ULVAC

MODEL

UR-Series
421/3601

TYPE
DRY VACUUM PUMP

INSTRUCTION MANUAL

Read this manual before using this pump and keep it hand for immediate reference.

Components Division,
ULVAC, Inc.

Before Use

This instruction manual provides methods for proper handling and maintenance of UR421/3601 products. This manual consists of specification, installation, operation and maintenance, and each of section includes important information with which potential hazards can be avoided. It is essential to understand these methods described in this manual concerning the Specification, Operation and Maintenance.

Before to use this device, you are expected to receive a general safety-training course regarded as effective by the government of your country. Also, personnel who will involve these products should have licensed concerning electricity, mechanics, cargo handling and vacuum.

This manual might change for the improvement, the specification change of the product, and the improvement of easiness to use.

When you have some ambiguities concerning the operation, please contact with your local ULVAC service center and ask for the matter. Refer to 5.3 Servicing.

For Safety Use

-Before to use these UR421/3601 series models, it is essential to understand what is described in this manual.

-Overhaul or repair work is performed at our service center. When any trouble occurs, please contact with your local service center (please refer to the ULVAC service center address list at the end of this manual).

- The interlock system and control system of the UR421/3601 series pumps are expected to be connected with the host equipment.

- The UR421/3601 series pumps are integrated into a host machine or are located close to the host machine (not more than 3m of travel to the next EMO button).

- Connect the power line of the UR421/3601 series with the EMO system of the host equipment.

- The gas, which can be exhausted with this UR421/3601 series pump, it provides for inert gas (Air, N2, Ar).

- Do not exhaust other gases (toxicity gas, combustion gas, corrosion gas, and explosiveness gas).

- The UR421/3601 series pumps are not made to withstand positive pressure. Operation goes positive pressure in the pump (positive-pressure gas suction, operation of the outlet port be closed), please do not absolutely. There is a risk of rupture.

- Set up this UR421/3601 series pump at ventilated room.

- These products are manufactured to conform with laws applied at the time of the preparation of this manual. When the applied laws are revised in the future, the legality of these products will not be ensured.

- If the host equipment of these products does not conform to the same laws, or if the products are modified, then the performance and safety of these products should not be insured. ULVAC should not have a responsibility in such a case.

- Personnel who have no record of formal safety training course regarded by your government (safety for electricity, cargo handling, etc) should not operate these products. Operator should have finished these-safety training course.

- Installation and operation of these products should be performed according to the applicable local safety codes and laws (e.g. firefighting law, electric installation code, etc).

- Before starting installation or removal work of these products, shut off all the energy sources (electricity, compressed air, cooling water, etc.).

- After long-term storage (if more than six months), this UR421/3601 series pumps must be overhauled before use. Even if this is not being used, elastomers (O-ring, Teflon seal) and vacuum pump oil degradation occurs. (Overhaul work is performed at our service center.)

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Safety Denotation

For this manual and for warning denotation of UR421/3601 series models, technical terms are defined according to the hazardous levels, with which workers should understand the rules to be followed.

- Articles attached with these denotations, describe countermeasures for potential hazards.

⚠ **DANGER** : Failure to comply with this instruction involves the possibility of impending death or serious personal injury.

⚠ **WARNING** : Failure to comply with this instruction involves the possibility of death or serious personal injury.

⚠ **CAUTION** : Failure to comply with this instruction involves the possibility of a medium degree of personal injury or serious damage to the equipment.

⚠ : Matter for which attention is necessary for using pump.

⚡ : Because this work has the danger of the electric shock, it is necessary to train the protection against electrical hazard.

♨ : Because this work has the danger of the burn, it is necessary to confirm the temperature of the pump has fallen.

Warning Label

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		**・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.** **・Be sure to close the lid of the terminal box before operating this unit. Never open it during operation.**
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.**
4		**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.** **Indoor Use Only**
5		**・ There is a serious risk of injury due to suction.** **・ Sufficient purging gas system** **・ Wear appropriate protective equipment and clothing**

UR421-T

UR3601 -TT
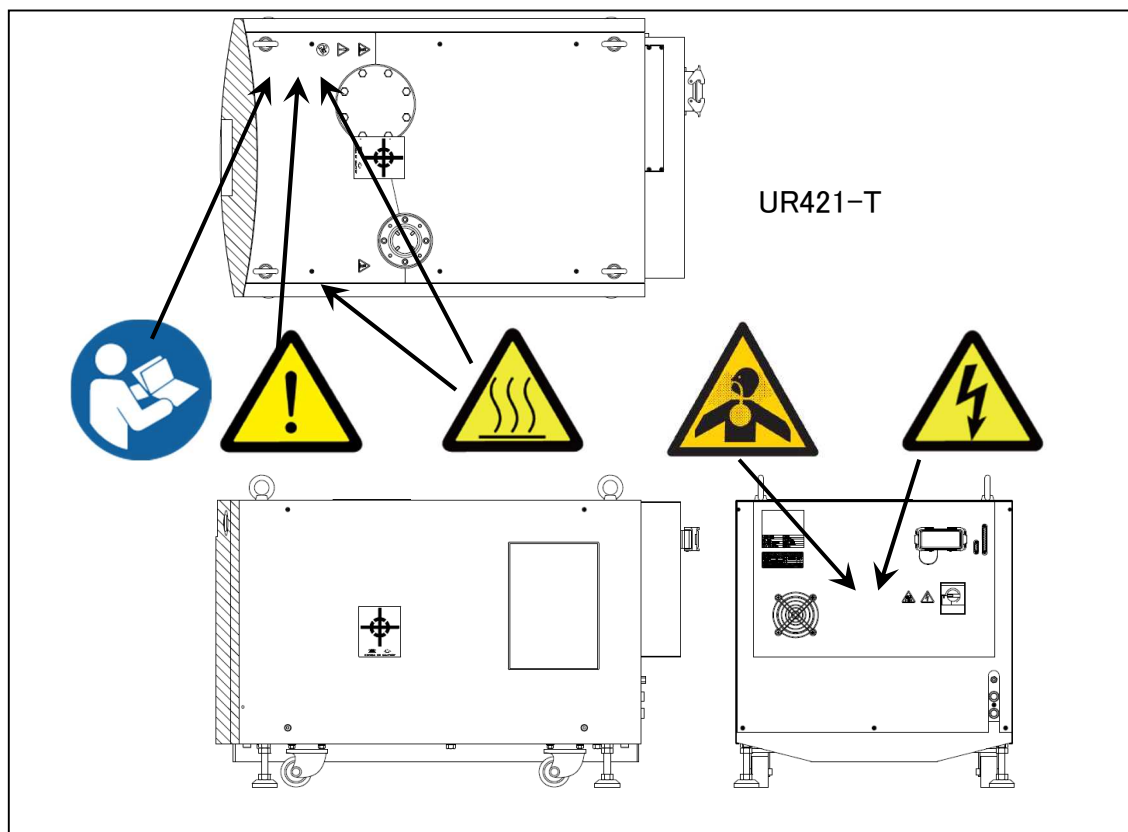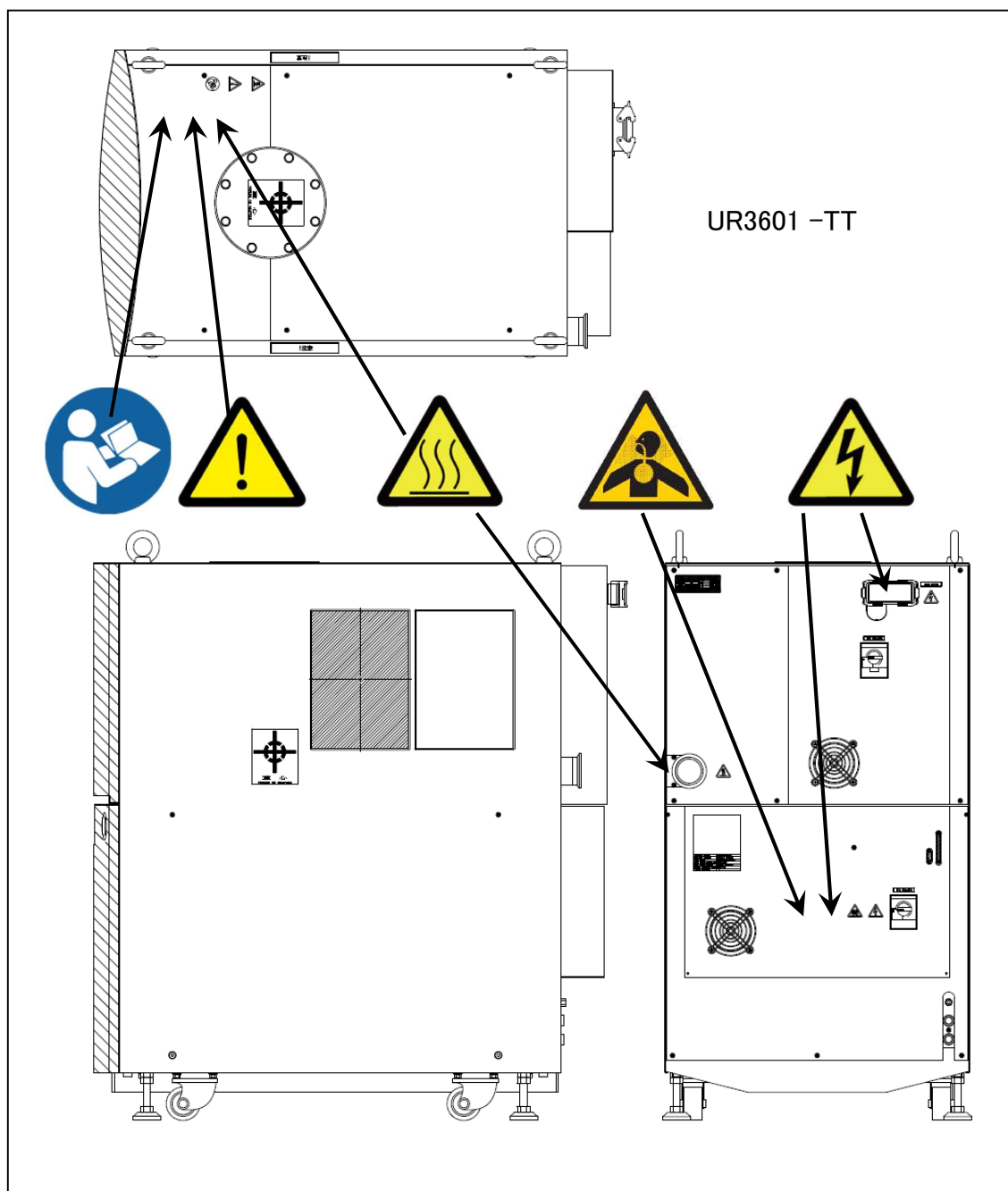
The method for the evasion of danger according to the work item is shown.
And the dangerous action, which should not be done, is shown.

Installation and Storage Requirements

⚠ **DANGER**
● When taking out the pump from wood frame, or lift it, instruct workers that the product should be hung by a crane at the pump top hook, then move it. ● Please do not use a forklift to lift up the product. This could drop or topple the pump. ● Only licensed worker can perform cargo handling or operate the lording machines.
⚠ **WARNING**
● This product is packed in the wooden crate. Please request dismantlement to a special trader. ● Please guide equipment with the glove made of the skin, and the use of an appropriate dismantlement tool to those who dismantle it. ● When handling is performed improperly or unpack tools are improperly maintained, there will be possibilities of falling down or topple of the pump, so no person should be underside of the pump.

Transit

⚠ **DANGER**
● Pallet truck and forklift should not directly be placed under the pump base bottom. This could drop or topple the pump.
⚠ **WARNING**
● Although this pump is provided with casters, do not move it a long distance using these casters. ● If you move this pump in such a way, the load exceeds the safety criterion. You could hurt your waist.

Earthquake Resistant Measures

⚠ **WARNING**
● To provide earthquake resistance, the pump should be tightly fixed according to the diagram below. If it is loosely installed, then the pump could topple or move and will produce damages for peripheral devices. ● Piping for vacuum, cooling water, nitrogen, and wiring, should be constructed so that they can absorb vibration and should not produce damages on piping or run off within defined vibration level.

Piping for inlet-outlet ports ＜Installation＞

⚠ **WARNING**
● Before start work, ensure that all hazardous energies are shut off. Refer to **2.1 For Safety Use**.

Nitrogen Gas Piping ＜Installation＞

⚠ **WARNING**
● Before start work, ensure that all hazardous energies are shut off. Refer to **2.1 For Safety Use**. ● Use the supplied nuts and ferrule for piping work.

Cooling Water Piping ＜Installation＞

⚠ WARNING
● Before start work, ensure that all hazardous energies are shut off. Refer to **2.1 For Safety Use**.

Power wiring ＜Installation＞

⚠ DANGER
● Before start work, ensure that all hazardous energies are shut off. Refer to **2.1 For Safety Use**. ● Wiring work should be performed by licensed workers. ● Use the supplied connectors only. If other connectors are used, the first ground contact may fail, and raise the possibility of electrical shocks.

Stop

⚠ WARNING
● The pump is very hot during operation and for some time after it stops. Contact with it may cause burn. Feed cooling water for about one hour after the pump is shut down. Never remove the external panel until the pump cools down. ● Contact with electric parts, wiring or others in the panel may cause electric shock. Never run the pump with the external panel removed. ● Suction and the exhaust pipe are 70℃ or more. Remove them after about one hour after the pump is shut down.

Power wiring ＜Detaching＞

⚠ DANGER
● There is danger of the electric shock when the breaker (UR421 series: MCB1 / UR3601 series: MCB1 and MCB2) is turning on (SEMI S2-0200 type4). Please cut off the power supply surely before it detaches it.

Cooling water ＜Detaching＞

⚠ WARNING
● Because cooling water in the pump boils when the collaboration of cooling water is removed immediately after the stop of the pump and pressure rises the sensor and piping might be damaged. Please supply cooling water until the temperature of the pump falls. ● The pump is very hot during operation and for some time after it stops. Contact with it may cause burn. Feed cooling water for about one hour after the pump shut down. ● Close the cooling water supply valve (HWSV). After the valve is closed, tag 「CLOSE」 sign on the grip. ● Through visual flow gauge (HWFM: e.g. flow sight) on the host equipment ensure that flow is shutoff.

Nitrogen Gas ＜Detaching＞

⚠ WARNING
● Close the nitrogen gas supply valve (HPSV) on the host equipment. After the valve is closed, tag 「CLOSE」 sign on the grip. ● Gas will still remain in the host equipment piping. Place pressure gauge on the host equipment nitrogen supply source (halfway of the piping to the pump), and ensure that the pressure has already down within atmospheric pressure.

Piping for inlet and outlet ports ＜Detaching＞

⚠ WARNING
● Remove the piping according to the manual provided for the host equipment. ● Suction and exhaust pipe is very hot for some time after pump stop. Remove them after about one hour after the pump is shut down. ● Completely close the inlet and outlet ports with using closing flange.

Shipping

⚠ DANGER
● Pallet truck and forklift should not directly be placed under the pump base bottom. This could drop or topple the pump.

⚠ WARNING
● Although this pump is provided with casters, do not move it a long distance using these casters. ● If you move this pump in such a way, the load to move the pump exceeds the safety criterion. You could hurt your waist.

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1. Specification

Design concept

This UR421/3601 series models are designed to perform vacuum pumping for electronic devices (such as semiconductor and LCD) manufacturing equipment. Consequently, the interlocking system and control system of this UR421/3601 series are assumed to be built-in to the host equipment.

UR421/3601 series can be used generally in the following processes:
- Chamber vacuum pumping in spattering or vapor deposit processes in which only inert gases (nitrogen or argon) are used.
- Vacuum pumping for chambers where devices are set or taking out (air pumping).
- Other general vacuum pumping (gases no toxicity, no inflammable, no corrosive and no explosive).

Performance and Configuration

UR421/3601 series have a performance of vacuum pumping in pressure regions from atmospheric pressure through medium vacuum pressure (UR421 series: about 5.0Pa / UR3601 series: about 0.67Pa).

UR3601 are a composition in which the mechanical booster pump is added to the upside of primary pump.

As for this manual, important information to use these products safely has been described. **Please read before it uses it.**

UR421-T

UR3601-TT
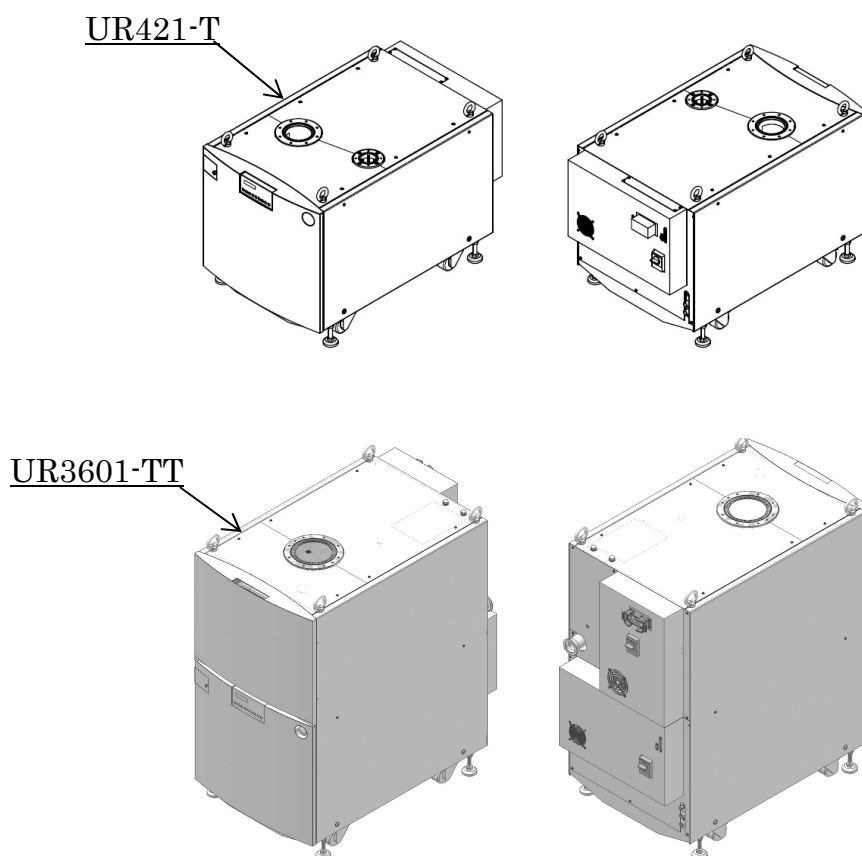
1.1 Overall Configuration

1.1.1 Pump Structure

As for a primary pump, the root rotor of six pairs queues up in the series. Casing space is gradually reduced toward the outlet. The booster pump is composed of the root rotor of big capacity by one stage.

The two rotors are positioned with a small allowance gap and rotate in opposite directions without contact with each other. Gases is introduced from the top of casing and pass through toward the bottom of it, then spew out from the outlet port.

The aluminum alloy casting is used for the main parts, which compose the pump. Canned motor is used to drive the rotors. This can eliminate the shaft seal construction, this improved the reliability of the device.
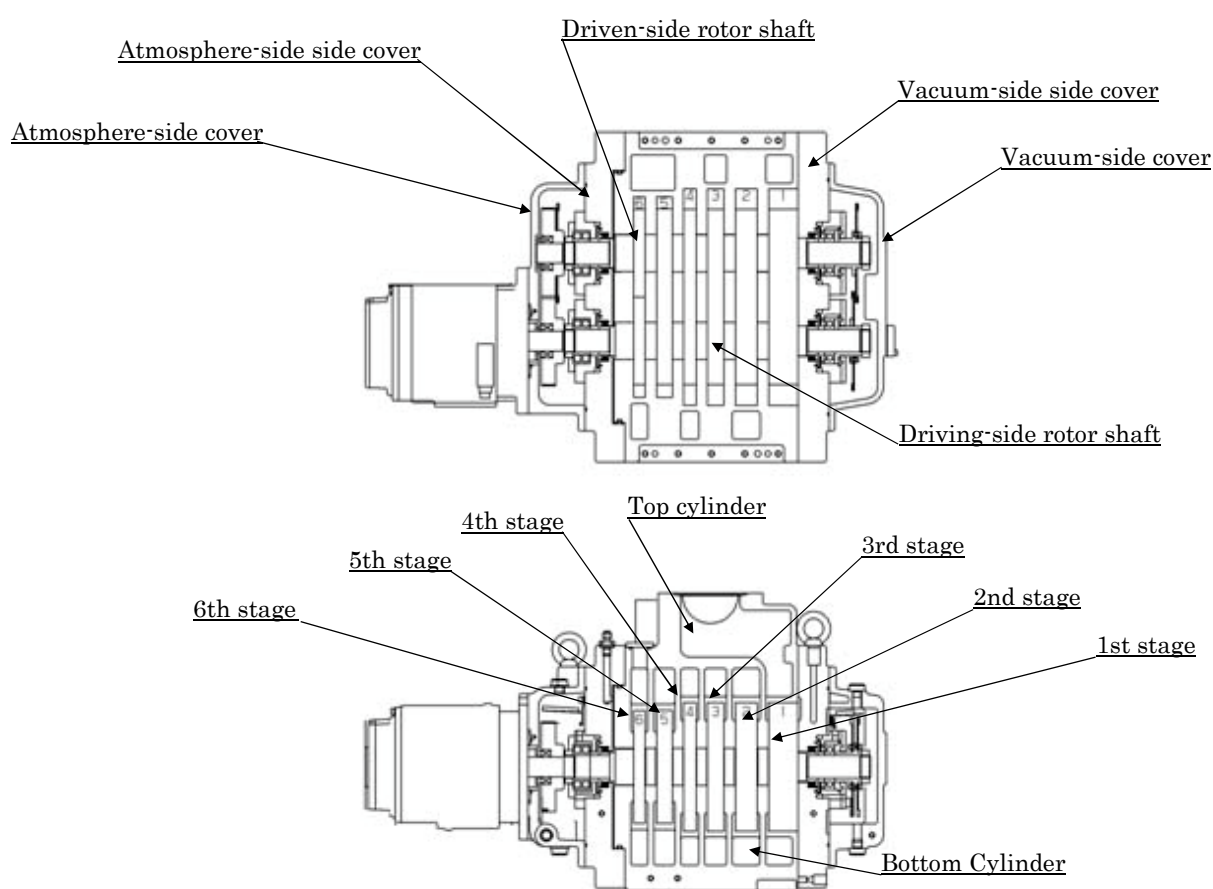
Aluminum surface treatment

	UR421-T	UR3601-TT
primary pump	Yes	Yes
Mechanical booster pump	---	Yes

The pump is completely clad with panels.The main body of the pump and electrical equipment, the sensor, the N2 adjustment equipment, and the cooling water piping, etc. which drive it are laid out in the package.

UR421-T

Inverter Area

Controler:PCTL

STOP SWITCH

Primary Pump Area

Control Box Area

UR3601-TT

Inverter Aria

Booster Pump Aria

Controller:PCTL

STOP SWITCH

Primary Pump Aria

Control Box Aria
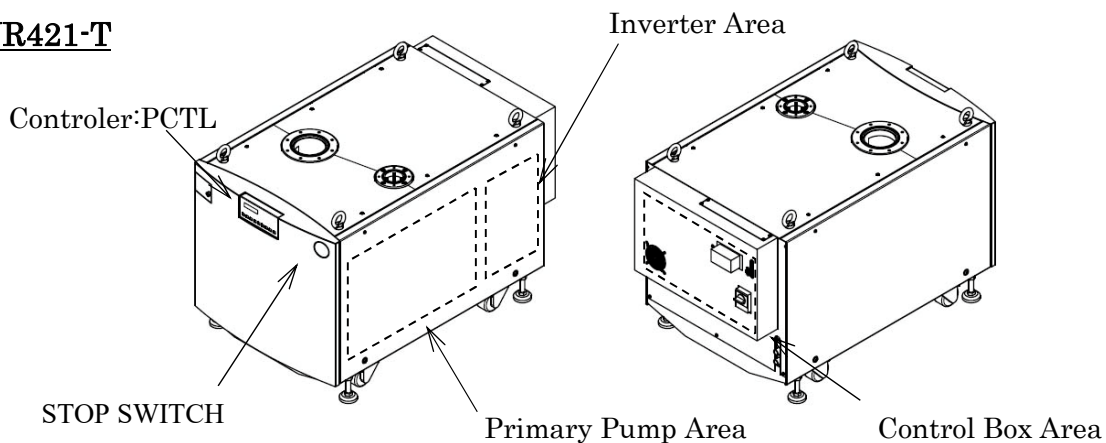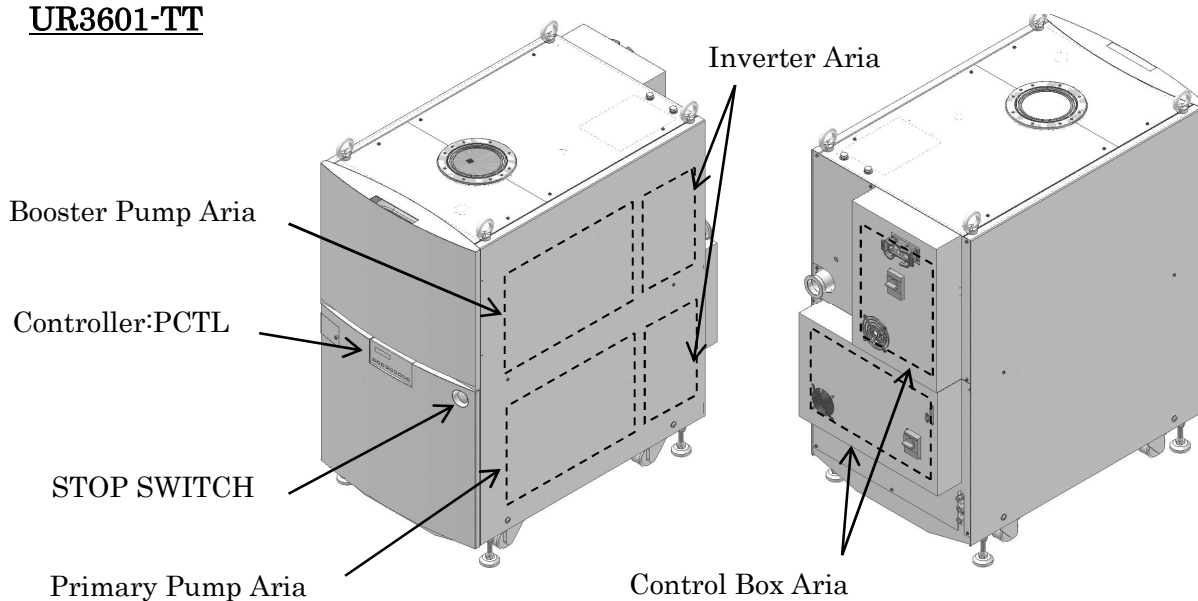
1.1.2 System Flow

N2, cooling water and power supply is required.

Nitrogen gas system
Nitrogen gas flows in two lines in the pump, one for the shaft seal and the other for gas ballast (attenuation).

The shaft seal prevents lubricating oil from entering the pump casing.
Gas ballast gas is fed to the pump casing to reduce corrosion by corrosive gas and accumulation of reactive products, or to reduce liquefaction during the compression and pressurization process of the pump after sucking the condensable gas. If you do not exhaust these gases, you do not need to run gas ballast gas.

Cooling water system
Cooling water flows from the cooling water inlet port to the flow meter, motor, pump body, and cooling water outlet port in that order to cool the pump.

UR421-T

N2 purge gas introduction port
SUS304 φ9.52 tube fitting male connecter
Proper supply pressure   : 0.1－0.5MPaG
Set pressure   : 0.05- 0.12MPaG
(Gauge pressure)
Range of set flowing quantity : 5 - 200SLM

Outlet port : VG50
Proper exhaust pressure : 0.10MPa＞
Exhaust pressure limit   : 0.12MPa
(Absolute pressure)

Cooling water port : Rc3/8
The maximum supply pressure   : 0.5MPaG
Minimum In/out difference pressure : 0.2MPaG
(Gauge pressure)
Proper water temperature   : 10－30℃
Proper flowing quantity   : 5.0L/min

UR3601-TT

N2 purge gas introduction port
SUS304 φ9.52 tube fitting male connecter
Proper supply pressure   : 0.1－0.5MPaG
Set pressure   : 0.05－0.12MPaG
(Gauge pressure)
Range of set flowing quantity : 5－200SLM

Outlet port
NW50
Proper exhaust pressure : 0.10MPa＞
Exhaust pressure limit   : 0.12MPa
(Absolute pressure)

RG1   PG1   DFM1   NV1   SV2

SV1   OR1

Inlet port

Seal gas line

Gas ballast line

CV1

WFM   Cooling water line

Cooling water port : Rc3/8
The maximum supply pressure   : 0.5MPaG
Minimum In/out difference pressure   : 0.2MPaG
(Gauge pressure)
Proper water temperature   : 10－30℃
Proper flowing quantity   : 4.0L/min＜
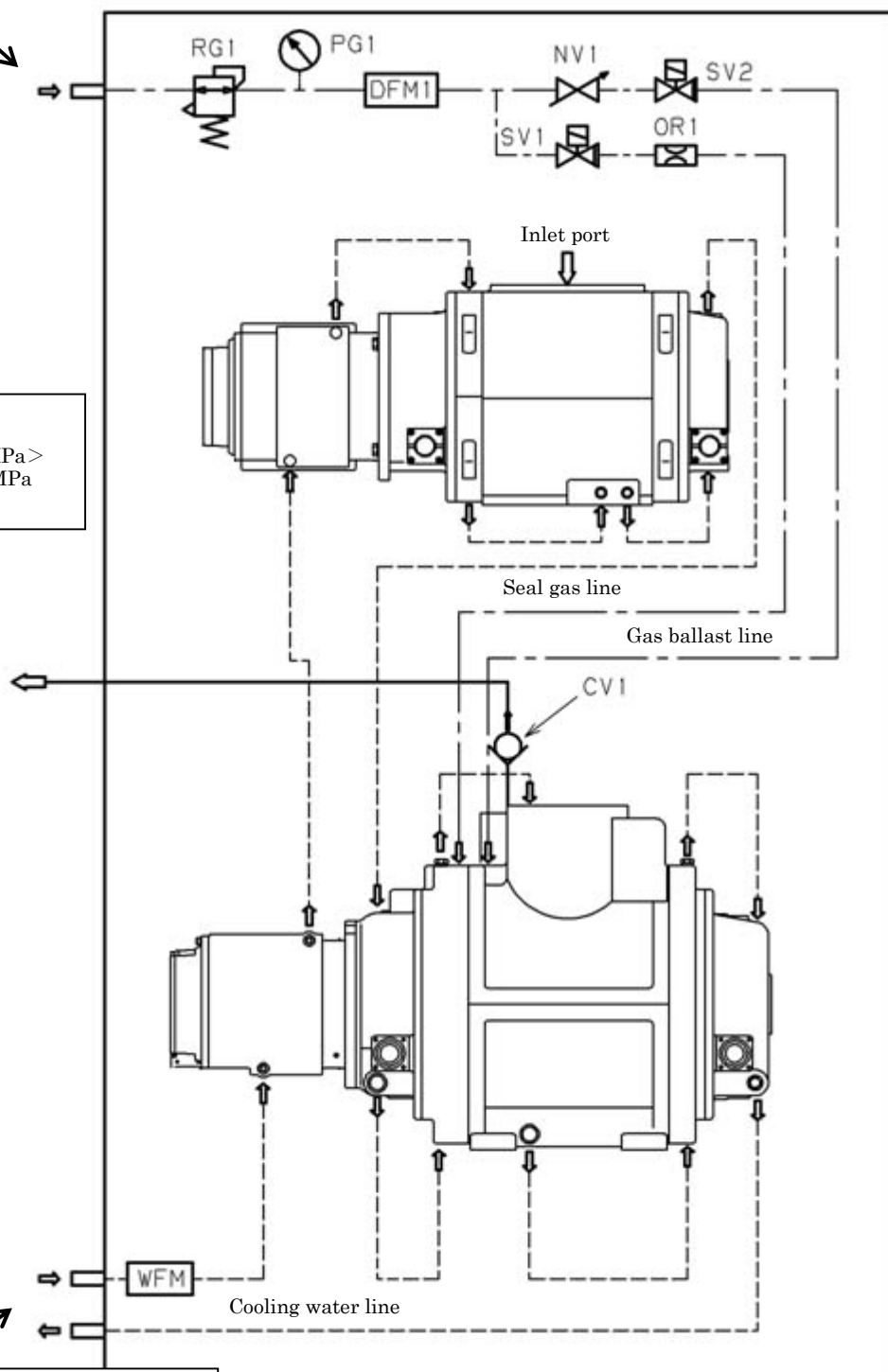
Electrical system has two lines of power line and control line.

A sensor is mounted in the system, which is constantly monitoring operation.

When the sensor detected abnormal situation, it will activates buzzer, LED and remote control to output warning signal.

You can operate the pump using pendant controller for local operation (LOCAL), or using electric signal through the remote controller for remote control (LEMOTE).

Electrical system
・ **Power line**   Wiring is arranged from the power connector to the motor through the breaker (with thermal relay), allowing the motor to be protected by the pump alone.
・ **Control line**   The pump monitors the cooling water flow rate, nitrogen gas flow rate, electric power value, and pump temperature at all times and gives alarm in two steps if any trouble occurs.
・ **When WARNING is displayed**   In case of WARNING alarm, pump operation is continued.   If the pump is stopped when the WARNING alarm is given, the alarm is held. The alarm can be reset by pressing the RESET switch. (The buzzer sound can be stopped with the BZ MUTE switch.)
・ **When ALARM is displayed**   If the cause of WARNING alarm is not eliminated, the pump will be shut down automatically. The ALARM is held even when the pump is shut down. The alarm can be reset with the RESET switch. (The buzzer sound can be stopped with the BZ MUTE switch).

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1.2 Specifications for utilities

Specification

Spec \ Model	UR421-T
Maximum pumping speed (m3/hr)	410
Maximum inlet pressure	Atmospheric pressure
Ultimate pressure (Pa)	5.0 [2]
Maximum exhaust pressure	Atmospheric pressure
Inlet diameter	VG100
Outlet diameter	VG50
Maximum amount of gas exhaust (m3/hr)	250
Lubricating oil	BARRIERTA J100F(E)
	2.5L
Weight (kg)	415

Spec \ Model		UR3601-TT
Booster Pump		PRC-036C-T
Primary Pump		UR421-T
Maximum pumping speed (m3/hr)		2700
Maximum inlet pressure (Pa)		5.0 [1]
Ultimate pressure (Pa)		0.67 [2]
Maximum exhaust pressure		Atmospheric pressure
Inlet diameter		VG150
Outlet diameter		NW50
Maximum amount of gas exhaust (m3/hr)		330
Lubricating oil	MBP	BARRIERTA J100F(E)
		1.1L
	DRP	BARRIERTA J100F(E)
		2.5L
Weight (kg)		720
Sound Level (dB(A)) [3] [4] [5]		69
Vibration (m/s2) [3] [4] [5]		6.7

1) Please do not drive continuously in the inhalation pressure of 200Pa or more. The temperature might work and the surpassing interlock work the upper bound.
2) The ultimate pressure is a value when the seal gas is 5SLM and the gas ballast gas is 0SLM.
3) When the suction pressure is Ultimate pressure.
   (The seal gas is 5SLM and the gas ballast gas is 0SLM and with silencer.)
4) Sound Level: 1m in the direction of A from the front of the pump and the height of 1m from the floor. Vibration: On the inlet flange.
5) Sound Level and Vibration are references, which are affected by the installation conditions, the suction pressure.

Utility Requirements

Model			UR421-T
Power			3 phase:200-240VAC, 50/60Hz
Current	At max. load (A)	200V	52.5
		220V	47.7
		230V	45.7
		240V	43.8
Cooling water	The maximum supply pressure (MPaG)		0.5
	Minimum In/out difference pressure (MPaG)		0.2
	Flow rate (L/min)		5.0
	Supply water temperature (°C)		10 ~ 30 [2]
Purge gas	Supply pressure (MPaG)		0.1 ~ 0.5
	Regulated pressure (MPaG)		0.05 ~ 0.12
	Flow rate	Shaft seal (SLM)	5.0 [3]
		Gas ballast (SLM)	~ 195 [4]

Model			UR3601-TT
Power			3 phase:200-240VAC, 50/60Hz
Current	At max. load (A) [1]	200V	68.3
		220V	62.1
		230V	59.4
		240V	56.9
	At ultimate pressure (A)	200V	39.8
		220V	36.2
		230V	34.6
		240V	33.2
Cooling water	The maximum supply pressure (MPaG)		0.5
	Minimum In/out difference pressure (MPaG)		0.2
	Flow rate (L/min)		5.0
	Supply water temperature (°C)		10 ~ 30 [2]
Purge gas	Supply pressure (MPaG)		0.1 ~ 0.5
	Regulated pressure (MPaG)		0.05 ~ 0.12
	Flow rate	Shaft seal (SLM)	5.0 [3]
		Gas ballast (SLM)	~ 195 [4]

1) The current at the maximum load of UR3601-TT has described the maximum current in the use-pressure range (Ultimate pressure to 200 Pa).

2) Not condensing.

3) The flow rate of shaft seal gas is 5SLM fixation.

4) UR421/3601 is a setting to which the seal gas and the gas ballast gas are thrown by the standard. Set the gas flow of the gas ballast according to the process used when the pump starts. Adjust it with the gas ballast gas adjustment valve of the front panel. Might it fall below the lower bound of the purge gas if the gas ballast gas is not thrown, and interlock work.

Chemical matters used in this pump

Primary pump
   Pump oil： BARRIERTA J100F(E)
Mechanical Booster pump
   Pump oil： BARRIERTA J100F(E)

Above oils are used for bearing lubrication. UR421/3601 series requires no oil supply for maintenance. We will replace the oil at the time of in-house overhaul. The reclaimed oil is legally dumped by qualified traders.
These oils are chemically stable, but when it is heated (burned), it will generate toxic gases. Do not burn these oils. The oils should be reclaimed and legally dumped by qualified traders.

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.

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1.3 Dimensional Drawings

UR421-T
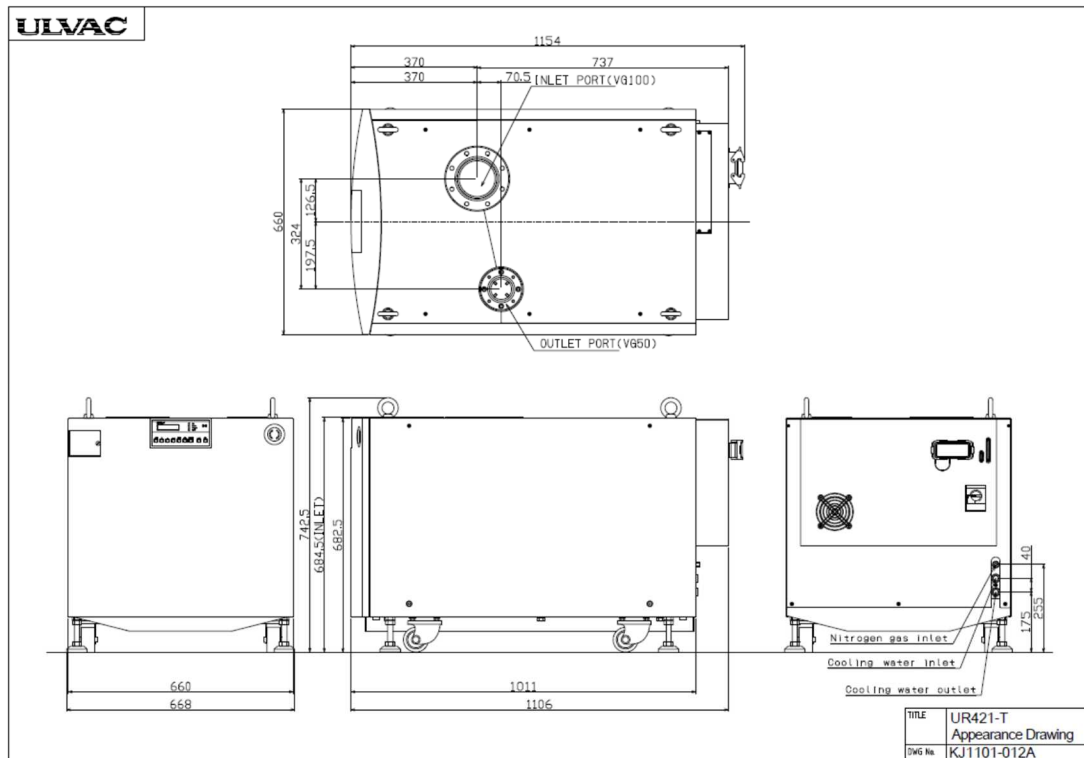
UR3601-TT
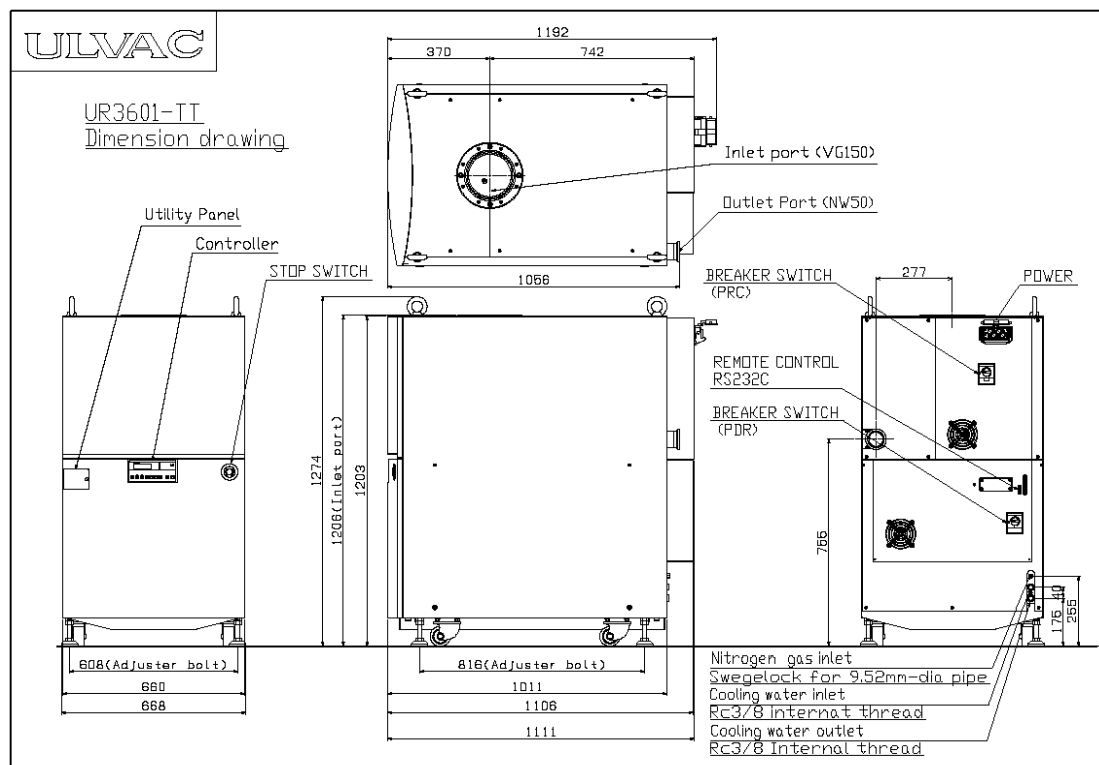
1.4 Description of Controller
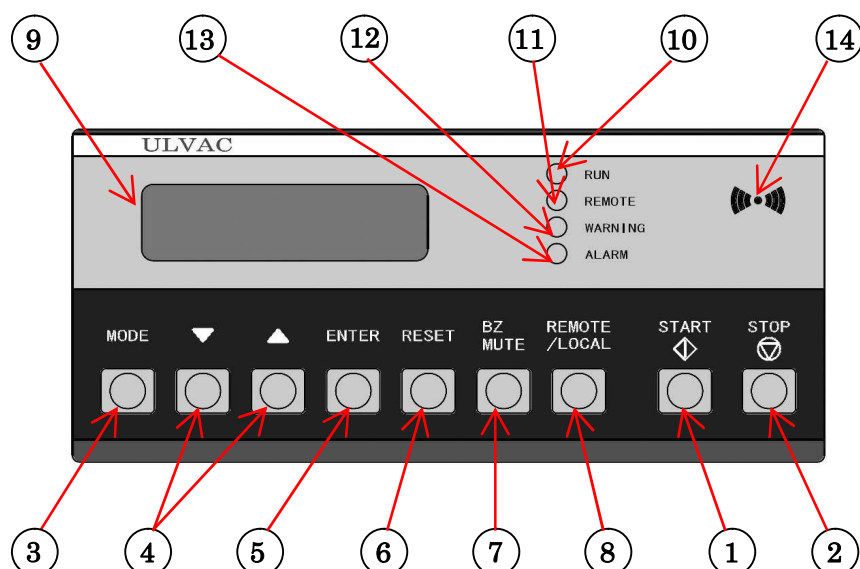
No.	Control	Sign	Function
1	START switch	START	Starts the pump.
2	STOP switch	STOP	Stops the pump.
3	MODE switch	MODE	Selects a setting item.
4	Input change switch	▽ △	Changes over the set value. Changes the selected content of setting.
5	ENTER switch	ENTER	Determines the selected item and setting.
6	RESET switch	RESET	Resets the alarm.
7	BZ MUTE switch	BZ MUTE	Stops buzzer sound.
8	REMOTE/LOCAL switch	REMOTE / LOCAL	Changes over the REMOTE/LOCAL mode.
9	Display	LCD	Displays the current status with characters.
10	RUN lamp	LED1 (green)	The lamp lights when the pump starts.
11	REMOTE lamp	LED2 (green)	The lamp lights when the pump is running in the REMOTE mode.
12	WARNING lamp	LED3 (orange)	The lamp lights when WARNING is given.
13	ALARM lamp	LED4 (red)	The lamp lights when ALARM is given.
14	Buzzer	BZ	The buzzer sounds in case of WARNING or ALARM.

When any trouble occurs, LED3 (orange : No12) and LED4 (red : No13) on the controller will light and warning buzzer sounds. Detailed information will be indicated on the LCD

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1.5 Utility Panel

UR421 series

⑩の内側
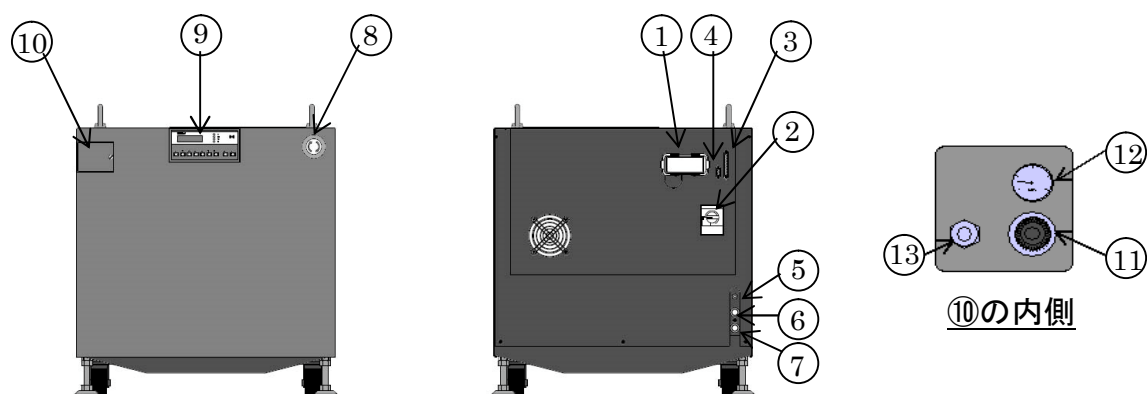
No.	Controls	Sign	Functions
1	POWER	CNI1	Input the power supply.
2	BREAKER SWITCH	MCB1	Turns ON/OFF the power.
3	REMOTE CONTROL	CNI2	Used for remote operation and signal input/output.
4	RS232C	CNI3	Used for connection with the computer.
5	N2 INLET	---	Nitrogen gas inlet port.
6	WATE INLET	---	Cooling water inlet port (Rc3/8).
7	WATER OUTLET	---	Cooling water outlet port (Rc3/8).
8	STOP SWITCH	---	Used for emergency stop of the pump.
9	CONTROLLER	PCTL	Used for operation of the pump.
10	CONTROL PANEL	---	Regulates nitrogen gas flow rate.
11	N2 PRESS. REGULATOR	RG1	Regulates the secondary pressure of nitrogen gas.
12	N2 PRESS. GAUGE	PG1	Displays the secondary pressure of nitrogen gas.
13	GAS BALLAST VALVE	NV1	Regulates the flow rate of gas ballast gas.

The figure indicates PCTL
can draw from UR421 series

約1m
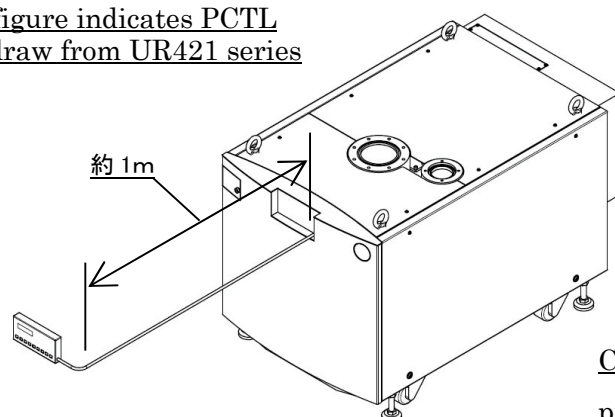
Cable of the controller (PCTL) can be
pulled out about 1m from the pump body.

UR3601 series
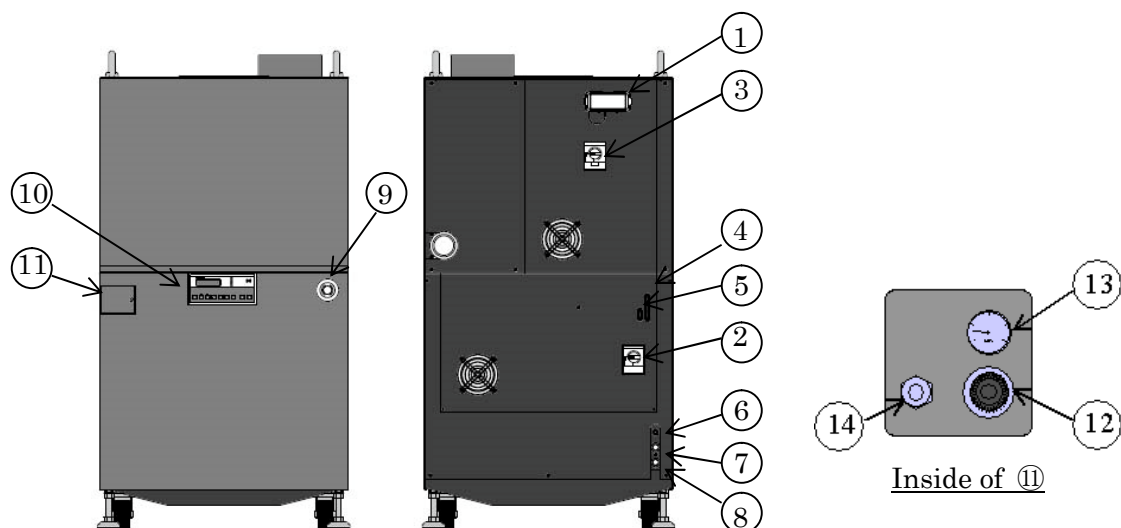
No	Controls	Sign	Functions
1	POWER	CNI1	Input the power supply.
2	BREAKER SWITCH(DRP)	MCB1	Turns ON/OFF the power.
3	BREAKER SWITCH(MBP)	MCB2	Turns ON/OFF the power.
4	REMOTE CONTROL	CNI2	Used for remote operation and signal input/output.
5	RS232C	CNI3	Used for connection with the computer.
6	N2 INLET	---	Nitrogen gas inlet port.
7	WATE INLET	---	Cooling water inlet port (Rc3/8).
8	WATER OUTLET	---	Cooling water outlet port (Rc3/8).
9	STOP SWITCH	---	Used for emergency stop of the pump.
10	CONTROLLER	PCTL	Used for operation of the pump.
11	CONTROL PANEL	---	Regulates nitrogen gas flow rate.
12	N2 PRESS. REGULATOR	RG1	Regulates the secondary pressure of nitrogen gas.
13	N2 PRESS. GAUGE	PG1	Displays the secondary pressure of nitrogen gas.
14	GAS BALLAST VALVE	NV1	Regulates the flow rate of gas ballast gas.

The figure indicates PCTL
Can draw from UR3601 series
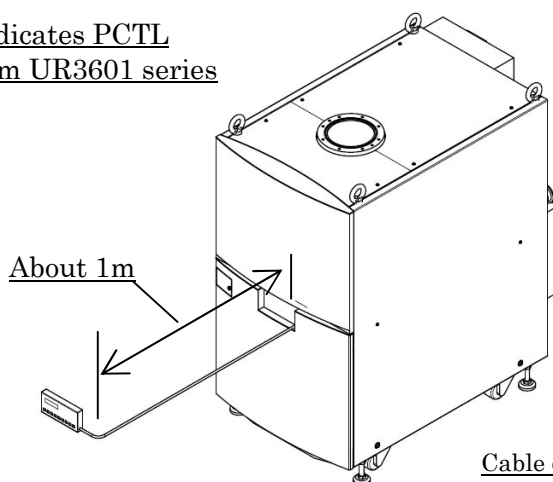
About 1m

Cable of the controller (PCTL) can be pulled out
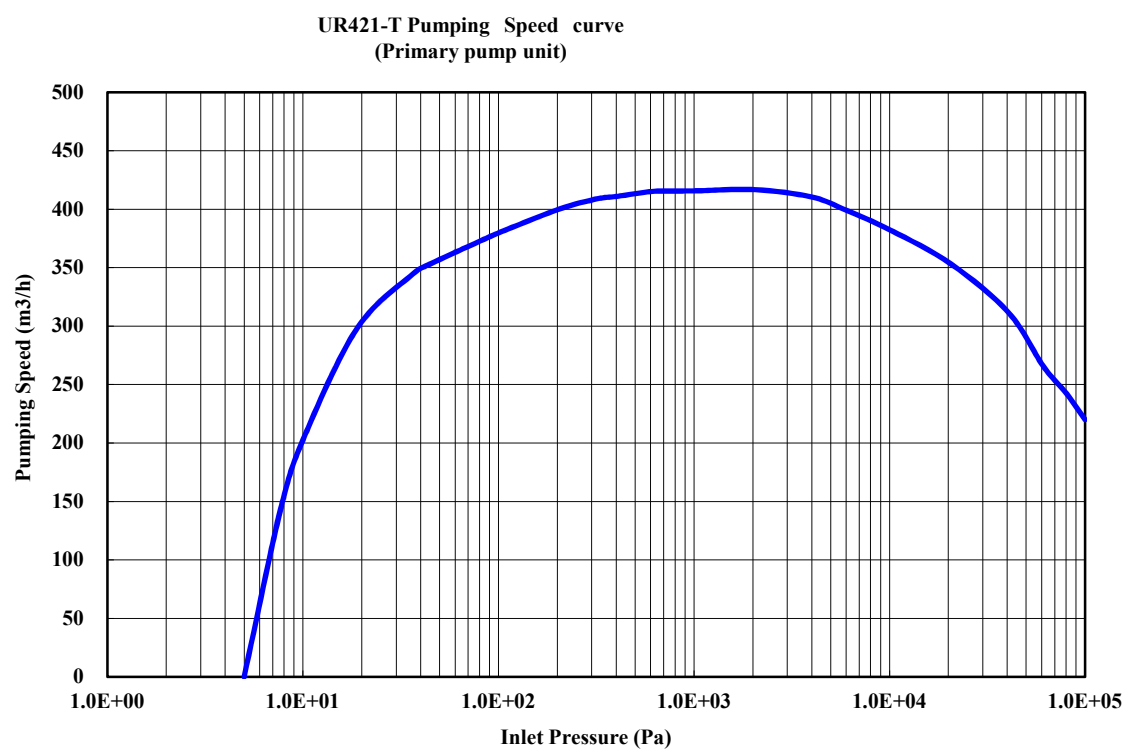
about 1m from the pump body.

1.6 Performance Curve

UR421-T

UR421-T Pumping Speed curve
(Primary pump unit)

UR3601-TT

Pumping Speed
(Booster pump unit)

Power-Pressure curve
(Booster pump unit)
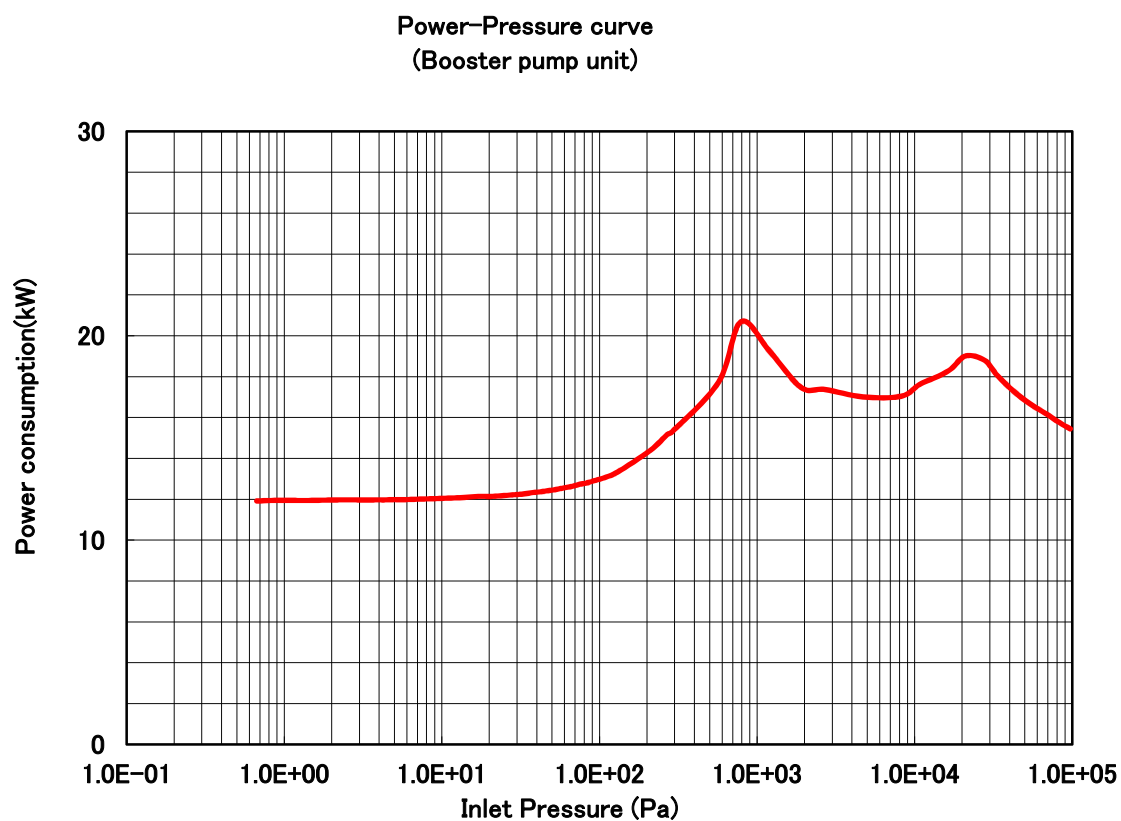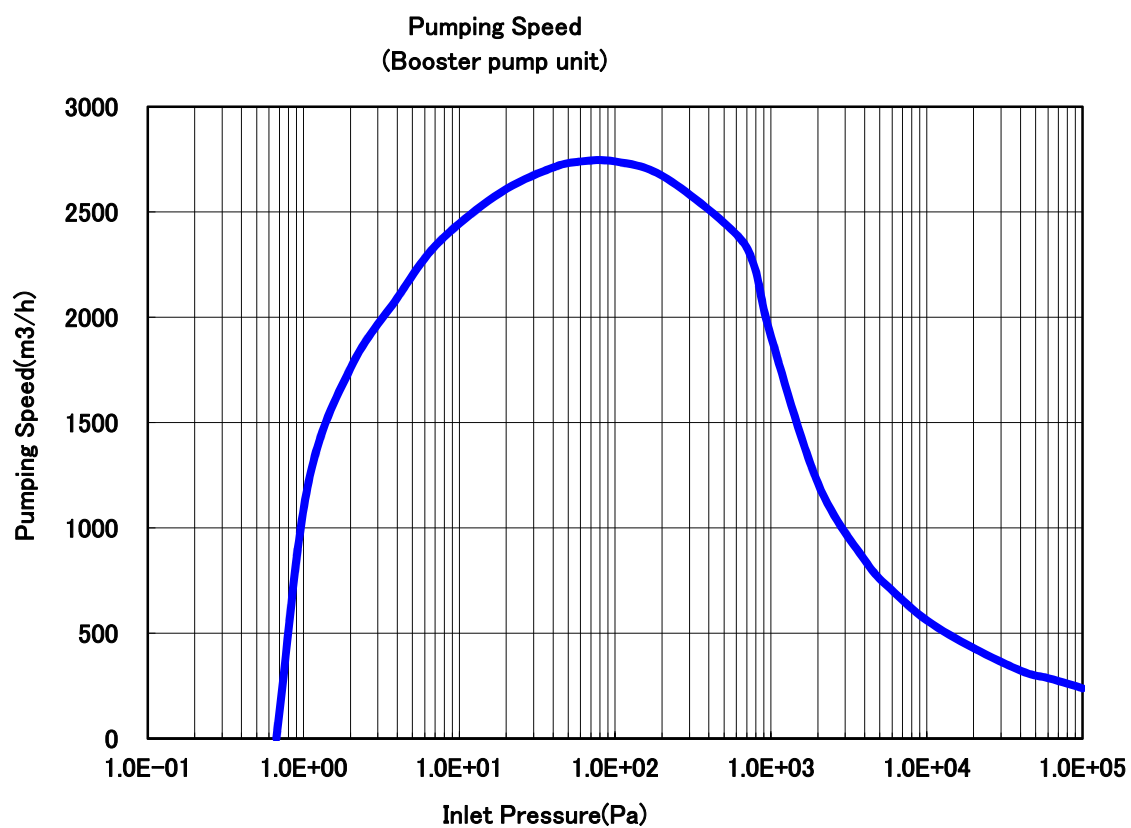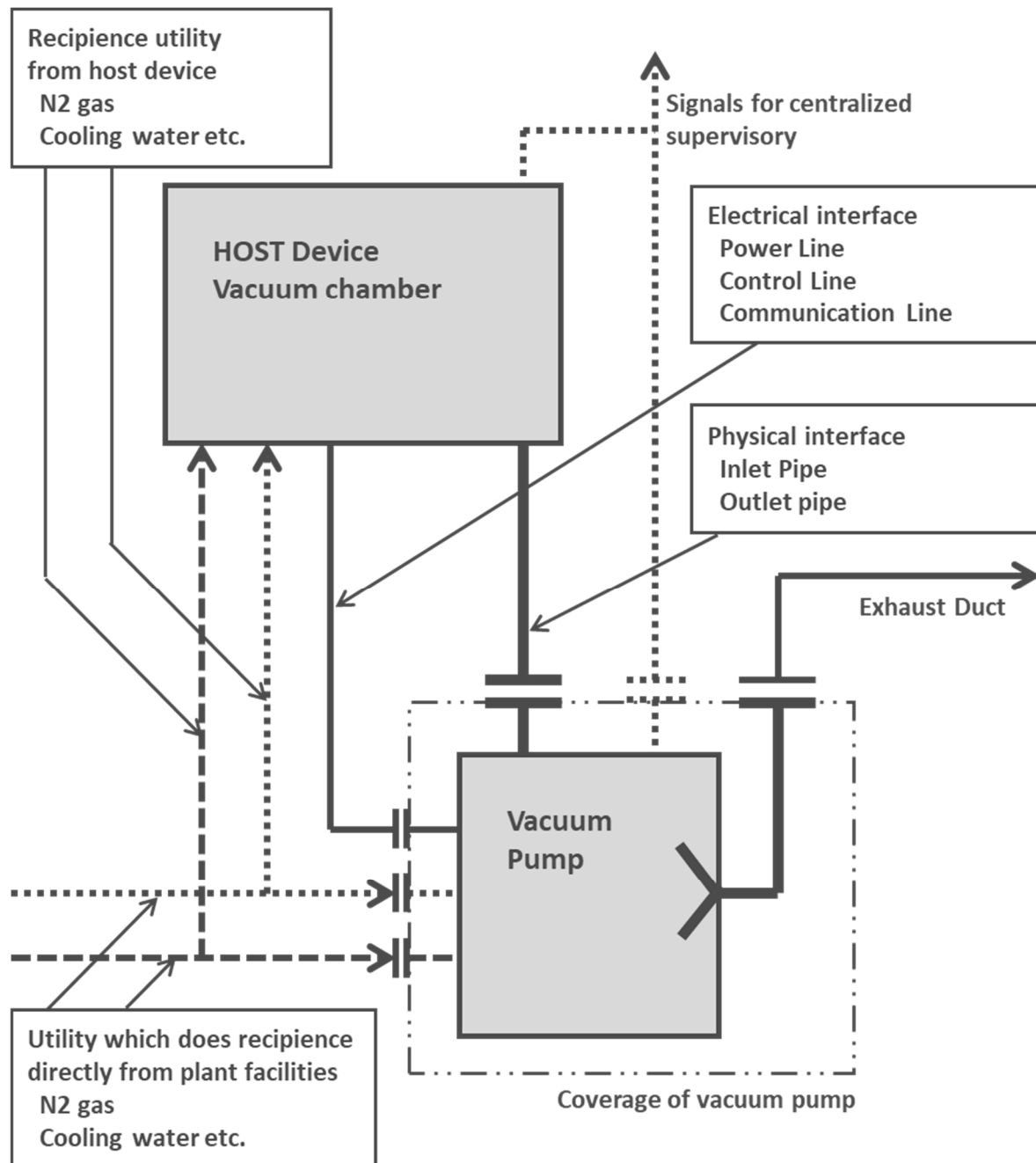
2. Installation
2.1 For Safety Use

Before to use these UR421/3601 series models, it is essential to understand what is described in this manual.

Overhaul or repair work is performed at our service center. When any trouble occurs, please contact with your local service center (please refer to the ULVAC service center address list at the end of this manual).

- The interlock system and control system of the UR421/3601 series pumps are expected to be connected with the host equipment.
- The UR421/3601 series pumps are integrated into a host machine or are located close to the host machine (not more than 3m of travel to the next EMO button).
- Connect the power line of the UR421/3601 series with the EMO system of the host equipment.
- The gas, which can be exhausted with this UR421/3601 series pump, it provides for inert gas (Air, N2, Ar).
- Do not exhaust other gases (toxicity gas, combustion gas, corrosion gas, and explosiveness gas).
- The UR421/3601 series pumps are not made to withstand positive pressure. Operation goes positive pressure in the pump (positive-pressure gas suction, operation of the outlet port be closed), please do not absolutely. There is a risk of rupture.
- Set up this UR421/3601 series pump at ventilated room.
- These products are manufactured to conform with laws applied at the time of the preparation of this manual. When the applied laws are revised in the future, the legality of these products will not be ensured.
- If the host equipment of these products does not conform to the same laws, or if the products are modified, then the performance and safety of these products should not be insured. ULVAC should not have a responsibility in such a case.
- Personnel who have no record of formal safety training course regarded by your government (safety for electricity, cargo handling, etc) should not operate these products. Operator should have finished these-safety training course.
- Installation and operation of these products should be performed according to the applicable local safety codes and laws (e.g. firefighting law, electric installation code, etc).
- Before starting installation or removal work of this products, shut off all the energy sources (electricity, compressed air, cooling water, etc.).
- After long-term storage (if more than six months), this UR421/3601 series pumps must be overhauled before use. Even if this is not being used, elastomers (O-ring, Teflon seal) and vacuum pump oil degradation occurs. (Overhaul work is performed at ULVAC.)

Following are description concerning with potential hazards and the method to avoid these hazards:

Location of vacuum pump in host device

Recipience utility
from host device
  N2 gas
  Cooling water etc.

Signals for centralized
supervisory

HOST Device
Vacuum chamber

Electrical interface
  Power Line
  Control Line
  Communication Line

Physical interface
  Inlet Pipe
  Outlet pipe

Exhaust Duct

Vacuum
Pump

Utility which does recipience
directly from plant facilities
  N2 gas
  Cooling water etc.

Coverage of vacuum pump

It is assumed that the pump stops suddenly when the interlock of the host device does not synchronize with the interlock of the facility. It is necessary to manage utility to give preventive measures. Do not use the utility not managed.

Power Wiring

- This UR421/3601 series pump is locked out in intercepting cooling water, the N2 gas, and the power line. Give the system which can lock out on the host equipment.
- Material selection, installation and operation of wiring should be done according to the rules and codes applied in your country (e.g. firefighting law, electric installation code, etc).
- For serious situations such as abnormal current or voltage, the products are provided with safety devices (e.g. noise filter) with which these abnormal situation can be avoided. To release the leaking current securely, the power wiring (cable terminal of the host equipment) should be directly connected to the terminal board (breaker).
- Though these products are provided with breaker (UR421 series: MCB1 / UR3601 series: MCB1 and MCB2), inner wiring from power connector through the breaker (UR421 series: MCB1 / UR3601 series: MCB1 and MCB2) is keeping hot. To completely shut off the electricity, provide a breaker (M/D: AIC 10kAV or above) to the host equipment.

When to perform installation or removal of these products, the power should be shut off completely according to the following diagram.

⚠ **CAUTION**

Current value at the maximum load and inverter's INPUT current are shown in the following (current which flows to inverters immediately after turning on of power supply).

Please select the electric wire, which the electric wire specification can be allowed referring to current at the maximum load.

Please confirm that the size of the electric wire is a size of the electric wire, which the connector can be allowed.

Model		UR421-T	UR3601-TT
Power		3 phase : 200-240 VAC, 50/60 Hz	
Current (A)	At maximum load (200VAC)	52.5	68.3 [1]
	Inverter's INPUT current	57.0	87.0
Size of recommended electric wire		AWG #4	AWG #2

1) The current at the maximum load of UR3601-TT has described the maximum current in the use-pressure range (Ultimate pressure to 200 Pa).

<< Possible electric shock hazard>>

If you have no record of electrical safety training course you should not perform the operation.

1. Shut off the breaker (UR421 series: MCB1 / UR3601 series: MCB1 and MCB2) of the pump.
2. Ensure that LCD of the controller (PCTL) is off.
3. Shutoff the breaker (M/D) of the host equipment.
4. Make lockout and tag-out according to the host equipment instruction manual.
5. Through current indication lamp, which may be provided in the host equipment, ensure that wire is not alive.
6. Remove power connector.

MCB1/MCB2 Operational procedure
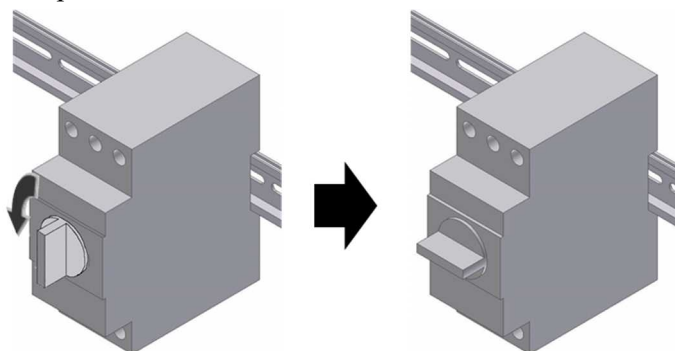
Turn the lever counterclockwise

Remove Power Connector
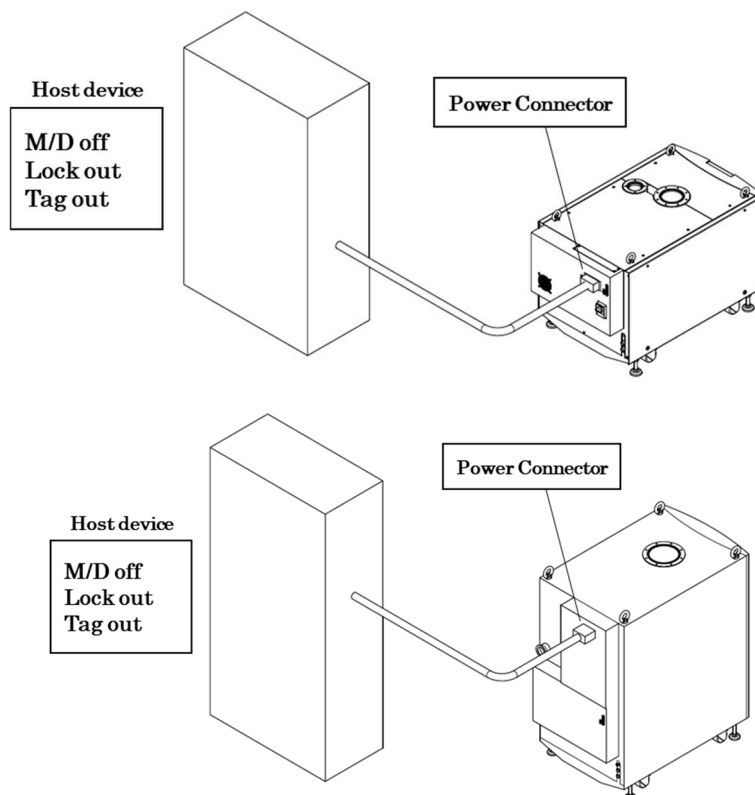
- These products are classified with the "High Leakage Current" product, and the plug connections etc. are prohibited.
- Please fix the power line wiring directly to the terminal or the breaker, etc.

<< Possible electric shock hazard>>
If you have no record of electrical safety training course you should not perform the operation.
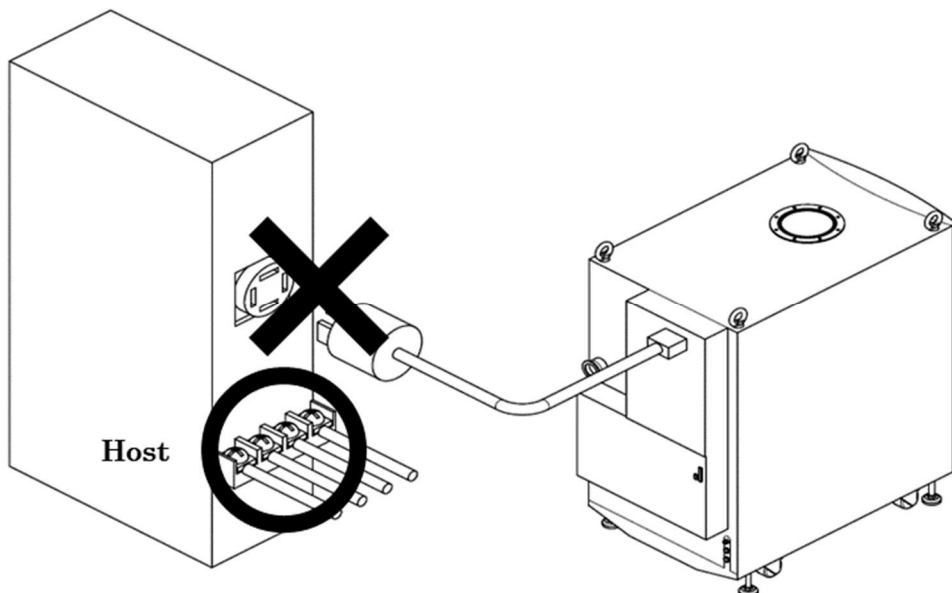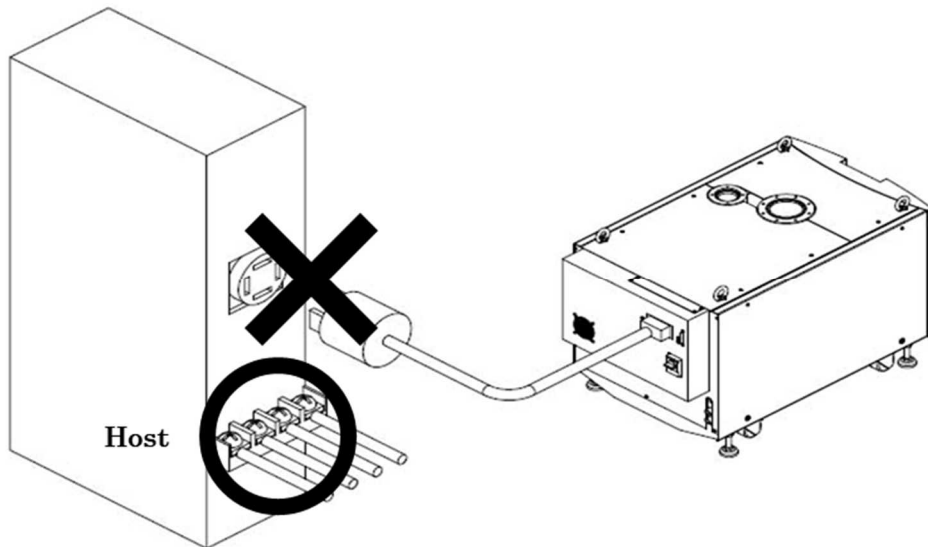
Cooling water

- UR421/3601 series models use cooling water. The products are designed and tested as leakage free for the conditions defined. Nevertheless, for conditions which departed from the criteria (e.g. abnormal high water pressure), may produce leakage. In that case, the leakage will continue unless water supply from the host equipment is shut off. Electric devices or wiring should not be arranged at the bottom of the pump or on the floor around it.

- When the leakage occurs at the position of supply side from the pump mounted flow sensor (WFM), the sensor will warn the leakage. But, if the decrease of the cooling water head level does not reach the warning level, the sensor cannot detect the leakage.

- Place water leakage sensor on the floor at the pump bottom, and connect it to the host equipment interlock system. When a water leakage is detected, close the cooling water valve (HWSV) at once. After the valve is closed, tag a **CLOSED** sign on the grip.

- Fix a flow gage (HWFM: e.g. flow sight) on the host equipment and make it possible to check if the cooling water is flowing.

- A drain port is provided at the bottom of base. This port should be connected with reliable drain outlet in case of a water leakage. The drainage requires adequate level difference.

- When to perform a work, there will be possibility of water leakage. Fix valves which compatible with the host equipment piping connector at the cooling water inlet-outlet.

Nitrogen gas

- UR421/3601 series models use nitrogen gas. The products are designed as leakage proof devices and tested under the conditions defined. Nevertheless, for conditions departed from the criteria (e.g. abnormal high gas pressure), there may be gas leakage.

- Set up this UR421/3601 series pump at ventilated room.

- Fix valve (HPSV) to shut off nitrogen gas supply.

- When to remove this products from the host equipment, close the nitrogen gas supply valve (HPSV) on the host equipment. After the valve is close, tag a **CLOSED** sign on the grip.

- There will be remaining gas in the host equipment piping. Fix a pressure gauge on the host equipment nitrogen supply source (midpoint of the piping to the pump), and then ensure that the pressure is reduced to the atmospheric pressure. When to perform work, if the internal gas pressure is high, the piping will be abruptly removed and injury could occur.

Suction and exhaust gases.

- We specifies gases, which can be exhausted by the pump. When the pump is used to exhaust other gases (e.g. toxic gas, combustible gas, corrosive gas and explosive gas), there could be serious accidents. These gases should not be applied to the pump.

High temperature surfaces

- UR421/3601 series models are designed to prevent any hazard which caused by heat. However, when the temperature of the gas is extremely high, then the surface of the device could be high temperature. Warning labels are attached at the positions where the temperature could result a serious injury.

<< High temperature surface >>

Be careful of the high temperature surface near this label (intake and exhaust outlet...).

Controlling wiring (power supply group units included)

- Be careful not to insert things into the fan louver.
- A protection circuit should be mounted in the host equipment so that the connector pins of the remote connector not receive voltage higher than DC24V.

EMC

- EMC performance of these products can be obtained under the conditions prescribed by the EMC instruction. The performance does not be guaranteed under unstable environment exceeding this standard level. To keep the EMC performance, use sealed cable and separate the products from components which generate noises (e.g. power switch, inverter, etc.), then check the noise level (conduction and emission) coming from host equipment is within criterion.

EMO

- EMO should be established as a total system including the host equipment with which this UR421/3601 series models will be installed (if only a pump unit suspends it's operation, the total system could be hazardous). Pump suspension matter should be incorporated with the host equipment EMO sequence of the total system, to shut off the power.

2.2 Installation and Storage Requirements

2.2.1 Unpack

UR421/3601 series models are packed in wood frames. Unpack work should be performed by expert trades.

DANGER
- When taking out the pump from wood frame, or lift it, instruct workers that the product should be hung by a crane at the pump top hook, then move it.
- Please do not use a forklift to lift up the product.
- Only licensed worker can perform cargo handling or operate the lording machines.
- When handling is performed improperly or unpack tools are improperly maintained, there will be possibilities of falling down or topple of the pump, so no person should be underside of the pump.
- This product is packed in the wooden crate. Please request dismantlement to a special trader.

WARNING
- Please guide equipment with the glove made of the skin, and the use of an appropriate dismantlement tool to those who dismantle it.
- Instruct the workers to wear leather gloves and use proper tool to avoid injuries caused wood frame debris and nails.

CAUTION
- Do not tilt the pump by more than $10°$.

Upon receipt of this products, make sure that the products is the correct model you ordered and that it is free from damage in transit.

List of Accessories

Description	Q'ty
Nitrogen inlet joint [1]	1 pc.
Power connector	1 pc.
Remote operation connector [2]	1 pc.
RS-232C/RS-485 communication connector	1 pc.
Quick manual	1 copy

1) A nut, back-ferrule and front-ferrule are attached at the Nitrogen gas inlet port.

2) As you can operate using pendant controller for local operation (LOCAL), 1-20pin and 4-22pin have shorting.

CAUTION
- If there are some problems, please contact with our office within one-week period.

2.2.2 Transit

⚠️ **DANGER** — Forklift should not directly be placed under the pump base bottom. This could drop or topple the pump. If you want to transit with a forklift, this must be loaded onto a pallet, fixed with jacks and surely bound with a palette by lashing belts, etc.

⚠️ **WARNING** — Although this pump is provided with casters, do not move it a long distance using these casters. If you move this pump in such a way, the load exceeds the safety criterion. You could hurt your waist.

When to transit the pump, you should use loading machines (e.g. moving crane) and hang it, or load and fix the pump with the jacks on a pallet and surely bind with a palette by lashing belts, etc. then transit it by pallet truck.

⚠️ **DANGER** — Pallet truck should not directly be placed under the pump base bottom. This could topple the pump.

⚠️ **CAUTION** — Do not tilt the pump by more than 10°.
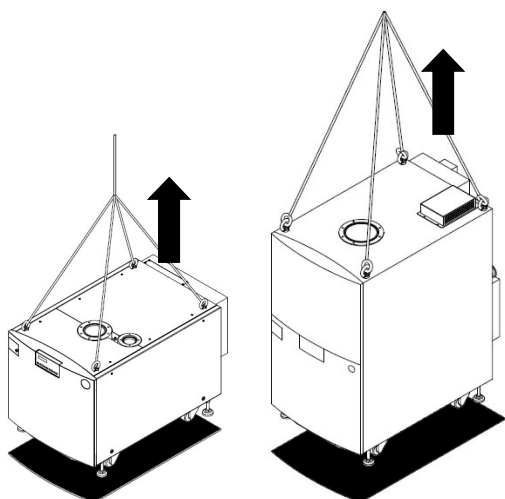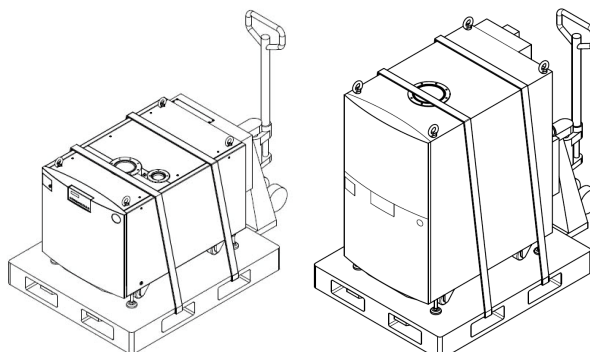
Crane hanging figure   Palette transportation figure

2.2.3 Removing of transportation jig (UR3601 series)

- To protect internal parts from the impact when transported, the pump equips with the jig.
- Please remove the jig according to 『Transportation jig removing procedure』 after transporting the pump.
- Please keep removed bracket, bolt, and nut. Again until they are used.

UR3601-TT Transportation jig removing procedure

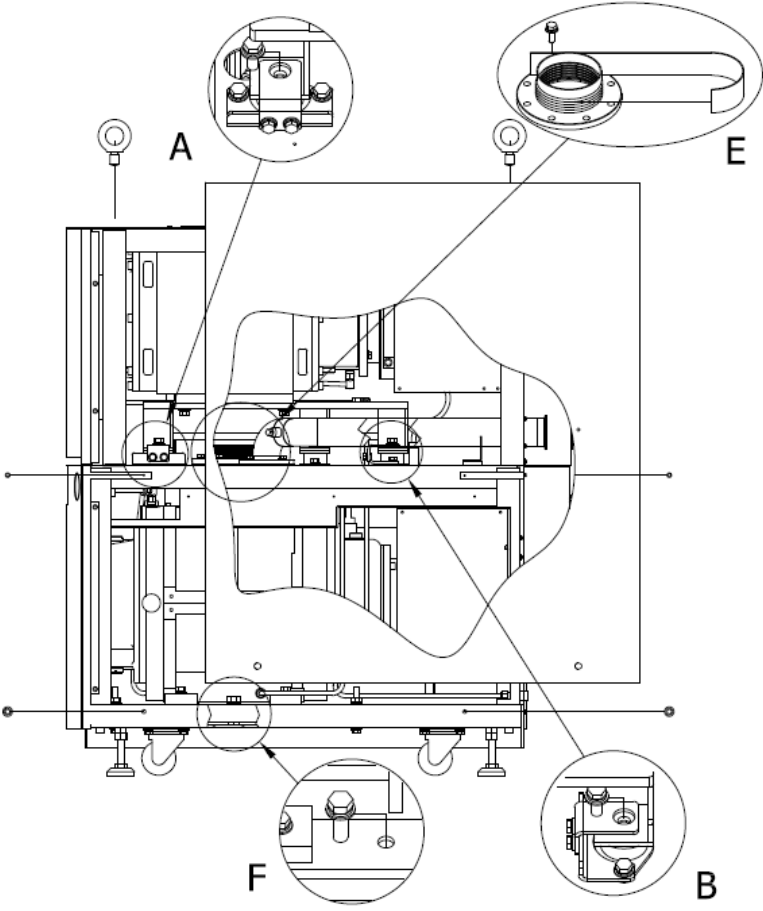|	
☐	① Four eyebolts are removed.
☐	② Cross-recessed head screws and hexagon socket button head screws are removed.
☐	③ Left and right side panels are removed.
☐	④ M12 × 30 hexagon head bolts are removed.
☐	⑤ M12 × 20 hexagon head bolt are fixed.
☐	⑥ Two sets of the M16×50 hexagon head bolt are removed.
☐	⑦ M10 × 45 hexagon head bolt and protective material are removed.
☐	⑧ 8 sets of M10 × 30 hexagon head bolt are fixed.
☐	⑨ Left and right side panels are installed.
☐	⑩ Cross-recessed head screws and hexagon socket button head screws are fixed.
☐	⑪ Four eyebolts are fixed.

①Remove 4 eyebolts on the top of the pump.

②Remove cross-recessed head screws and hexagon socket button head screws.

③Remove left and right side panels.

④Remove the M12 × 30 hexagon head bolts (1 set each of plain washer and spring washer) that fix brackets A and B. (Two sets each of plain washer and spring washer are used, of which one set is used as it is.)

⑤Fix the supplied M12 × 20 hexagon head bolt at A and B.

⑥Remove two sets (both left and right side) of the M16×50 hexagon head bolt (1 set each of plain washer and spring washer), which secure the DRP chassis.

⑦Remove the M10 × 45 hexagon head bolt and protective material from the flange of the bellows in E.

⑧Set the supplied 8 sets of M10 × 30 hexagon head bolt, plain washers, spring washers to the flange of the bellows in E.

⑨Install left and right side panels.

⑩Fix cross-recessed head screws and hexagon socket button head screws.

⑪Fix 4 eyebolts on the top of the pump.(Work completed)

! CAUTION

●Keep the removed parts, which will be required when transferring the pump. When transferring the pump, Re-install the removed parts by reversing the removing procedure.

●Fix 8 hexagon head bolts to the bellows flange.

2.2.4 Environmental Requirements for Installation

Following installation and storage requirements should be met.

Storage and installation requirements

Description	Requirement
Temperature and humidity (for storage)	- 30 - 60° C, less than 95%RH
Temperature and humidity (for operation)	5 - 40° C, less than 95%RH
Above sea level	Not exceeding 1000m
Outside vibration	Not exceeding 0.5G

* Not condensing

2.2.5 Other Requirements

⚠ CAUTION
- Set up and keep this UR421/3601 series pump at ventilated room.
- Before storage, drain the pump. If water is remaining in the pump, it will be freezing at a low temperature (below 0°C) and may damage the components.
- Do not lay two pumps one on the other nor lay the pump on its side during storage.
- After moving the pump to the place of installation or storage, adjust the jack to set it in a horizontal position.
- When operation after long-term storage (more than six months) or long-term interruption of devices, it might cause failure of internal parts. Please contact with your local service center, that has been described at the end of manual.

Adjust the jack
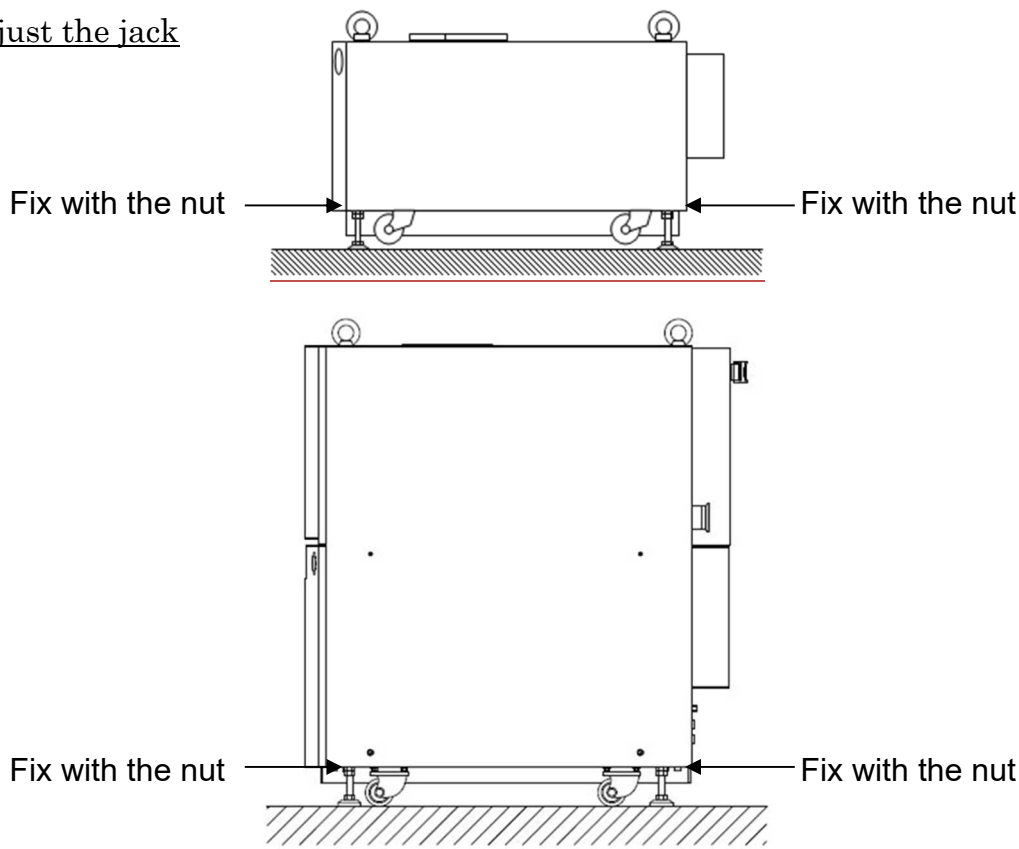
Fix with the nut →   ← Fix with the nut

Fix with the nut →   ← Fix with the nut

2.2.6 Earthquake Resistant Measures

 WARNING

- To provide earthquake resistance, the pump should be tightly fixed according to the diagram below. If it is loosely installed, then the pump could topple or move and will produce damages for peripheral devices. (Fixing bracket has been prepared as an option.)
- Piping for vacuum, cooling water, nitrogen, and wiring, should be constructed so that they can absorb vibration and should not produce damages on piping or run off within defined vibration level.

Fixing bracket installation figure

Fixing bracket (option)

Fixing bracket (option)
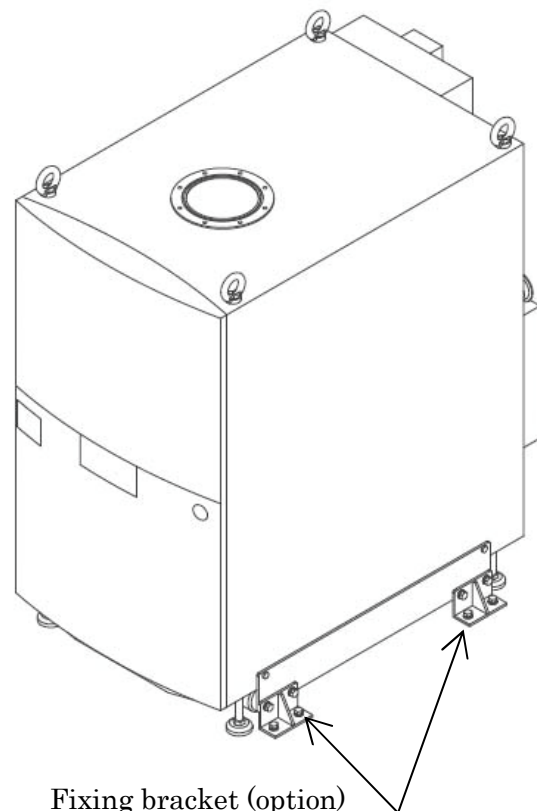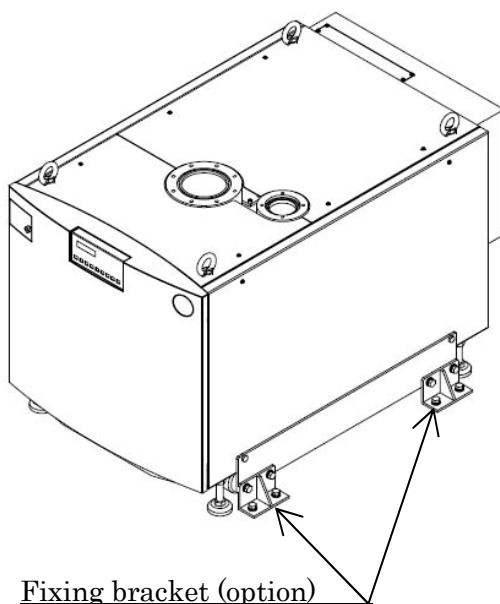
Earthquake-proof strength was examined based on the demands postulated of 1997 version United States union construction standard (UBC).

Please refer to the next table for a fall moment, the horizontal load, and the center of gravity position.

UR421 series

			ULVAC, Inc. Components Div.
Antiearthquake procedures			Date : Sep 23, 2008
		unit	
The maximum width on surface of projection which falls easily	L1	mm	660
Short distance from fulcrum on surface of projection which falls easily to center of gravity position	L2	mm	330
The distance from rear panel to center of gravity position	L3	mm	717
Height from floor side to center of gravity position	h	mm	380
Weight of device	Wp	kg	415
Horizontal pressure(Adjuster) Fp=0.94*Wp	**Fp/4**	**kg**	**97.5**
0.94*h>=0.85*L2			OK
Fall power R=(Wp*(0.94h-0.85L2))／(2*L1)	**R**	**kg**	**24.1**
Shearing power of anchor bolt (M10)	τ		1537
Fp<τ			OK
Tensility of anchor bolt(M10)	σ		2300
R<σ			OK
Jack interval	J1	mm	608
Earthquake-proof Bracket interval	J3	mm	706
Fall angle	**α1**	**deg**	**38.7**
Earthquake-proof Bracket interval	J2	mm	730
Fall angle	**α2**	**deg**	**43.8**
α>15deg			OK
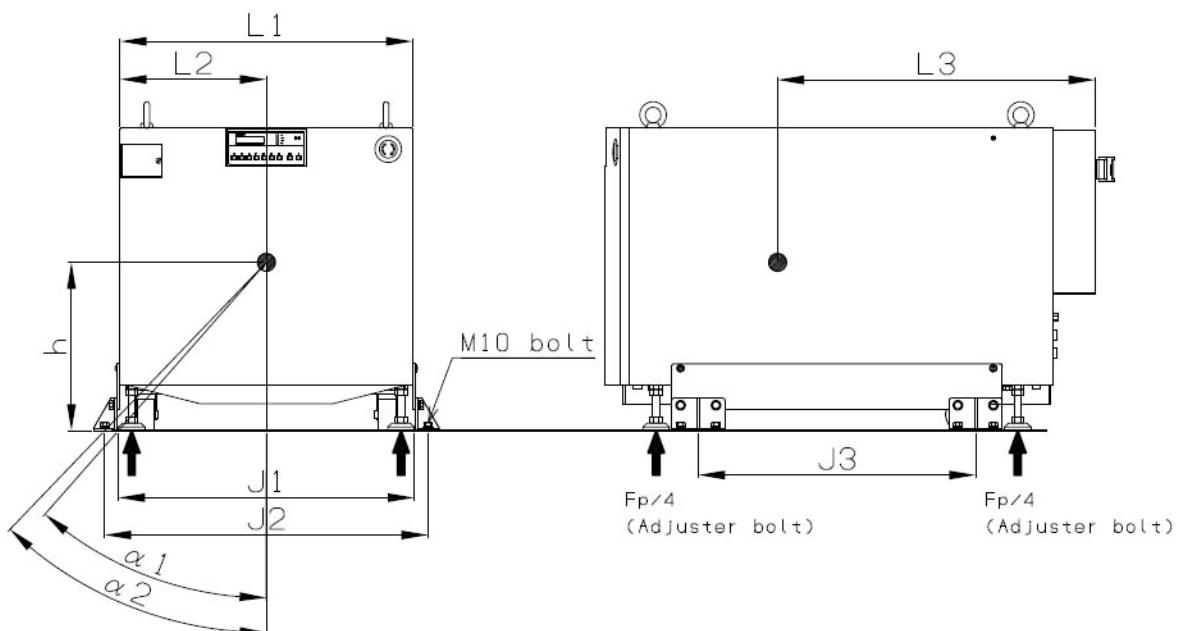
UR3601 series

ULVAC, Inc. Components Div.			
Antiearthquake procedures		Date : April 2, 2012	
		unit	
The maximum width on surface of projection which falls easily	L1	mm	660
Short distance from fulcrum on surface of projection which falls easily to center of gravity position	L2	mm	330
The distance from rear panel to center of gravity position	L3	mm	719
Height from floor side to center of gravity position	h	mm	714
Weight of device	Wp	kg	660
Horizontal pressure(Adjuster) Fp=0.94*Wp	**Fp/4**	**kg**	**155.1**
0.94*h>=0.85*L2			OK
Fall power R=(Wp*(0.94h-0.85L2))／(2*L1)	**R**	**kg**	**195.3**
Shearing power of anchor bolt (M10)	τ		1537
Fp<τ			OK
Tensility of anchor bolt(M10)	σ		2300
R<σ			OK
Jack interval	J1	mm	668
Earthquake-proof Bracket interval	J3	mm	730
Fall angle	**α1**	**deg**	**25.1**
Earthquake-proof Bracket interval	J2	mm	730
Fall angle	**α2**	**deg**	**27.1**
α>15deg			OK
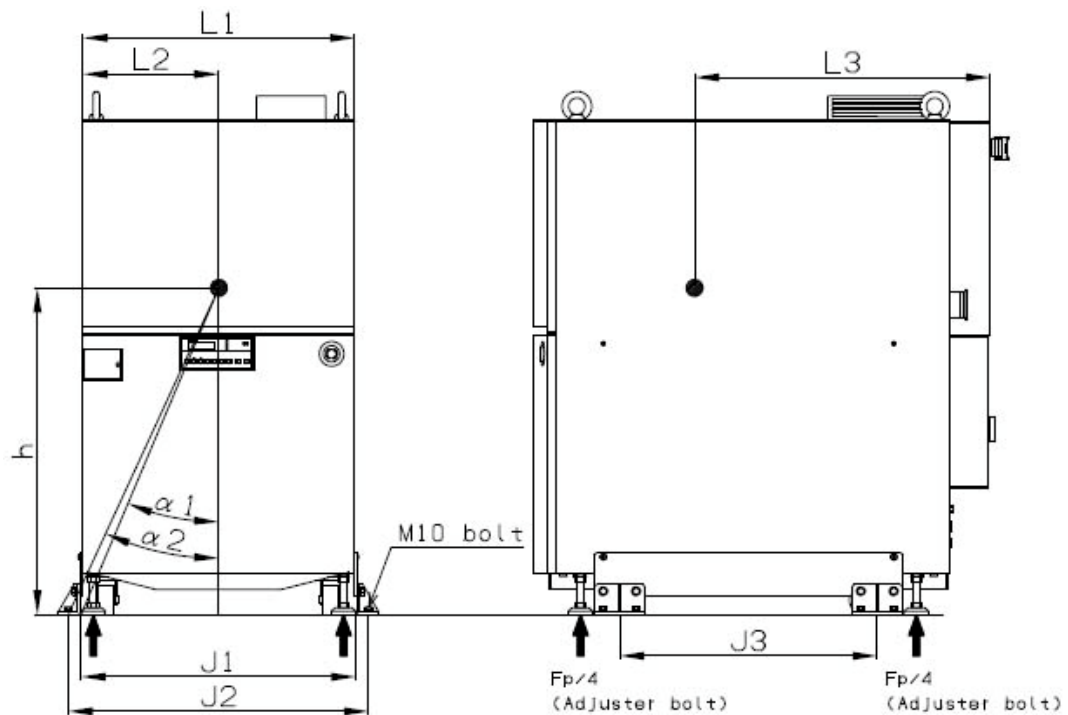
2.3 Piping

2.3.1 Piping for inlet-outlet ports

| ⚠ **WARNING** | - Before start work, ensure that all hazardous energies are shut off. Refer to **2.1 For Safety Use**. |

| ⚠ **CAUTION** | - UR421/3601 series has installed flange for keeping on the suction entrance flange. The suction entrance mesh has not been installed. Please do not remove flange for keeping until the time of connected work of piping to prevent the foreign body fall in the pump. |

- When connecting piping, be careful not to drop foreign matter (e.g. bolt) into the inlet/outlet port of the pump. If something was dropped into these port, then the pump should be disassembled to remove the matter from the pump, so contact with your local service center.
- The pump flange should not be loaded directly (refer to 2.2.6 Earthquake Resistance Measures).
- Be careful not to damage the gasket surface. After the completion of the piping work, perform gas leak test for the whole system.
- If thin metal piping, bellows or the likes are used, the pulsing stream of gas in piping may produce pipe resonance, and the sound could exceed the work environment sound criteria if the piping, bellows or the like are made with thin metal wall. Provide material of adequate thickness.
- The temperature of the intake pipe and the exhaust pipe becomes 70℃ or more.

2.3.2 Nitrogen Gas Piping

| ⚠ **WARNING** | - Before start work, ensure that all hazardous energies are shut off. Refer to **2.1 For Safety Use**.
- Use the supplied nuts and ferrule for piping work. |

■ Connection Requirements : Tube fitting for 9.52mm-diameter pipe
■ Proper Piping: Use SUS pipe of outside diameter of 9.52mm-diameter with more than 0.9MPaG pressure proof and 100℃ temperature proof.

model			UR421-T	UR3601-TT
Nitrogen gas	Supply gas pressure (MPaG)		0.1 ~ 0.5	
	Regulated pressure (MPaG)		0.05 ~ 0.12	
	Flow rate	Shaft seal (SLM)	5.0	
		Gas ballast (SLM)	~ 195	

2.3.3 Cooling Water Piping

⚠ **WARNING**	- Before start work, ensure that all hazardous energies are shut off. Refer to **2.1 For Safety Use**.
⚠ **CAUTION**	- If two or more pumps are used, connect them in parallel, if connected serial, then the cooling performance will be reduced and resulted a failure.

- Do not mistake the cooling water inlet and outlet.
- If cooling water contains much scale or impurities, filter it with a filter in the fore stage.
- It is difficult to accomplish an adequate flow rate when water supply source is far distant from drain outlet, or piping level is uneven (the drain outlet level is higher than that of the pump). In this case, improve the piping arrangement, or use larger sized pipe, or increase the water pressure within specified pressure scope.
- Only stainless steel pipe is used for cooling water piping of the dry pumps. Please note that troubles because of following causes shall be paid service, due to choked pipe and drop of cooling efficiency by deposition and accumulation of impurities (water stain, microorganism, metal powder and metal ion).
- Do not use any metal pipe other than stainless steel pipe in the cooling water system (including host side). Ions could be merged into water, if metal pipe such as copper and zinc are included is used. Cooling water flow rate could be decreased because merged ion accumulates and adheres to the inner wall of the pipe.
- It is recommended to use water which does not include any impurities (e.g. industrial water. See table below). Keep in mind not to use poor quality of water because metal ion could be included in cooling water even inlet side of cooling water is clean. Water stain such as calcium carbonate could be accumulated in cooling water system depending on water quality and it could made cooling efficiency low. In addition, there could be cooling water leakage because of corrosion from the inner wall of water pipe by chlorine ion.
- The pump could be damaged if it continuously runs with cooling water flow rate lower than specified amount. Make sure to keep specified flow rate.

[Reference] Standard Water Quality of Industrial Water

Turbidity mg/L	pH −	Alkalinity $CaCO_3$ mg/L	Hardness Mg, $CaCO_3$ mg/L	Evaporation residue mg/L	Chlorine ion 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.

Established by: Japan Industrial Water Association

■ Connector Requirement: Connector port Rc3/8 female

■ Compatible piping: Joint and pipe should have water pressure resistance of more than 0.9MPaG, and heat resistance of more than 70℃.

Cooling water	The maximum supply pressure (MPaG)	0.5
	Minimum inlet/outlet pressure difference (MPaG)	0.2
	Flow rate (L/min)	5.0
	Supply temperature	10 ~ 30 [1)]

1) Not condensing
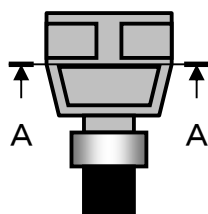
2.4 Wiring

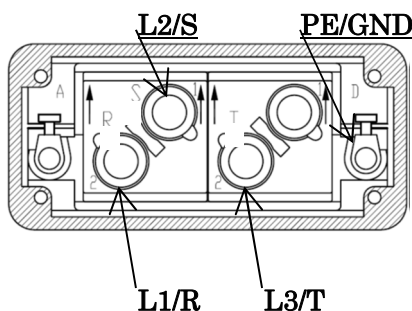### 2.4.1 Power wiring

 DANGER ：Before start work, ensure that all hazardous energies are shut off. Refer to **2.1 For Safety Use**.

Wiring work should be performed by licensed workers.

Use the supplied connectors only. If other connectors are used, the first ground contact may fail, and raise the possibility of electrical shocks.

Connector

Section A-A

Pin assignment	
Pin No.	Specification
2 (A side)	L1/R phase
1 (A side)	L2/S phase
2 (D side)	L3/T phase
D	PE/GND

Specifications

Pump model	UR421/3601 series
Connector maker	HARTING®
Connector part No.	Han 100Amodule 2 pieces (16B size)
	Han® Axial Screw Module 100 Male insert：09 14 002 2651
	Hinged frames(marking ad)：09 14 016 0313
	Housing：09 30 016 0301
	Protection cover：09 30 016 5425
	Cable shoe 16mm² (for PE extension)：09 14 000 9912
Acceptable Connector	Han 100Amodule 2 pieces (16B size)
	Han® Axial Screw Module 100 Female insert：09 14 002 2751
	Hinged frames(marking AD)：09 14 016 0303
	Standard Hoods ：09 30 016 0421
	Cable shoe 25mm² (for PE extension)：09 14 000 9913
	Universal cable protection：7215556d36
Acceptable electric wire kind	BNCT,PNCT,RNCT,(VCT),KIV,WL1,MLFC,LKGB (incompatible electric wire:CV,IV,HIV,andKGB)
Size of acceptable electric wire	L1/R phase, L2/S phase, L3/T phase: 16-35mm² (max. AWG2) (source diameter ϕ0.45mm the following) PE/GND: 16 mm² (source diameter ϕ0.45mm the following)
Ratings current (maximum)	100A

 DANGER
- Use wire compatible with your local safety codes (e.g. UL, TUV compatible).
- Wiring work should be performed according to your local wiring codes (rules). To ensure safety from direct contact, cable should be fixed firmly, or cable rack should be provided.
- Wire for the cable according to regulations of NEC Article 400.

2.4.2 Wiring for remote control

Pin assignment				
Pin No.	I/O	Item	Specifications	
1	IN	External interlock	CLOSE: Normal	OPEN: External interlock stop
2				
3	IN	Pump start	CLOSE: Run	OPEN: Stop
4	IN	Remote emergency shutdown	CLOSE: Normal	OPEN: Emergency shutdown
5	IN	Alarm reset	CLOSE: Reset	
6	IN	WATING MODE[1]	*The setting in the options[1]	
7	IN	Seal gas valve	CLOSE: Valve open	OPEN: Valve close
8				
9	OUT	DRP start check	CLOSE: Running	OPEN: At stop
10	OUT	MBP start check	CLOSE: Running	OPEN: At stop
11	OUT	REMOTE/LOCAL status check	CLOSE: Remote	OPEN: Local
12	OUT	Emergency shutdown status check	CLOSE: Normal	OPEN: At emergency stop
13	OUT	WATING MODE check[1]	*The setting in the options[1]	
14	OUT	Ready check	CLOSE: Ready	OPEN: Under preparation
15	OUT	Alarms in a batch	CLOSE: Normal	OPEN: Alarm
16	OUT	Warnings in a batch	CLOSE: Normal	OPEN: Warning
17				
18				
19	OUT	OUT 9 - 16 COM		
20	IN	IN 1 COM		
21				
22	IN	IN 3-7 COM		
23				
24	OUT	Purge gas warning	CLOSE: Normal	OPEN: Warning
25	OUT	Cooling water warning	CLOSE: Normal	OPEN: Warning
26	OUT	DRP temperature warning	CLOSE: Normal	OPEN: Warning
27	OUT	MBP temperature warning	CLOSE: Normal	OPEN: Warning
28	OUT	DRP power alarm	CLOSE: Normal	OPEN: Alarm
29	OUT	DRP power warning	CLOSE: Normal	OPEN: Warning
30	OUT	MBP power alarm	CLOSE: Normal	OPEN: Alarm
31	OUT	MBP power warning	CLOSE: Normal	OPEN: Warning
32	OUT	Pumping pressure alarm[1]	CLOSE: Normal	OPEN: Alarm
33	OUT	Pumping pressure warning[1]	CLOSE: Normal	OPEN: Warning
34	OUT	System error	CLOSE: Normal	OPEN: Alarm
35				
36				
37	OUT	OUT 24 - 34 COM		

1） The setting in the option. (The standard dose not work.)For more information, please contact our service center.

2） Do not connect to PIN No. 2, 8, 17, 18, 21, 23, 35, 36.

Pump side connector	D-sub 37pin female
Compatible connector	D-sub 37pin male
Compatible wire size	AWG #22 Use the shielded cable

- Before start the work, ensure that all hazardous energies are shutoff. Refer to the Section **2.1 For safety Use**.
- Wiring work should be performed by licensed worker.
- If the external interlock function is not used (used when an interlock with equipment other than a system in which the pump is installed is activated), connect 1 and 20 by a jumper wire or if the remote emergency stops function (only AC line is shut down) is not used, connect 4 and 22 by a jumper wire. If this wiring is not connected between these pins, the pump will recognize it as an external interlock command or an emergency shutdown command and will not start. (Refer to Fig.1)

  ※Remote connector of the accessory has become a pre-short between 1-20, 4-22.
- A voltage of DC24V is applied to the input system on the pump side. Prepare a no-voltage contact. The pump side of the output is a no-voltage contact. Use the pump within the following specified range.

  <u>Operable voltage : Less than DC24 V, Contact capacity : 50mA (per one contact)</u>

OUT-COM is commonly using the N-COM; hence connect the same power of 0Vdc. If positive electric potential is put, the contact point will be open and may result a failure. (Refer to Fig.2)
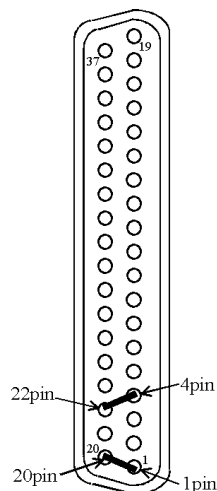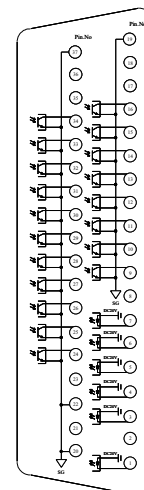

Fig.1 Example of short-circuit line.   Fig.2 Circuit in base

- -When the current between a signal pin and GND terminal flows more than 0.1mA, it may cause the circuit the malfunction. Ensure that it flows equal or less than 0.1mA.

Pin No.1 External interlock

 The pump can be stopped interlocked with equipment other than a host unit (for example, gas detector on the pump floor or other) by connecting the pump to a unit other than a control unit. If this is not used, connect 1 and 20 by a jumper wire.

Pin No.4 Remote emergency shutdown

 The pump can be stopped by breaking short circuit. The difference from normal start/stop is that it shuts down all, including nitrogen auto purge immediately after shutdown.

Pin No.6 Waiting mode
Pin No.13 Waiting mode check

The setting in the option. (The standard dose not work.)

For more information, please contact our service center.

Pin No.7 Seal gas valve (SEAL GAS VALVE)

Only the seal gas valve can be opened/closed in the run mode 1 (mode in which nitrogen gas is not used). When a large amount of water content is pumped for a specific time in a CRYO pump regenerating process, give a command that feeds seal gas from this terminal only in the process time zone to suppress rusting due to water content permeating to the bearing.
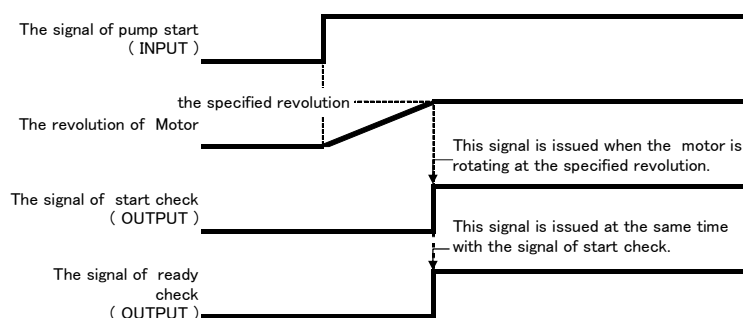
Pin No.9, 10 DRP start check , MBP start check

No.9 and No.10 is terminal that gives notice that each pump is ready for pumping. Can change the timing that sends this signal.
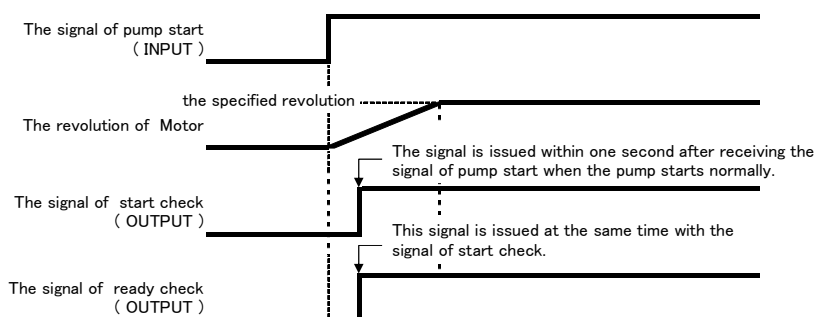
Pin No.14 Ready status check (READY)

Terminal that gives notice that the pump is ready for pumping. This signal is issued by confirming that the pump is rotating at the specified revolution and that the temperature of each part being measured reaches the preset temperature. Temperature is not set as standard, but can be set, as and if required. To set a temperature other than the pump temperature, it is necessary to add a sensor.
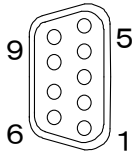
Case 1. 『SET-UP 1』⇒『start up mode』⇒『1』

The signal of pump start (INPUT)

the specified revolution
The revolution of Motor

This signal is issued when the motor is rotating at the specified revolution.

The signal of start check (OUTPUT)

This signal is issued at the same time with the signal of start check.

The signal of ready check (OUTPUT)

Case 2. 『SET-UP 1』⇒『start up mode』⇒『2』

The signal of pump start (INPUT)

the specified revolution
The revolution of Motor

The signal is issued within one second after receiving the signal of pump start when the pump starts normally.

The signal of start check (OUTPUT)

This signal is issued at the same time with the signal of start check.

The signal of ready check (OUTPUT)

For the run mode, refer to "3.6 Setting item change Run mode". If the pump is used to pump only air or inert gas, seal gas is not always necessary, but it is to be noted that air contains moisture that induces corrosion. ULVAC recommends use of seal gas. (UR421/3601 series is set to run mode 3 as standard.)

2.4.3 Communication

Used when operating the pump using a personal computer or checking the operation history. Contact your local ULVAC service center for the communication functions.

Pin assignment			Communication specifications		
No.	Item		Signal format	RS-232C/RS485	
1	FG (Frame GND)		Baud rate	9600 bps	
2	RS-232C RxD		Bit Configuration	Start	1 bit
3	RS-232C TxD			Data	8 bits
4	RS-485 B(-)			Parity	even
5	GND			Stop	1 bit
6	RS-485 A(+)		Data Configuration	Code of character	JIS code
7				Terminator	CR code
8	RS-485 Terminator			Numerical data(Response)	BCD [1]
9	RS-485 Terminator		1) The response data of command B8 and B9contains BIN in part.		

9 5
6 1

Specifications

Pump side connector	D-sub 9pin female
Compatible connector	D-sub 9pin male
Compatible wire size	AWG #22

List of communication commands : Please refer to attached material in the end of a book for the communication command and the connection of the communication connector.(b. Supplementation of the communication system).

Command	I/O	Contents	Supplement
A0	OUT	System status read-out	Microcomputer status
A1	IN	Stop command	
A2	IN	Start command	
A3	OUT	Status read-out	Pump status (normal or abnormal)
A5	OUT	Valve status read-out	Seal gas valve. Gas ballast gas valve. Option valve.
A8	IN	Remote/local selection	
A9	IN	Alarm reset	
B1	OUT	Display read-out at start	Pump status by item
B2	OUT	Alarm log read-out	Alarm log up to 30 cases in the past [1]
B3	OUT	Warning read-out	
B4	OUT	Alarm read-out	
B8	OUT	Run log read-out	Run status at every 30 seconds for the past one week
B9	OUT	Current status read-out	Loads current run status in a batch
C5	IN	Baud rate setting	
C6	IN	RS485 address setting	
D0	OUT	Model read-out	
D2	OUT	Serial No. Read-out	
D4	OUT	Clock read-out	

1) Run log: It records every minute between 30 minutes after the pump starts. And after the pump stops, run log of one minute is recorded. Run log is recorded every minute when warning occurs.When alarm occurs after 30 minutes pass by starting the pump, run log is recorded 16 minutes from 15 minutes before alarm occurs to 1 minute after alarm occurs.

⚠ **CAUTION** Noting when communicating by RS-485.

●Please input the 3 digits of " : n n" (JIS code) before the command when you order the command from the host side.

: _n n_ [Command name] ＊The command is the same as the RS-232C communication.
colon address command

●The response code from the pump side is the same as the RS-232C communication.

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3. Operation Procedure
3.1 Flowchart for operation
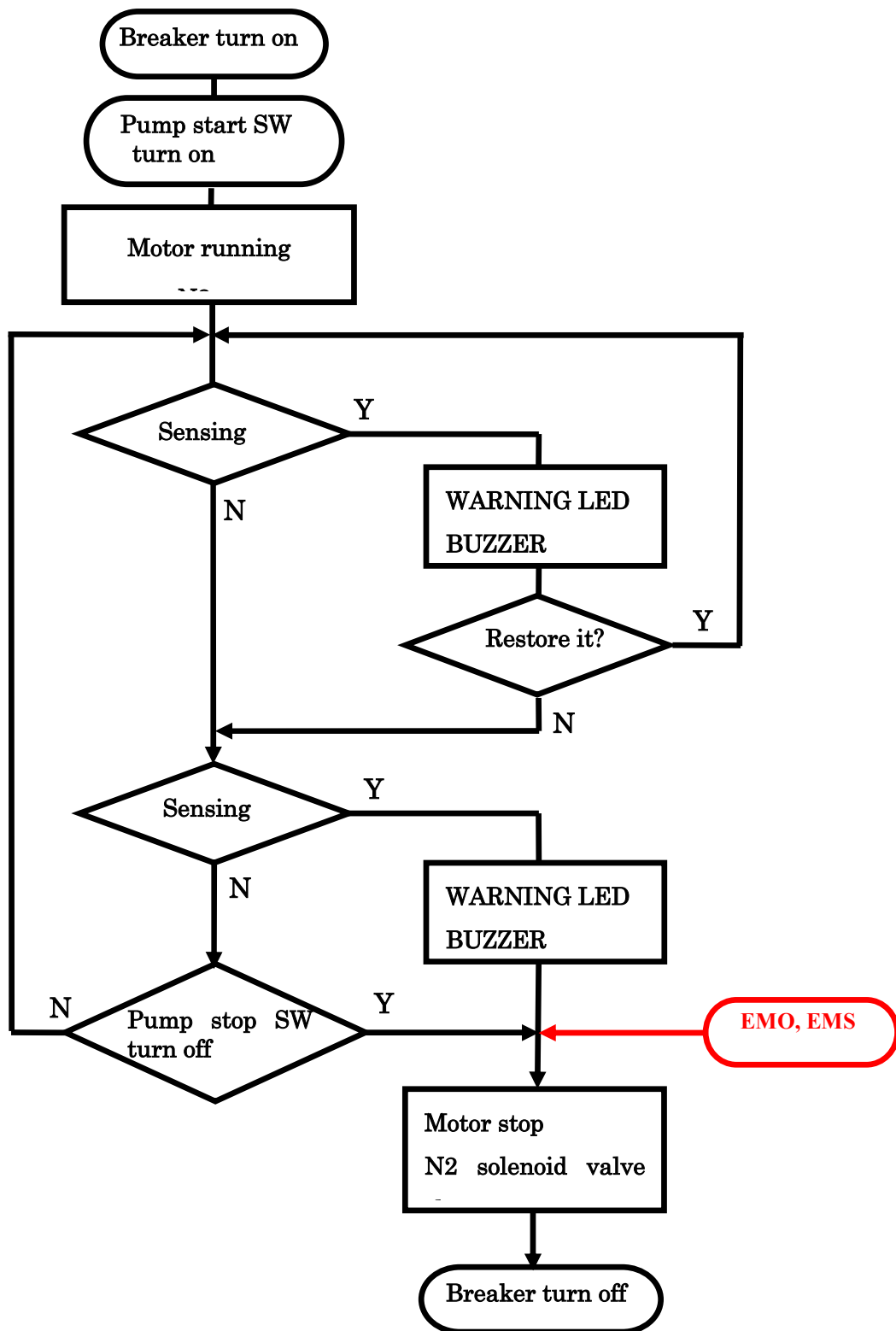
3.2 Prior Operation

1. Ensure that all the piping and wiring works are completed.

2. Open the cooling water valve, and ensure that no water leakage is observed.

3. Turn the nitrogen regulator fully counterclockwise, and open supply valve, and ensure that no nitrogen gas leakage is observed.

4. Turn ON the host equipment breaker (M/D).

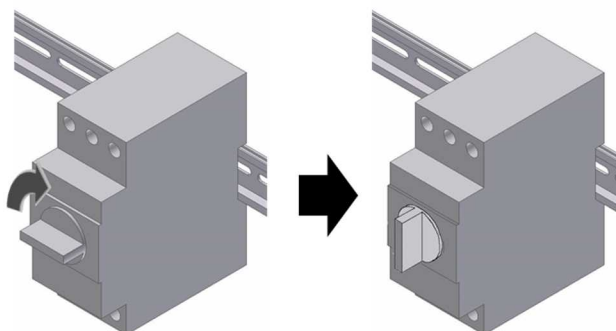5. Turn ON the breaker (UR421 series: MCB1 / UR3601 series: MCB1 and MCB2) on the pump.

⚠ **CAUTION** "Initialize" is displayed for initialization and operation cannot be performed immediately after the breaker is turned ON. Perform the following operation after verifying that "Waiting" appears about 30 seconds later.

Connect Power Connector
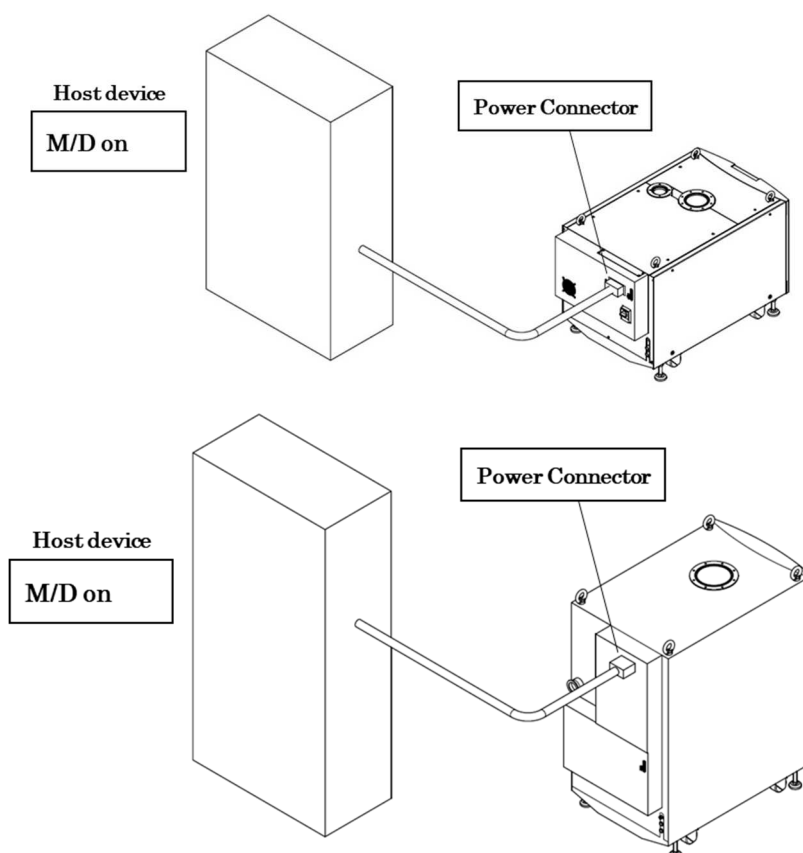
MCB1/MCB2 Operational procedure

Turn the lever clockwise

3.3 Selecting LOCAL (manual)/REMOTE

	Switch to use
(a) Local (manual) operation Mode for manual start and stop of the pump (b) Remote operation Mode for starting and stopping the pump by switch operation on the system. The run mode is selected with the REMOTE/LOCAL switch on the controller.	REMOTE /LOCAL ◯

3.4 Start and Stop

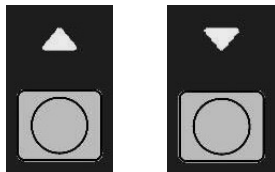| LOCAL operation		
	1. [CONDITION /STAND-BY] or status is displayed on the controller display.	Switch to use
Run	2. Press the [START] switch on the controller.	START ◇ ◯
	3. The pump starts and the [RUN] lamp on the controller lights.	
	4. [CONDITION / RUNNING] or status is displayed on the controller display.	
Stop	1. Press the [STOP] switch on the controller.	STOP ▽ ◯
	2. The pump stops and the [RUN] lamp on the controller goes off.	
	3. [CONDITION /STAND-BY] or status is displayed on the controller display.	

REMOTE operation	
Run	Turn on Pump start signal. The pump starts.
Stop	Turn off Pump start signal. The pump stops.

3.5 Checking the Pump Run Status

This pump is equipped with multiple sensors, allowing the pump status to be checked on LCD.

<Operation> (example)

Operation	Controller display
1. Turn ON the breaker.	CONDITION / STAND-BY
2. Start the pump.	CONDITION / Running
3. Display an item to check using [∇] or [Δ] switch.	N2 Purge Flow 4.3 SLM ↓ Water Flow 3.0 L/min ↓ DRP Pump TEMP 55℃

If an item selected last is left as it is for one minute or more, the subsequent display during pump start will be that item.
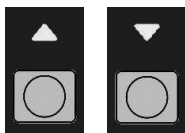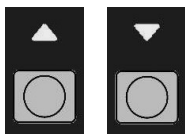
List of monitor items (standard specification)

Display item	Display content	Unit of display
CONDITION	Displays the pump run status.	-
N2 Purge Gas	Displays the N₂ purge gas (seal, ballast) flow rate.	SLM
WATER FLOW	Displays cooling water flow rate.	L/min
EX. PRESS.	Displays the pressure of exhaust pipe. (The setting in the options)	MPa
DRP revolution	Displays the primary pump run frequency	rpm
MBP revolution	Displays the mechanical booster pump run frequency	rpm
DRP POWER	Displays the motor input power of primary pump.	kW
MBP POWER	Displays the motor input power of mechanical booster pump.	kW
DRP PUMP TEMP.	Displays primary pump temperature.	°C
MODE	Displays the pump run mode.	-
OPTION VALVE	Displays the state of the option valve.	-
Auto Purge Time	Displays the setting time of the auto purge-function.	Sec
CONTACT	Displays the setting-output of the contact function. (A or B contact)	-
Running Time	Displays integrated pump run hours.	Hr
Time	Displays the current time and date.	yy/mm/dd /time
LANGUAGE	Displays the selected language.(Japanese or English)	-

3.6 Set item change

- There are two kinds of set items when you change the set item with the pump of UR421/3601 series.
- 『SET-UP 1』 is not protected by the password, and set value can be changed according to the specification.
- 『SET-UP 2』 is protected by the password, and set value cannot be changed because it is related to the performance of the pump.

Method of changing set value. (Items that are managed in "SET-UP 1")

Operation	Switch to use
1. By pressing the [MODE] switch several times, 『SET-UP1』 is displayed in LCD.	MODE
2. Press [ENTER] switch. (『SET-UP 1』 can be selected by pressing [ENTER].)	ENTER
3. The change item is displayed in LCD by pressing [△], [▽].	▲ ▼
4. The change item can be selected by pressing [ENTER].	ENTER
5. A set value is changed pressing [△], [▽].	▲ ▼
6. The change of a set value ends when fixing it pressing [ENTER].	ENTER
7. Display the Pump Run Status in LCD by pressing [MODE] when the change of a set value ends.	MODE

Set item managed by 『SET-UP 1』[1]		
No.	Title displayed in LCD	Supplementary explanation
1	『CONTACT』	The output signal setting of remote control. (Contact A / Contact B)
2	『Time』	Sets the current date and time.
3	『LANGUAGE』	Select the language you want to view. (JAPANESE / ENGLISH)
4	『RS BAUD』	Set the baud rate according to the equipment connected when RS232C/485 is used.
5	『RS485 ADDRESS』	The address is the No. of the branch-wired pump when RS485 is used. Up to maximum 16 can be branched.
6	『START CHECK』	Start check sets a timing to issue the signal of start check. (『Start check mode 1』 / 『Start check mode 2』) *For more detail, please refer to 2.4.2 "Wiring for remote control".
7	『W.PSC』[2]	Configure whether or not to control the rotational speed of the pump, when receiving the signal of "WAITING MODE". (『0』 → OFF, 『1』 → ON, 『2』 → AUTO RETURN) *For overview, please refer to 2.4.2 "Wiring for remote control".
8	『W.N2 ALARM』[2]	Configure whether or not to monitor the N2 purge gas ALARM, when receiving the signal of "WAITING MODE". (『0』 → Do not monitor, 『1』 → Monitor)
9	『W.DGV』[2]	Configure whether or not to open the N2 gas ballast gas valve, when receiving the signal of "WAITING MODE". (『0』 → CLOSE, 『1』 → OPEN)
10	『W.DSV』[2]	Configure whether or not to open the N2 purge gas valve, when receiving the signal of "WAITING MODE". (『0』 → OPEN, 『1』 → CLOSE)
11	『W.READY』[2]	Configure whether or not to output the "READY" signal, when receiving the signal of "WAITING MODE". (『0』 → "OFForON", 『1』 → Continue to "ON" ,『2』 → OFF)
12	『W.WARNING BZ』[2]	Select whether or not to output the buzzer, if any WARNING occur during receiving the signal of "WAITING MODE". (『0』 → "BZ ON", 『1』 → "BZ MUTE")
13	『W.N2 WARNING』[2]	Configure whether or not to monitor the N2 purge gas WARNING, when receiving the signal of "WAITING MODE". (『0』 → Monitor, 『1』 → Do not monitor)
14	『W:WARNING BATCH』[2]	Configure whether or not to output the "Warnings ina batch, if any WARNING occur during receiving the signal of "WAITING MODE".(『0』 → Output, 『1』 → Do not output)
15	『MBP RUN』[2]	Set to drive the primary pump only if you want. (『0』 → Drive both primary and mechanical booster pump, 『1』 → Drive the primary pump only)

1) About factory default settings, please refer to 3.7 List of set items.

2) Items of No.7-14 need to be set only when "WAITING MODE" is valid. ("WAITING MODE" is optional.) Therefore, the standard products (or which "WAITING MODE" is not valid), are not required the change of setting from the factory default. For more details of "WAITING MODE", please contact our service center.
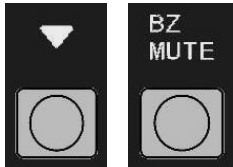
	CAUTION	Set item managed by 『SET-UP 2』 is protected by the password. The customer cannot change the setting. When you want to change these set values after purchase the product, please contact with your local service center.

Set item managed by 『SET-UP 2』			
1	『N2 Purge Gas』	14	『BOX option 1』
2	『OP N2 Purge Gas』	15	『BOX option 2』
3	『WATER FLOW』	16	『DRP PUMP TEMP.』
4	『EX.PRESS.　WARN』	17	『MBP PUMP TEMP.』
5	『EX.PRESS.　ALM』	18	『EX.PIPE TEMP.』
6	『DRP revolution』	19	『OPTION TEMP.』
7	『MBP revolution』	20	『BOX OP. SWITCH』
8	『option 1』	21	『MODE』
9	『option 2』	22	『OPTION VALVE』
10	『DRP POWER WARN』	23	『Auto Purge Time』
11	『DRP POWER ALM』	24	『Running Time』
12	『MBP POWER WARN』	25	『N2 SENSOR』
13	『MBP POWER ALM』		

Run Mode

The pump can be run in the following modes.

Mode 1	Both seal gas and gas ballast gas are not used.
Mode 2 [1]	Seal gas is used, but gas ballast gas is not used. (The solenoid valve opens when the pump starts.)
Mode 3	Both seal gas and gas ballast gas are used. (The solenoid valve opens when the pump starts.)
Mode M	Manually controls the seal gas valve and gas ballast gas valve.
In the Mode M, the seal gas valve and gas ballast valve can be controlled as follows.	
The gas ballast gas valve (SV2) can be opened/closed by pressing [∇] and [BZ.MUTE] switches on the controller simultaneously.[1]	▲ BZ MUTE
The seal gas valve (SV1) can be opened/closed by pressing [∆] and [BZ.MUTE] switches on the controller simultaneously.	▼ BZ MUTE

About optional specifications

* The personal computer used for this pump permits control of multiple functions to cope with a variety of applications. Items displayed differ depending on the additional functions. Refer to the list of set items for individual functions.

3.7 List of set items

⚠ **CAUTION**

- "WARNING" indicates that the pump is approaching the limit of operation. But at this moment, the pump is still running. "ALARM" tells that the pump has exceeded the limit of operation, and simultaneously with it, the pump will stop automatically.
- Pump temperature and motor power settings differ from model to model.

ULVAC

UR421-T

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	5 SLM	Lower limit alarm	5 sec fixed	180 sec	5 sec after run to run stop
2	OP_N2 purge gas	0.0 SLM	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
3	Cooling water	4.0 L/min	Lower limit alarm	5 sec fixed	180 sec	5 sec after run to run stop
4	Pumping pressure WARNING	0.120 MPa	Higher limit alarm fixed	10 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.130 MPa	Higher limit alarm fixed		2 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 4700 rpm, rated revolution 4700 rpm				
7	MBP_INV frequency	Intermediate revolution 0000 rpm, rated revolution 0000 rpm				
8	Analog input spare 1 (10V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
9	Analog input spare 2 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
10	DRP POWER WARN	99.9kW	Upper limit alarm	20 sec		15 min after run to run stop
11	DRP POWER ALM	99.9kW	Upper limit alarm		20 sec	3 min after run to run stop
12	MBP POWER WARN	0.00kW	Upper limit alarm	20 sec		5 sec after run to run stop
13	MBP POWER ALM	0.00kW	Upper limit alarm		20 sec	5 sec after run to run stop
14	BOX analog input spare 1 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
15	BOX analog input spare 2 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
16	DRP temperature	Higher limit 135°C Ready90°C,HTcont. 115℃		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C, HT cont. 0℃		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 0°C Ready 0°C, HT cont. 0℃		5 sec fixed	0 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C, HT cont. 0℃		5 sec fixed	0 sec	5 sec after run to run stop
20	Spare switch on box	b contact open alarm fixed		5 sec fixed	0 sec	5 sec after run to run stop
21	Run mode	3				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	N2 SENSOR	0				
25	A/B contact	B contact				
26	English/Japanese	English				
27	Baud rate setting	9600 bps				
28	RS485 address setting	00				
29	Start check	1				
30	W.PSC	0				
31	W.N2 ALARM	0				
32	W.DGV	0				
33	W.DSV	0				
34	W.READY	0				
35	W.WARNING BZ	0				
36	W.N2 WARNING	0				
37	W:WARNING BATCH	0				

UR3601-TT

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	5 SLM	Lower limit alarm	5 sec fixed	180 sec	5 sec after run to run stop
2	OP_N2 purge gas	0.0 SLM	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
3	Cooling water	4.0 L/min	Lower limit alarm	5 sec fixed	180 sec	5 sec after run to run stop
4	Pumping pressure WARNING	0.120 MPa	Higher limit alarm fixed	10 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.130 MPa	Higher limit alarm fixed		2 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 4700 rpm, rated revolution 4700 rpm				
7	MBP_INV frequency	Intermediate revolution 5000 rpm, rated revolution 5000 rpm				
8	Analog input spare 1 (10V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
9	Analog input spare 2 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
10	DRP POWER WARN	99.9kW	Upper limit alarm	20 sec		15 min after run to run stop
11	DRP POWER ALM	99.9kW	Upper limit alarm		20 sec	3 min after run to run stop
12	MBP POWER WARN	99.9kW	Upper limit alarm	20 sec		5 sec after run to run stop
13	MBP POWER ALM	99.9kW	Upper limit alarm		20 sec	5 sec after run to run stop
14	BOX analog input spare 1 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
15	BOX analog input spare 2 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
16	DRP temperature	Higher limit 135°C Ready 90°C, HT cont. 115℃		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 140°C Ready 85°C, HT cont. 90℃		5 sec fixed	180 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 150°C Ready 0°C, HT cont. 130℃		5 sec fixed	180 sec	5 sec after run to run stop
19	Option temperature	Higher limit 120°C Ready 90°C, HT cont. 100℃		5 sec fixed	180 sec	5 sec after run to run stop
20	Spare switch on box	b contact open alarm fixed		5 sec fixed	0 sec	5 sec after run to run stop
21	Run mode	3				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	N2 SENSOR	0				
25	A/B contact	B contact				
26	English/Japanese	English				
27	Baud rate setting	9600 bps				
28	RS485 address setting	00				
29	Start check	1				
30	W.PSC	0				
31	W.N2 ALARM	0				
32	W.DGV	0				
33	W.DSV	0				
34	W.READY	0				
35	W.WARNING BZ	0				
36	W.N2 WARNING	0				
37	W:WARNING BATCH	0				
38	MBP RUN	0				

Explanation of Set Items

(1) The list above shows the default values of standard settings.

(2) This pump gives the following two types of WARNING and ALARM signal.

(a) When the number of set value is one and the pump is to be stopped at a certain time
The pump displays ″N$_2$ Purge Gas″ if DRP N2 purges gas becomes lower than the WARNING set value of 0.5L/min and this condition continues for more than the WARNING set time of 5.0 sec. If the purge gas flow rate is not corrected and the ALARM set time has passed 180 seconds, ALARM will be given and the pump will stop automatically. The same applies to ″N$_2$ FLOW OPTION″, ″WATER FLOW″ and ″DRP PUMP TEMP″. Also set items include flow rate set value and set time.

(b) When values can be set individually to WARNING and ALARM
The pump gives ″ Pumping pressure ″ WARNING if the motor power has exceeded the WARNING set value of 0.12MPa and this condition continues for more than WARNING set time of 10 sec. If the ALARM set value of 0.13MPa is exceeded for the ALARM set time of 2 sec, ALARM will be given and the pump will stop automatically. Set items include four: WARNING set value and set time and ALARM set value and set time.

(3) If the alarm set value is 0, the item will not be monitored.

(4) In the item of temperature, the initial set value (H) is the alarm set value. The next set value (R) is the READY signal set value when temperature rise is completed. The third set value is used when controlling the heater using this input. Temperature is controlled within the range of set temperature $\pm 3°C$.

(5) Auto purge delays the time of closing the N2 purge gas valve when stopping the pump. Enter delay time.

(6) Set the baud rate according to the equipment connected when RS232C/485 is used. The baud rate is 9600bps as standard, but it can be changed to 2400bps or 4800bps if required.

(7) The address is the No. of the daisy-chain-wired pump when RS485 is used. Up to maximum 16 can be chained.

(8) Start check sets a timing to issue the signal of start check. In the case of 1, the signal of start check is issued by confirming that the pump is rotating at the specified revolution. In the case of 2, the signal of start check is issued one second later when start switch of the controller is pushed. In addition, when intermediate revolution and rated revolution are same (DRP_INV frequency / MBP_INV frequency), the signal of start check is issued one second later when start switch of the controller is pushed regardless of start check = 1 or 2.

⚠ **CAUTION**

Pin.No
+
14

Equipment which shows Ready signal in device. (Relay etc.)

−
19

DC24V 50mA or less

SG
Circuit in base
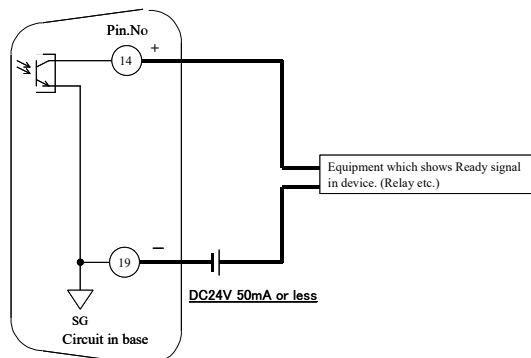
Example of using Ready signal.

- When the temperature of the pump is low, and the process is done, the process gas is cooled in the pump.

- Driving the pump because a sublime material adheres in the pump according to the kind of the gas might become impossible. Please confirm Ready signal of the temperature of the pump to avoid such trouble.

- Ready signal is Pin.14 of (2.4.2 Wiring for remote control)

- If the temperature of the pump rises up to the preset temperature, Pin.No14 and No19 close.

3.8 Preliminary Operation (Setting of Utilities)

Setting of secondary utilities (pump side) should be done after starting the pump.

⚠ **CAUTION**
- The maximum exhaust pressure is 0.10 MPa (absolute pressure). In excess of this, the seal members may be damaged or overheated, resulting in trouble. Installation of a pressure gauge that can monitor the exhaust pressure is recommended.
- Always use the pump with the check valve installed. Otherwise, exhaust-side gas may back-stream abruptly when the pump is stopped and may damage the drive control system of the pump.
- Before starting the pump, check the primary utility setting. Until all the utility setting is fulfilled, the pump cannot start because the safety circuit activates.
- If valve is fixed at the downstream of the outlet port, then check the valve is opened.

Start the pump

3.8.1 Setting of Nitrogen Gas Pressure

Open the valve on the supply side to apply nitrogen gas pressure.

The regulator is factory locked. Pull the knob until it clicks to unlock it and regulate the pressure on the pump side to 0.05 ~ 0.12 MPaG (gauge pressure).

⚠ **CAUTION**
- If pressure is increased to above 0.9 MPaG, the solenoid valve in the pump will be disabled.
- Regulate the flow rate after the pump has started. Refer to 『1.2 Specifications for utilities』 for the flow rate and pressure setting conditions.

Nitrogen gas pressure varies with consumption. Re-regulate the secondary pressure to the specified value of 0.05 ~ 0.12MPaG (gauge pressure) after regulate it for consumption.
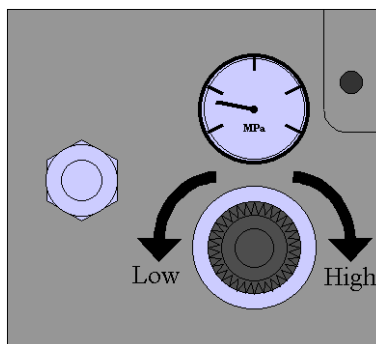
3.8.2 Setting the seal gas flow rate

The seal gas flow rate is controlled by a fixed orifice. Gas flows at a rate of 5.0 SLM within the range of 0.05 ~ 0.12 MPaG. Regulation is not required.
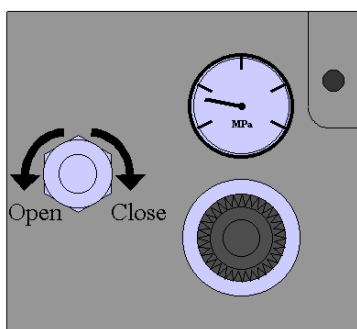
3.8.3 Setting the gas ballast gas flow rate (in mode 3)

After the pump has started, set the gas ballast gas flow rate according to the process.

| ⚠ CAUTION | - If gas ballast gas is fed, the ultimate pressure will higher (about 10 Pa at 45 SLM). |

For the adjustment, use the gas ballast gas-regulating valve on the front panel.

3.8.4 Setting the cooling water flow rate

| ⚠ CAUTION | - If the pump is operated for a long time with insufficient cooling water, the pump may fail. Always feed cooling water at the prescribed flow rate. |
| | - Regulate the cooling water flow rate to 5.0L/min using the primary pressure or cooling water flow rate control valve in the system. |

3.9 Operation

Please contact with your nearest service center in order to avoid occurring an alarm or a failure, if the pump can be used under following conditions.

| ⚠ CAUTION | - Don't use the pump under a continuous heavy load (e.g. a slow pumping) for a long time in a tact operation. In this case, the pump may be broken down due to a heavy load. The pump was designed in order to evacuate a closed vacuum chamber without a leak. |
| | - Don't use the pump under a continuous heavy load for more than one minute at a start-up. .If the pump cannot reach the stationary rotational frequency within one minute at a start-up, the pump will be stopped due to working a protection circuit of an inverter. An alarm of "MBP Power E alarm" is displayed in the controller, and the pump will be stopped. |

3.10 stop

Stop the pump.

DANGER

- The pump is very hot during operation and for some time after it stops. Contact with it may cause burn. Feed cooling water for about one hour after the pump is shut down. Never remove the external panel until the pump cools down.

- Contact with electric parts, wiring or others in the panel may cause electric shock. Never run the pump with the external panel removed.

- Suction and the exhaust pipe are 70℃ or more. Remove them after about one hour after the pump is shut down.

3.11 Self-Diagnostic Function

The operating state is always monitored for the monitor items mentioned earlier. When abnormality occurs

Operation	Controller display
0. Normal Operation	CONDITION/Running
1. If pump operation is continued without meeting the requirements, WARNING will be given on LCD and as remote signal.	Pump temperature High – WARNING
2. If the condition in (1) continues for a certain length of time or if the operation limit value is reached, ALARM will be given on LCD and as remote signal. Pump automatically stops.	Pump temperature High – ALARM

- The WARNING LED on the controller will light and the buzzer will sound if any trouble occurs. (The pump is running in this state.)
- If the pump is stopped when the WARNING signal is given, the signal will be held even after stop.
- When the pump stops automatically, the ALARM signal will be held even after the stop.
- To reset these signals, press the RESET switch.
- ALARM signal will not be given when the pump is at stop.
- If two or more troubles occur during operation, * will be displayed at extreme end of the item. In this case, other items can be checked by pressing [Δ] or [∇] key.
- The present value of the item for which alarm is given can be checked by pressing the [MODE] key when the item is displayed on the alarm display screen.

3.12 Logging Function

・ Records the time items of ALARMS and WARNINGS were given up to maximum 100 events.
・ When the [MODE] switch is pressed, **"SITUATION RECORD DATA"** is displayed.
・ Pressing the [∇] or [△] switch displays the items in occurrence order.
・ Can be checked during run.

Display example	Cooling water low<ALM>0101071435
Display content	Stopped due to low cooling water flow rate at 2:35 pm on January 7, 2001.

4. Inspection And Maintenance

4.1 Inspection

- Periodically check (it is recommended to check once a day) the controller or the remote operation output to see if any alarming signal is output. Also check the log data to see if any alarming data is reported.
- If alarming signal is displayed, take steps according to the **TROBLE SHOOTING.**
- When the pump is contaminated, wipe out it with a dry rag.

4.2 Maintenance

-When any trouble occurs, please contact with your local service center (please refer to the ULVAC service center address list at the end of this manual).

< Maintenance period >

It is recommended to overhaul the pump once a year.
The bearing on the vacuum side uses grease for lubrication. Replace the bearing once a year, as rule, though the frequency changes with use and application of the pump. It is important to maintain the performance (safety is included) and keep the programmed production. (However, the exchange period is different depending on use conditions)

When overhauling it, parts for which the exchange is necessary.

Part name	Model name	Part name	Model name
Bearing	All models	Power lock	All models
O-ring	All models	Vacuum pump oil	All models
Teflon seal	All models	Nylon tube	All models
Ball	All models		

Parts for which exchange is necessary every two years.

Part name	Model name	Part name	Model name
Bearing case	All models	Slinger	All models
Seal sleeve	All models	Exhaust pressure sensor	All models
Bellows	UR3601 series		

Parts for which exchange is necessary every three years.

Part name	Model name	Part name	Model name
Pressure diameter for purge gas	All models	Regulator	All models
Caster	All models	Solid state relay	All models
Thermostat	All models	Heaters	All models
Cylinder [2]	All models	Rotor shaft [2]	All models
Side-cover [2]	All models		

Parts for which exchange is necessary every five years.

Part name	Model name	Part name	Model name
Electrical parts [1]	All models	Motor [1]	All models
Vibration-proof rubber	All models		

1) Although there are differences due to the use environment, if the degradation are observed they are the exchanges.

2) When the size is measured, and the warp is confirmed, they are the exchanges.

When overhaul is required, please contact with your local service center. All overhaul will be performed at our service center.

< Removal procedure >

Power wiring

| ⚠ | **DANGER** | Shutoff the power securely according to the diagram below before starting installation or removal work. |

<< Electric shock is possible >>

You should not operate this system unless you have electrical safety training course record.

1. Shut off the breaker (UR421 series: MCB1 / UR3601 series: MCB1 and MCB2) of the pump.
2. Ensure that LCD of the controller (PCTL) is off.
3. Shutoff the breaker (M/D) of the host equipment.
4. Make lockout and tag-out according to the host equipment instruction manual.
5. Through current indication lamp, which may be provided in the host equipment, ensure that wire is not alive.
6. Remove power connector.

MCB1/MCB2 Operational procedure
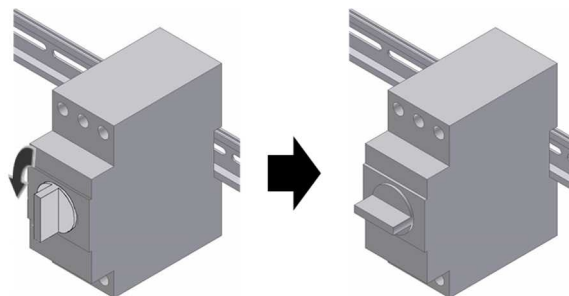
Turn the lever counterclockwise

Remove Power Connector
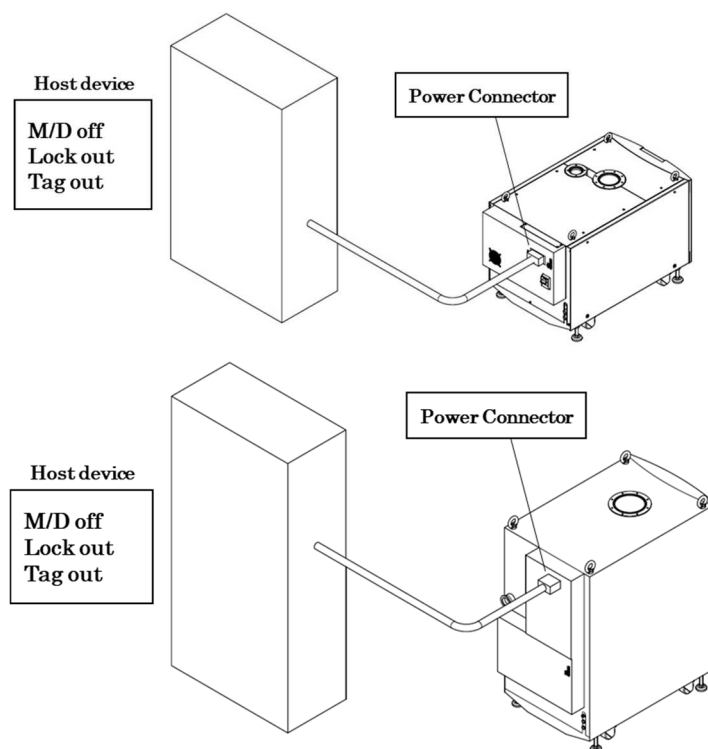
Cooling water

⚠ **WARNING**
- Because cooling water in the pump boils when the collaboration of cooling water is removed immediately after the stop of the pump and pressure rises the sensor and piping might be damaged. Please supply cooling water until the temperature of the pump falls.
- The pump is very hot during operation and for some time after it stop. Contact with it may cause burn. Feed cooling water for about one hour after the pump shut down.
- Close the cooling water supply valve (HWSV). After the valve is closed, tag **CLOSE** sign on the grip.
- Through visual flow gauge (HWFM: e.g. flow sight) on the host equipment ensure that flow is shutoff.

Please do the following work when you drain cooling water from the pump.
1) Compress air is introduced from 『Cooling water outlet』 of the pump.
2) Work ends if compress air is exhausted from 『Cooling water inlet』.

Remove piping after confirming as mentioned above.

Nitrogen Gas

⚠ **WARNING**
- Close the nitrogen gas supply valve(HPSV) on the host equipment. After the valve is closed, tag **CLOSE** sign on the grip.
- Gas will still remain in the host equipment piping. Place pressure gauge on the host equipment nitrogen supply source (halfway of the piping to the pump), and ensure that the pressure has already down within atmospheric pressure.

Remove piping after confirming as mentioned above.

Suction and exhaust gases

<< High temperature surface >>

Be careful of the high temperature surface near this label (intake and exhaust outlet...).

⚠ **WARNING**
- Remove the piping according to the manual provided for the host equipment.
- Suction and exhaust pipe is very hot for some time after pump stop. Remove the protection cover after about one hour after the pump is shut down.
- Completely close the inlet and outlet ports with using closing flange

Shipping

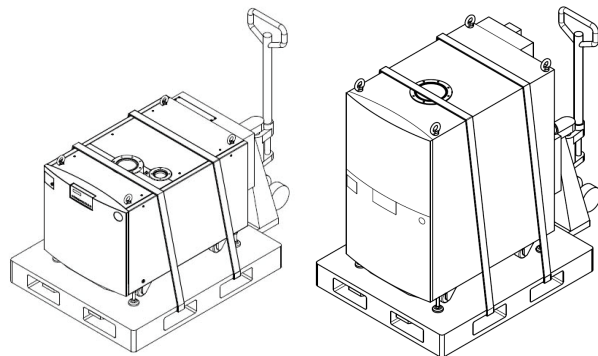| ⚠ **DANGER**	- Forklift should not directly be placed under the pump base bottom. This could drop or topple the pump. If you want to transit with a forklift, this must be loaded onto a pallet, fixed with jacks and surely bound with a palette by lashing belts, etc.

⚠ **WARNING**	- Although this pump is provided with casters, do not move it a long distance using these casters. If you move this pump in such a way, the load to move the pump exceeds the safety criterion. You could hurt your waist.

When to transit the pump, you should use loading machines (e.g. moving crane) and hang it, or load and fix the pump with the jacks on a pallet and surely bind with a palette by lashing belts, etc. then transit it by pallet truck.

Crane hanging figure　　　　　　Palette transportation figure

⚠ **DANGER**	- Pallet truck should not directly be placed under the pump base bottom. This could topple the pump.

⚠ **CAUTION**	- Do not tilt the pump by more than 10°.

⚠ **CAUTION**	- Please install a transportation jig when you carry out the pump. (UR3601 series)

4.3 TROUBLESHOOTING

4.3.1 Major Troubles

Symptom	Cause	Corrective action
Power cannot be applied.	Power is not supplied.	Supply power.
	Incorrect wiring of connector	Correctly make wiring connection. (Refer to 2.6.1 Power wiring)
	Leak in pump	Disassemble and repair pump.
No indication on display	Breaker is not turned on.	Turn on breaker.
	Failure of instrumentation	Replace instrumentation.
Controller cannot activates the Pump.	LOCAL mode is not selected.	Press REMOTE/LOCAL switch on controller.
	STOP SWITCH is turned on.	Turn off STOP SWITCH.
	"EMERGEMCY STOP" is displayed.	Emergency stop pin of remote operation connector is not shorted. (Refer to 2.6.2 Wiring for remote control)
	"INTERLOCK" is displayed.	External interlock pin of remote operation connector is not shorted.
	Failure of instrumentation	Replace instrumentation.
Pump does not start by remote operation.	REMOTE mode is not selected.	Press REMOTE/LOCAL selector switch on controller.
	Failure of instrumentation	Replace instrumentation.
Unusual sound is heard from pump.	Panel is vibrating	Contact with service center Check by ULVAC personnel
	Exhaust sound	Sound may be high due to resonance in the piping when gas is being fed. Use a pipe with a thicker wall to suppress the sound.
	Failure of the pump	Contact with service center Check by ULVAC personnel
	Backing pressure rise	Check the exhaust piping.
	Leakage at inlet port	Check the piping. Repair the trouble.
Pressure does not lower.	Intake port wire netting is clogged.	Check the piping at the upstream of the PUMP.
	Pump operating temperature is not static.	Measure again one hour later. The ultimate pressure in the "Specifications" is the value directly above the pump.

4.3.2 In Case of Alarm Signal

Display	Symptom	Cause	Corrective action
N$_2$ PURGE GAS LOW ALARM	Purge gas flow rate low	Flow rate regulating valve is closed.	Open the flow rate-regulating valve.
		Insufficient difference pressure at inlet/outlet ports	Increase supply pressure from host equipment.
		Insufficient supply of gas	Increase supply of gas.
		Clogged piping	If the trouble is in the pump, contact with service center. Repair by ULVAC
		Leak in joint	
		Failure of instrument	Contact with service center, repair by ULVAC,
WATER FLOW LOW ALARM	Cooling water flow rate low	Flow rate regulating valve is closed.	Open the flow rate-regulating valve.
		Insufficient difference pressure at inlet/outlet ports	Increase supply pressure from host equipment.
		Insufficient supply of gas	Increase supply of gas from host equipment.
		Clogged piping	If the trouble is in the pump, contact with service center. Repair by ULVAC
		Leak in joint	
		Failure of instrument	Contact with service center. Repair by ULVAC
DRP/MBP PUMP TEMP HIGH ALARM	Abnormal increase of pump temperature	Environment temperature is high.	Lower the environment temperature.
		Insufficient cooling water	Open the flow rate-regulating valve.
		Failure of instrument	Contact with service center. Repair by ULVAC
		Increase of backing pressure	Clean and wash the exhaust pipe.
		The inlet pressure is high. (only booster pump units of HR series.)	Usual pressure is operating the range that is from the ultimate pressure to 200Pa.
Exhaust TEMP HIGH ALARM	Abnormal increase of exhaust pipe temperature	Environment temperature is high.	Lower the environment temperature.
		Exhaust pressure is high. (>0.13Mpa)	Clean and wash the exhaust pipe. (Reverse-valve)
DRP/MBP PUMP, Exhaust, Option TEMP E ALARM	Failure of temperature sensor	Disconnection of the sensor wiring, contact of the connector, PC board portion bad connection.	Contact with service center. Repair by ULVAC

Display	Symptom	Cause	Corrective action
DRP/MBP CURRENT HIGH ALARM	Overload of motor	Increase of backing pressure	Clean and wash piping at downstream of pump
		Failure of instrument	Contact with service center. Repair by ULVAC
		Rotation disabled by foreign substance	
		Rotation disabled by low flow rate	
		Rotation disabled by damaged bearing	
DRP CURRENT E ALARM	Cut-off of the electromagnetic switch	Malfunction of the electromagnetic switch	Contact with service center. Repair by ULVAC
		Failure of disconnection and instrumentation products	
MBP CURRENT E ALARM	Inverter alarm activation	Breaker not turned.	Turn on the breaker.
		By the high load operation at startup, does not reach the steady rotation within the specified time.	Avoid exhaust immediately after start-up.
		Failure of disconnection and instrumentation products	Contact with service center. Repair by ULVAC
DINV/MINV Err65	Inverter alarm activation	Rotor shafts cannot be rotated. Bearings would be broken	Contact with service center. Repair by ULVAC
RS232C ERROR	Communication error between controller and main PC	Disturbance of the transmitted signal due to noise, etc.	Improvement of the device side noise environment Strengthening of the grounding line
		ROM/RAM data destroyed by static electricity, etc.	Contact with service center. Repair by ULVAC
		Failure of instrument	
		Controllers and PC software version is not compatible.	
SYSTEM ERROR	PC program out of control Control power output low	Watch dog circuit actuated	Turn off power and turn it on again.
		Low output of control power in pump	Contact with service center. Repair by ULVAC
		Short-circuit of 24VDC line	
		Short terminal of program down-load JP1 misconnection	
OPPOSITE TURN	Abnormally of the main PC	Failure of the PC board program.	Contact with service center. Repair by ULVAC

5. Warranty Clauses

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

5.1 Warranty Product
(1) Dry Vacuum Pump: UR421-T
(2) Dry Vacuum Pump: UR3601-TT

5.2 Warranty Period
(1) Domestic transaction: one year after shipping date from ULVAC.
(2) Direct export transaction: one year after date of B/L

5.3 Warranty scope
(1) Domestic transaction:
 - For a product at the time of delivery with a damage because of trouble during transportation.
 - For a product not satisfying the basic specification in spite of using the product within the service condition (temperature range, power supply, etc).
(2) Direct export transaction:
 - For a product at the time of delivery with a damage because of trouble during transportation. However, for an international direct trade, it shall conform to the warranty coverage of international merchandise trade condition (INCOTERMS etc) defined at the time of each trade.
 - For a product not satisfying the basic specification in spite of using the product within the service condition (temperature range, power supply, etc).

5.4 Disclaimer

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

5.5 How to Respond

(1) Domestic transaction:
An alternative is delivered or the product is sent back to us or the nearest our service center for repair. If it is necessary to respond on site, contact our Components Division, or the nearest sales office or agency for assistance.
(2) Direct export transaction:
An alternative is delivered or the product is sent back to us or the nearest our service center for repair. The return cost shall be borne by the customer.
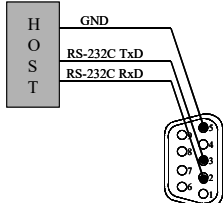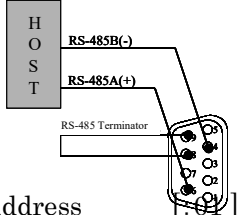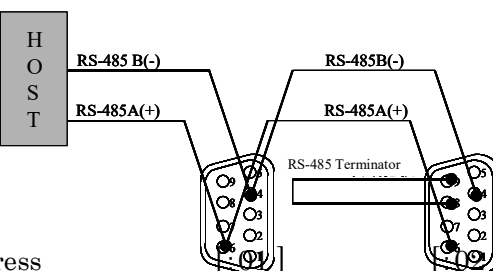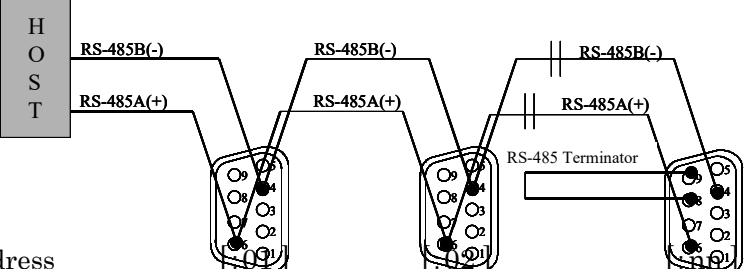
5.6 Others

(1) If there are individual contracts and memorandum related to specifications in addition to this document, the contents in those documents prevail.
(2) Please let us know if you export this product from Japan and take necessary procedures according to the provisions of export-related laws and regulations, such as foreign exchange laws and foreign trade laws.
(3) For any questions and consultation on this product, check the model/serial number and then contact the nearest sales office or agency, or our Components Division.
https://www.ulvac.co.jp/support_info/
(4) Note that the contents in this document is subject to change without prior notice.

Attachment

b. Communication system supplementation.

b-1 Communication connector connection chart.

When communicating by RS-232C.
Pin assignment
Pin No   Item
  2:    RS-232C   RxD
  3:    RS-232C   TxD
  5: GND	

When communicating by RS-485.
Pin assignment
Pin No   Item
  4:    RS-485 B(-)
  6:    RS-485 A(+)
  8:    RS-485 Terminator
  9:    RS-485 Terminator
	In case of one.
	
	Pump address [:01]

At two connection. Pump address 	
At nn connection. Pump address 	

 CAUTION   Noting when communicating by RS-485.

● For the pump connected at the end, RS-485 terminator (between 8-9) is short-circuited.

● It is necessary to set the address to the pump when communicating by RS-485.

Please contact the service center when it is not set.

● Please input the 3 digits of " : n n" (JIS code) before the command when you order the command from the host side.

    :   n n   [Command name]   ＊The command is the same as the RS-232C communication.

    colon   address   command

b-2 Communication command.

Command name : System start/stop status read-out.

Host side: A0 CR

Pump side
(Response): A0 x CR

x=0 : At stop　x=1 : Reverse-rotation detection　x=3 : Interlocked
x=2 : At emergency stop
x=4 : Alarm generating　x=5 : At start　x=6 : Running　x=7 : Stop-operation beginning
x=8 : Undefined　X=9 : RAM clear END

Command name : Stop.

Host side: A1 CR

Pump side
(Response): OK CR

Command name : Start.

Host side: A2 CR

Pump side
(response): OK CR　or　NG　　CAUTION : Does not start when alarm is activated.

Command name : Status read-out.

Host side: A3 CR

Pump side
(Response): A3 x CR The bit x represents the following status.

b0	At start
b1	Multiple alarms occur
b2	REMOTE
b3	Warning
b4	Alarm
b5	Pressure SW
b6	Multiple warnings occur
b7	(Always Hi)

Command name : EEP-ROM read-out completion graph read-out.

Host side: A4 CR

Pump side
(Response): A4 x CR
x<>0 is complete.

Command name : SV1-3 valves status read-out.

Host side: A5 CR

Pump side
(Response): A5 x CR The bit x represents the following status.

b0	Manual operation
b1	SV1 On
b2	SV2 On
b3	SV3 On
b4	(Always Hi)
b5	(Always Hi)
b6	(Always Low)
b7	(Always Low)

Command name : Local/remote selection.

Host side: A8 CR

Pump side
(Response): OK CR　LOCAL/REMOTE is changed over each time a signal is sent.

Command name : Alarm reset.

Host side: A9 CR

Pump side
(Response): OK CR　CAUTION : Do not send it when pump is running.

Communication specifications.

- Signal format　　　　: RS-232C
- Transfer system　　　: Start-stop synchronous system
- Baud rate　　　　　　: 9600bps
- Bit configuration　: Start　　　1bit
　　　　　　　　　　　　: Data　　　　8bit
　　　　　　　　　　　　: Parity　　EVN
　　　　　　　　　　　　: Stop　　　　1bit
- Data configuration : JIS code
　　　　　　　　　　　　: Terminator　CR code

SP : Space code
CR : Carriage return code
The figure data is a BCD code. (However, B8 and the B9 command are excluded)
RS-485 command adds ":m" ahead of RS-232C command.
The response of RS-485 command is the same as RS-232C command.

TITLE: New PDR-C commands – Part 1 –

ULVAC

Command name: Baud rate setting.

Host side: C5BAUDx[CR]
Pump side (Response): OK[CR]

x=0:9600pbs   x=1:19200bps
x=2:38400bps   x=3:4800bps

Command name: RS-485 address setting.

Host side: C6485nn[CR]
Pump side (Response): OK[CR]

nn:00~99

Command name: Reset at running time.

Host side: C791[CR]
Pump side (Response): OK[CR]

Command name: Display data read-out at start.

Host side: B1nn[CR]
Pump side (Response): B1nnxxxxx[CR]

nn: Sensor number. XXXXX: Instruction value of sensor.

Sensor number table.

No	Sensor name
01	N2 purge gas.
02	OP N2 purge gas.
03	Cooling water.
04	Exhaust pressure
05	DRP INV frequency.
06	MBP INV frequency.
07	Option spare 1.
08	Option spare 2.
09	DRP current.
10	MBP current.
11	Spare 1 in BOX.
12	Spare 2 in BOX.
13	DRP temperature.
14	MBP temperature.
15	Exhaust pipe temperature.
16	Option temperature.
17	Spare switch in BOX.

Command name: SV1 reversing instruction.

Host side: C1[CR]
Pump side (Response): OK[CR]

OK   or   NG

Command name: SV reversing instruction.

Host side: C2[CR]
Pump side (Response): OK[CR]

OK   or   NG

Command name: Alarm log clearness.

Host side: C4[CR]
Pump side (Response): OK[CR]

Command name: Read-out of set content.

Host side: B5nnn[CR]

Pump side (Response): B5nnnxxxx[CR]

nnn : Set content number.   XXXX : Set value.

Set content number table.

No.	Set content.
032	N2 purge gas warning value.
033	OP N2 purge gas warning value.
034	Cooling water warning value.
035	Exhaust pressure warning value.
036	Exhaust pressure alarm value.
037	DRP INV intermediate frequency.
038	PMB INV intermediate frequency
039	Option spare 1 warning value.
040	Option spare 2 warning value.
041	DRP current warning value.
042	DRP current alarm value.
043	MBP current warning value.
044	MBP current alarm value.
045	Warning value spare 1 in BOX.
046	Warning value spare 2 in BOX.
047	DRP temperature upper bound warning value.
048	MBP temperature upper bound warning value.
049	Exhaust pipe temperature upper bound warning value.
050	Option temperature upper bound warning value.

No.	Set content.
052	N2 purge gas bound pair value comparison setting.
053	OP N2 purge gas bound pair value comparison setting.
054	Cooling water bound pair value comparison setting.
055	
056	
057	DRP INV rated frequency.
058	MBP INV rated frequency
059	Option spare 1 bound pair value comparison setting.
060	Option spare 2 bound pair value comparison setting.
061	
062	
063	
064	
065	Bound pair value comparison setting spare 1 in BOX.
066	Bound pair value comparison setting spare 2 in BOX.
067	DRP temperature READY temperature.
068	MBP temperature READY temperature.
069	Exhaust pipe temperature READY temperature.
070	Option temperature READY temperature.

0001 : Upper bound comparison
0000 : Lower bound comparison

No.	Set content.
072	N2 purge gas alarm timer.
073	OP N2 purge gas alarm timer.
074	Cooling water alarm timer.
075	Exhaust pressure warning timer.
076	Exhaust pressure alarm timer.
077	DRP INV conservation of energy frequency.
078	MBP INV conservation of energy frequency.
079	Option reserve 1
080	Option reserve 2
081	DRP current warning timer.
082	DRP current alarm timer.
083	MBP current warning timer.
084	MBP current alarm timer.
085	Alarm timer spare 1 in BOX.
086	Alarm timer spare 2 in BOX.
087	DRP temperature alarm timer.
088	MBP temperature alarm timer.
089	Exhaust pipe temperature alarm timer.
090	Option temperature alarm timer.
091	Spare switch alarm timer in BOX.

A set value of the timer is 0.1 seconds.

No.	Set content.
096	Run mode (1, 2, 3, M(4))
097	A / B contact (A contact = 0, B contact = 1).
098	Auto-purge time (unit = second).
099	Option valve (0 = It is not 1 = It is.).
100	Japanese / English (0 = Japanese, 1 = English).
117	DRP heater temperature.
118	MBP heater temperature.
119	Exhaust pipe heater temperature.
120	Option heater temperature.

Command name: Writing the content of the set.

Host side: B6nnnxxxx[CR]

Pump side (Response): OK[CR]

nnn : Set content number.   XXXX : Set value.

Response : OK or NG

[Attention] Please use only the number which exists in the set table.

The number which dose not exist in the set table is used internally.

When the number which does not exist in the set table is written, the operation is not guaranteed.

Moreover, it does not return in ON / OFF of the power supply because DATA is recorded in EEP-ROM when written.

TITLE New PDR-C commands
– Part 3 –

ULVAC

Command name : Alarm log read-out.

Host side

| 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 |

B2 n n CR

Pump side (Response)

B2 n n y y m m d d h h m m s s x x e e k k u u u u a a SP SP SP SP SP SP SP SP P1 P2 P3 P4 P5 A D - 1 PA B3 0 C D D E 0 F 0 0 CR

Set "nn" at 00 to 99 (00 is the latest data).

yy/mm/dd/hh/mm/ss is a year/month /day/hour/minute/second.

xx is a sensor number (When the sensor number is 35 or more, data from the 19th byte to the 68th byte becomes irregular data.) △

ee shows warning by 01 and the alarm is shown by 02.

kk shows the low alarm by 00, the high alarm is shown by 01, and other warning is shown by 02.

uuuu is an instruction value when warning is generated.

In the absence of data, signal is sent back with "0" entered at the 5th byte, "CR" entered at the 6th byte

aa is a model number. △

Please disregard it because data from 37th to 68th byte is CPU internal data. △

Sensor number table.

No.	Sensor name
01	N2 purge gas.
02	OP N2 purge gas.
03	Cooling water.
04	Exhaust pressure
05	DRP INV frequency.
06	MBP INV frequency.
07	Option spare 1.
08	Option spare 2.
09	DRP current.

No.	Sensor name	
10	MBP current.	
11	Spare 1 in BOX.	
12	Spare 2 in BOX.	
13	DRP temperature	
14	MBP temperature	
15	Exhaust pipe temperature.	
16	Option temperature.	
17	Spare switch in BOX.	

No.	Sensor name	
35	Pump start.	
36	Pump stop.	
37	Pump stop by remote emergency stop.	△
38	Pump stop by local emergency stop.	△
39	Pump stop by interlock.	
40	Pump stop by reversal detection	△

Command name : Warning read-out.

Host side

| 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 |

B3 n n CR

Pump side (Response)

B3 n n x x e e k k u u u u CR

Set "nn" at 00 to 17 (00 is the first data).

xx/ee/kk/uuuu is the same as alarm log read-out.

In the absence of data, signal is sent back with "0" entered at the 5th byte , "CR" entered at the 6th byte.

Command name : Alarm read-out.

Host side

| 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 |

B3 n n CR

Pump side (Response)

B3 n n x x e e k k u u u u CR

Set "nn" at 00 to 17 (00 is the first data).

xx/ee/kk/uuuu is the same as alarm log read-out.

In the absence of data, signal is sent back with "0" entered at the 5th byte , "CR" entered at the 6th byte.
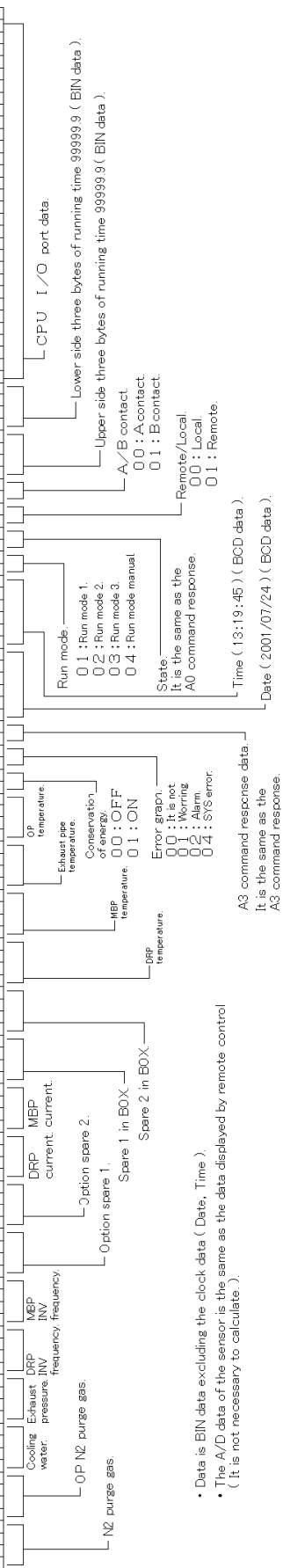
SP : Space code.
CR : Carriage return code.

承 認 検 図 設 計 製 図

ULVAC

SCALE	:	·
DATE	·	·

MFG No.

TITLE   New PDR-C commands
－ Part 4 － △

DWG No.

Command name : Run log read-out.

Host side

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | ... |
| B | 8 | h | h | h | h | CR | | |

Pump side (Response)

| 0 | 6 | C | 7 | D | 1 | A | E | 0 | 9 | 9 | C | 0 | 4 | 3 | 1 | D | 0 | C | E | D | 5 | D | 7 | B | 2 | 0 | 7 | 1 | 1 | D | 3 | 3 | F | 0 | 2 | 1 | 1 | D | 2 | 9 | E | 0 | 3 | D | 6 | ... | CR |

- Cooling water.
- Exhaust pressure.
- DRP INV frequency.
- MBP INV frequency.
- OP N2 purge gas.
- N2 purge gas.
- DRP current.
- MBP current.
- Option spare 2.
- Option spare 1.
- Spare 1 in BOX.
- Spare 2 in BOX.
- DRP temperature.
- MBP temperature.
- Exhaust pipe temperature.
- OP temperature.

Conservation of energy.
00 : OFF
01 : ON

Error graph.
00 : It is not.
01 : Worning.
02 : Alarm.
04 : SYS error.

A3 command response data.
It is the same as the A3 command response.

Run mode
01 : Run mode 1.
02 : Run mode 2.
03 : Run mode 3.
04 : Run mode manual.

State.
It is the same as the A0 command response.

Time (13:19:45) (BCD data).
Date (2001/07/24) (BCD data).

A/B contact.
00 : A contact.
01 : B contact.

Remote/Local.
00 : Local.
01 : Remote.

CPU I/O port data.

Lower side three bytes of running time 99999.9 (BIN data).
Upper side three bytes of running time 99999.9 (BIN data).

- Data is BIN data excluding the clock data (Date, Time).
- The A/D data of the sensor is the same as the data displayed by remote control
  (It is not necessary to calculate.).

Command name : Current status read-out.

Host side

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | ... |
| B | 9 | CR | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Response is the same as run log read-out.

ULVAC

Command name：Model read-out.

Host side： D 0 CR

Pump side
(Response)： D 0 n n CR

"nn" is a model number (It is writable only while stopping.).

Command name：Model writing.

Host side： D 1 A 5 n n CR

Pump side
(Response)： O K CR

Command name：Production number read-out.

Host side： D 2 CR

Pump side
(Response)： D 2 n n n n n n n n n n CR

"nnnnnnnnnn" is a production number.

Command name：State read-out.

Host side： D 3 n n n n n n n n n CR

Pump side
(Response)： O K CR

"nnnnnnnnn" is a production number.

Command name：Clock read-out.

Host side： D 4 CR

Pump side
(Response)： D 4 y y m m d d h h m m CR

"yy/mm/dd/hh/mm" is a year/month/day/hour/minute.

Command name：Clock writing (Correction).

Host side： D 5 y y m m d d h h m m CR

Pump side
(Response)： O K CR

"yy/mm/dd/hh/mm" is a year/month/day/hour/minute.

Command name：

Host side：

Pump side
(Response)：

Command name：

Host side：

Pump side
(Response)：

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.

Table1. Making format for names and contents of hazardous substances or elements

Name of parts	Hazardous substances or elements					
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
Body	O	O	O	O	O	O
Panel	O	O	O	O	O	O
Base	O	O	O	O	O	O
Electrical Parts	O	O	O	O	O	O

O: 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:

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	

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.		

ULVAC

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