	Coupling spider	Hs76 for M-90	FPM	1	Motor coupling section
4	O-ring	AS568-278	FPM	4	Casing, side cover
5	O-ring	V175	FPM	1	Intake port
6	O-ring	P16	FPM	6	Communicating port
7	O-ring	S32	FPM	4	Rotor shaft
8	O-ring	P32	FPM	1	Separate exhaust port
9	O-ring	P18	FPM	2	Seal plug
10	O-ring	P9	FPM	1	Separate exhaust plug
11	O-ring	G70	FPM	1	Level gauge
12	O-ring	G160	FPM	1	Motor flange
13	Motor maintenance kit	For CAND motor 5.5 kW		1 set	Motor
14	Pump oil ※1	ULVOIL R-42	Mineral oil	1.9 L	
15	Power lock	PL030X035E	Special steel	4	Gear

※1. After confirming oil kind plaque of a real machine when you exchange oil, Please go.



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					
	Pb	Hg	Cd	Cr <sup>6+</sup>	PBB	PBDE
Body	○	○	○	○	○	○

○: 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.

×: 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.

## ULVAC Components / Certificate of Decontamination

This is a certificate of decontamination for repair and inspection request of ULVAC Components. All material must be certified as decontaminated and this certificate must be submitted to your closest local ULVAC service center or sales office prior to shipment.

Please consult with your closest local ULVAC service center or sales office if our components are used with toxic gases or contaminated with reactive products or substances produced by reaction.

Product model:

Model:

Serial No.:

Application:

Remarks:

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Contaminant (Check an applicable box.)

- ☐ I guarantee that above returned item(s) is not contaminated with harmful substances.
- ☐ Above returned item(s) is contaminated with the following harmful substances.

	Name of contaminant (molecular formula)	Characteristics
1		
2		
3		
4		
5		

To: ULVAC

Attn:

Date:        /        /        (YYYY/MM/DD)

Your company

Division

Contact

Phone

Fax

E-mail

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Please pack returned item(s) carefully before shipment. Any accident occurred during transportation to us **and during disassembly** caused by contaminant is under your responsibility. It is also to be understood that ULVAC may decline to repair returned item(s) depending on the type of contaminant and degree of contamination, and return it to you.

To be filled in by ULVAC	Received by	
Request for SDS: Yes/No		
ULVAC job No.		

株式会社アルバック  
規格品事業部

<https://showcase.ulvac.co.jp/ja/>

製品情報・サービス拠点・お問い合わせはこちらから



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