

ULVAC

MODEL

LR-Series/HR-Series
60/90/180/300/600/1200/1800

LR-Series

420/3600

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 LR/HR 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.

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.

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1. Specification

Design concept

This LR/HR 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 LR/HR series are assumed to be built-in to the host equipment.

LR/HR series can be used generally in the following processes:

- Chamber vacuum pumping in sputtering 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 (low hazardous level gases: gases no toxicity, no inflammable, no corrosive and no explosive).

Performance and Configuration

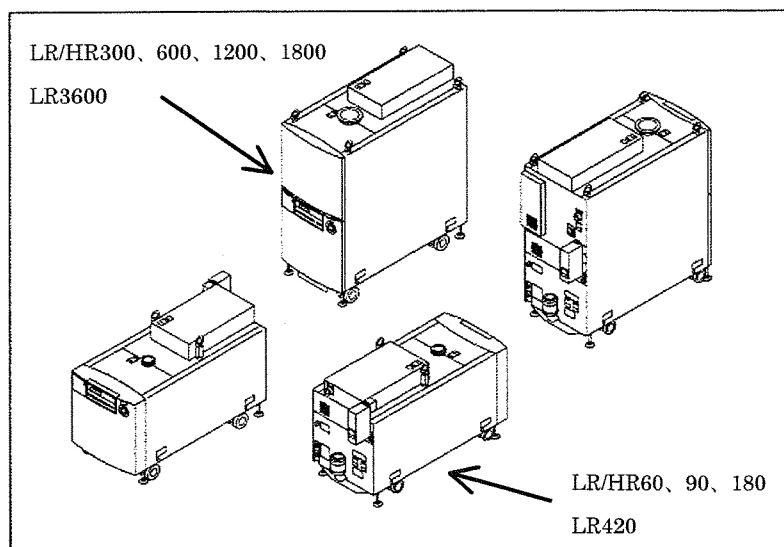
LR/HR series have a performance of vacuum pumping in pressure regions from atmospheric pressure through medium vacuum pressure (about 5Pa). And LR/HR series have nine variations of speed to support various equipment.

LR/HR60, LR/HR90, LR/HR180, and LR420 is composed of the primary dry vacuum pump unit.

LR/HR300, LR/HR600, LR/HR1200, LR/HR1800, and LR3600 is a composition in which the booster pump is added to the upstream of LR/HR60, LR/HR90, LR/HR180, and LR420.

As for this manual, important information to use these products safely has been described.

Please read before it uses it.



1.1 Overall Configuration

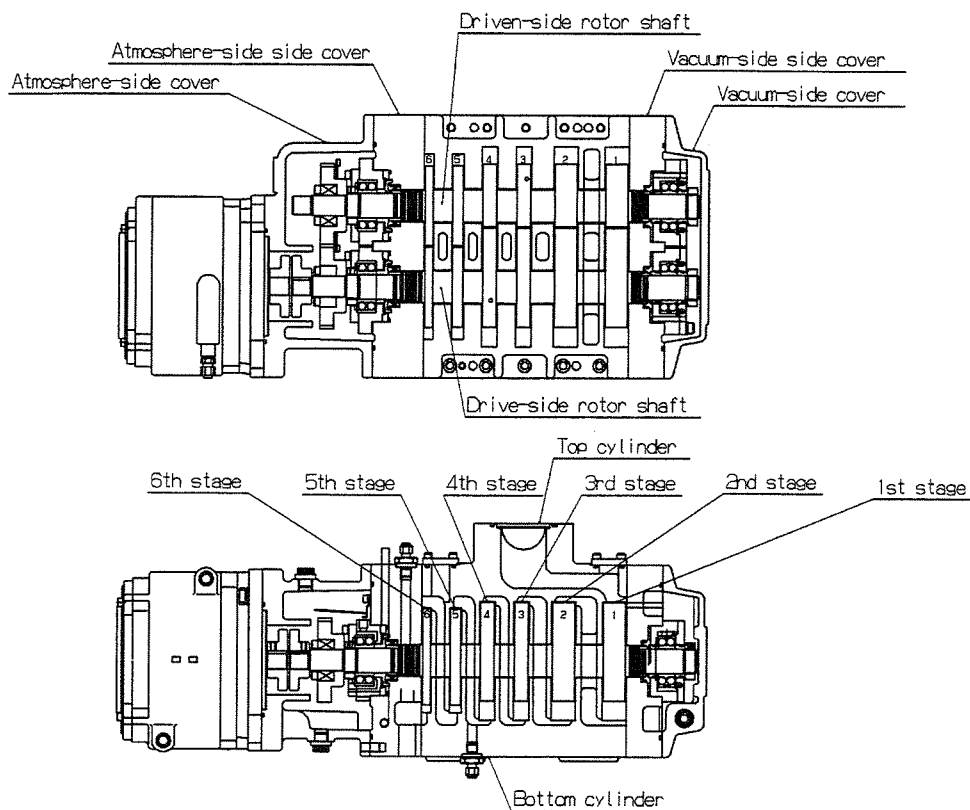
1.1.1 Pump Structure

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.

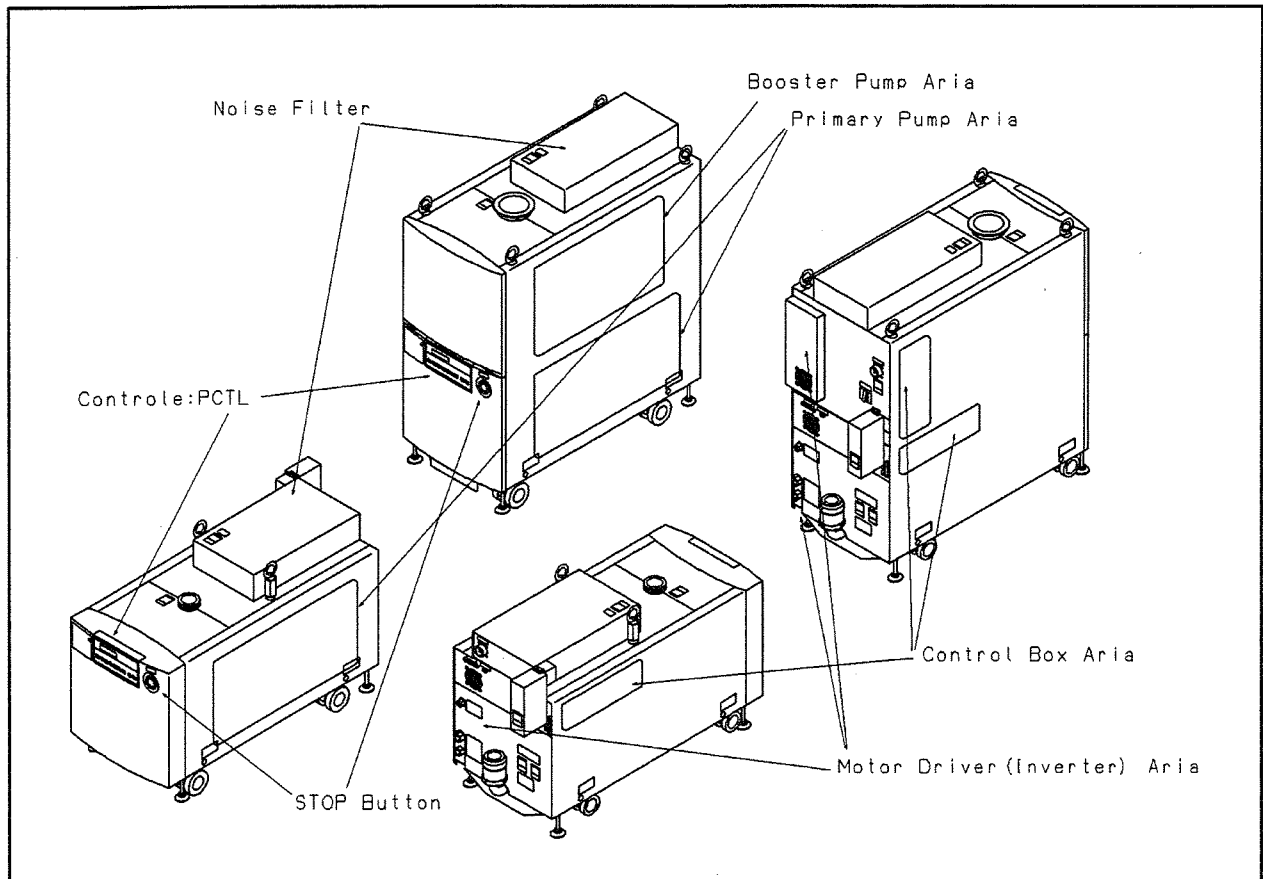
The aluminum alloy casting is used for the main parts which compose the pump. And the aluminum surface is treated with a special process.

Canned motor is used to drive the rotors. This can eliminate the shaft seal construction, this improved the reliability of the device.



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.



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. It is not necessary to feed gas ballast gas when there is no corrosive or reactive product.

Cooling water system

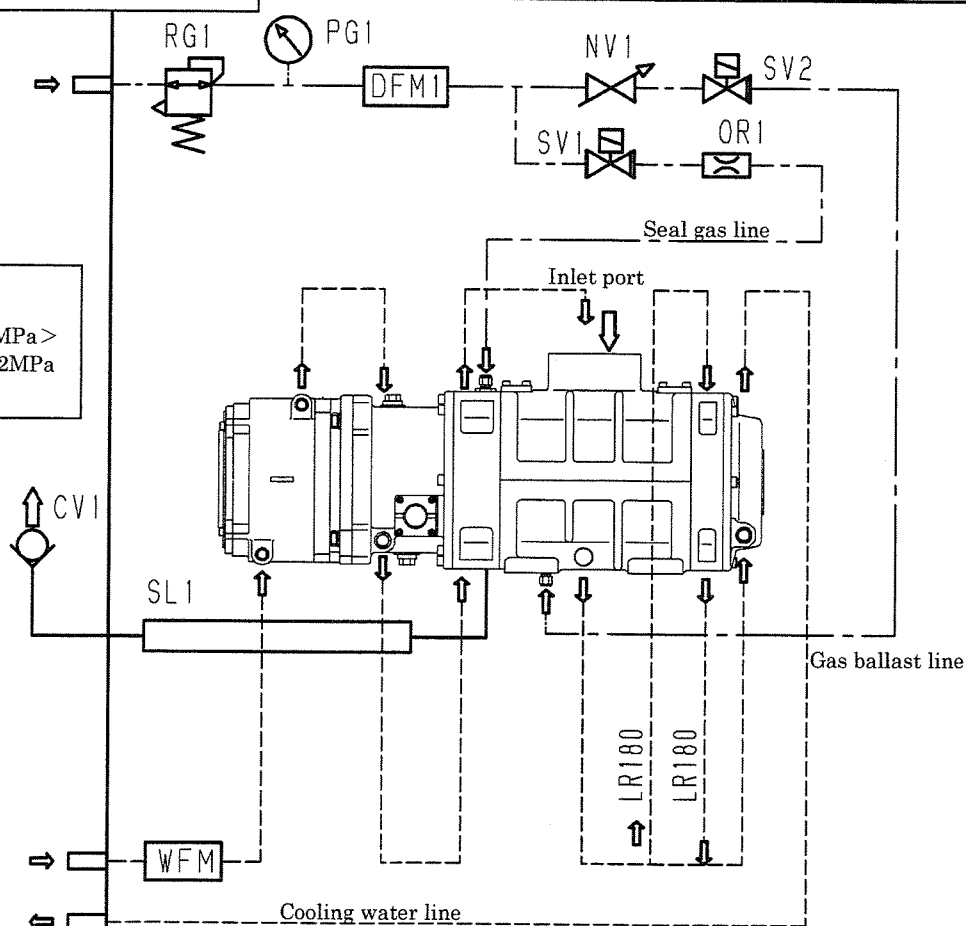
Cooling water flows from the cooling water inlet port to the flow meter, motor, pump body, and cooling water outlet port in that order to cool the pump.

N₂ purge gas introduction port
SS400 SwegeLock
Proper supply pressure : 0.1–0.5MPa
Set pressure : 0.1MPa(Running State)
Range of set flowing quantity : 0–50SLM

LR60, LR90, LR180

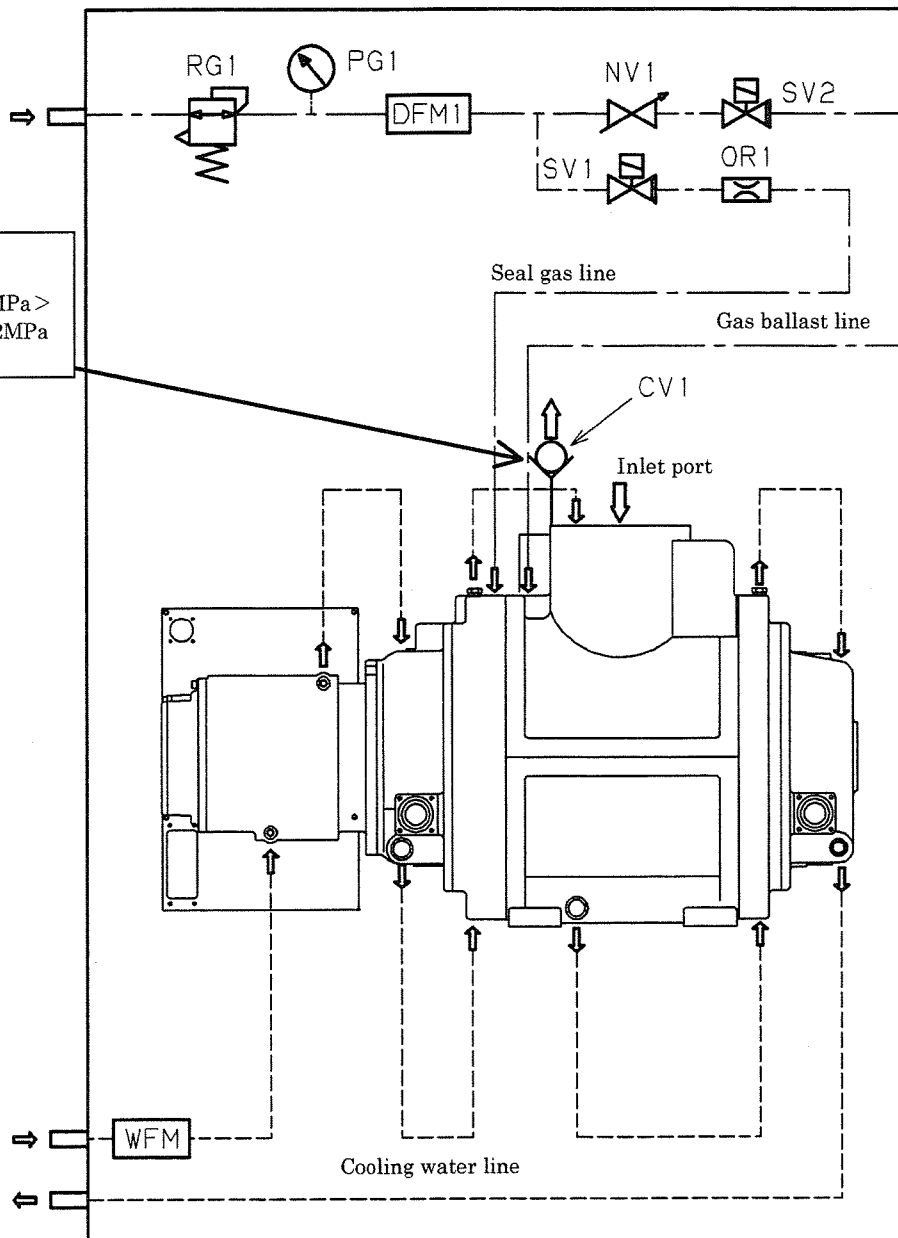
Outlet port
NW40
Proper exhaust pressure : 0.1MPa >
Exhaust pressure limit : 0.12MPa
(Absolute pressure)

Cooling water port : Rc3/8
Supply hydraulic pressure : 0.1–0.5MPa
Gateway difference pressure : 0.1MPa <
Proper water temperature : 10–30°C
Proper flowing quantity : 4.0L/min
Range of set flowing quantity : 0–50SLM



N2 purge gas introduction port
SS400 SwegeLock
Proper supply pressure : 0.1–0.5MPa
Set pressure : 0.1MPa(Running State)
Range of set flowing quantity : 0–50SLM

Outlet port
VG50
Proper exhaust pressure : 0.1MPa>
Exhaust pressure limit : 0.12MPa
(Absolute pressure)



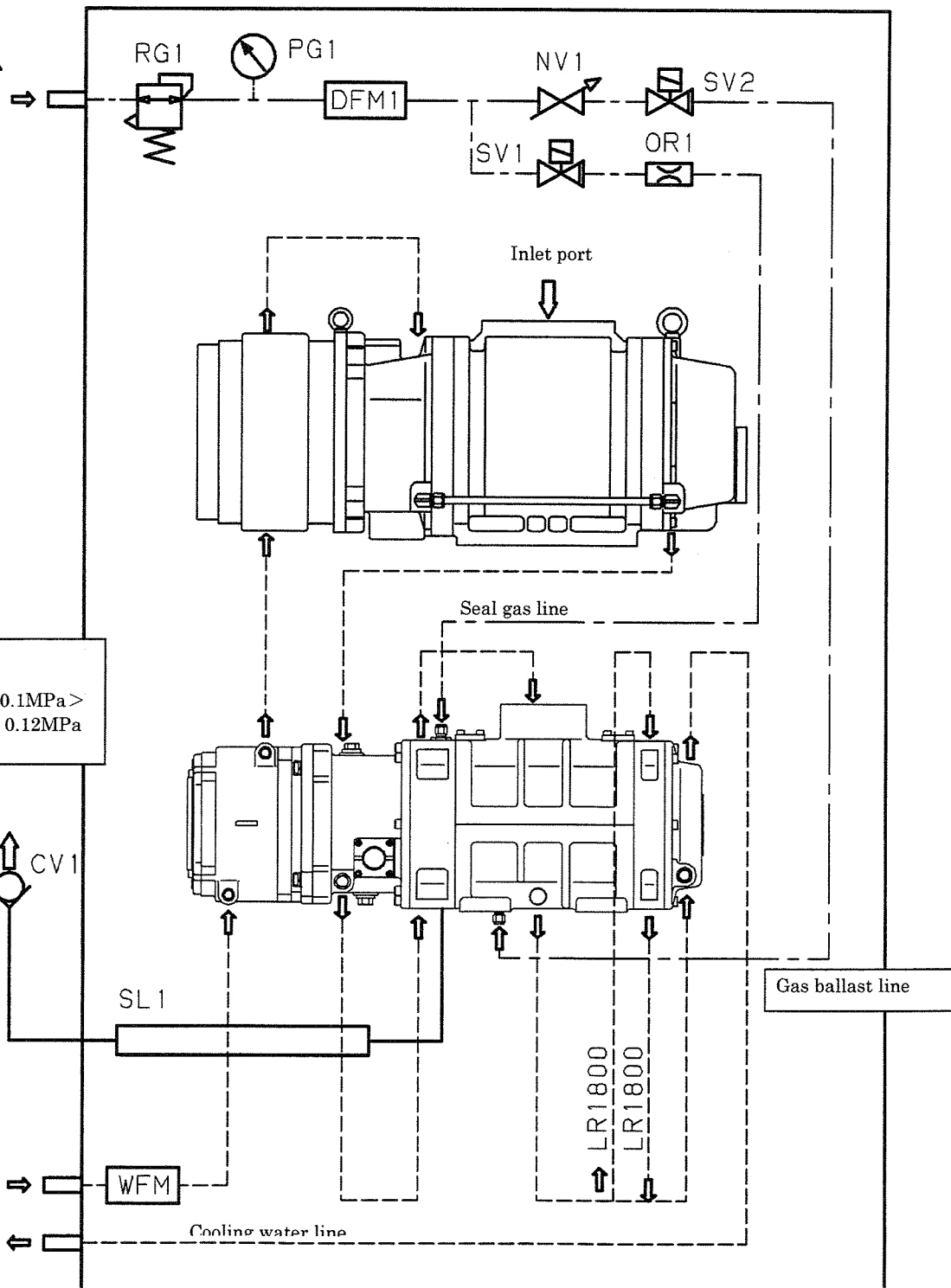
Cooling water port : Rc3/8
Supply hydraulic pressure : 0.1–0.5MPa
Gateway difference pressure : 0.1MPa<
Proper water temperature : 10–30°C
Proper flowing quantity : 4.0L/min

LR300. LR600. LR1200. LR1800

N2 purge gas introduction port
SS400 SwegeLock
Proper supply pressure : 0.1–0.5MPa
Set pressure : 0.1MPa(Running State)
Range of set flowing quantity : 0–50SLM

Outlet port
NW40
Proper exhaust pressure : 0.1MPa>
Exhaust pressure limit : 0.12MPa
(Absolute pressure)

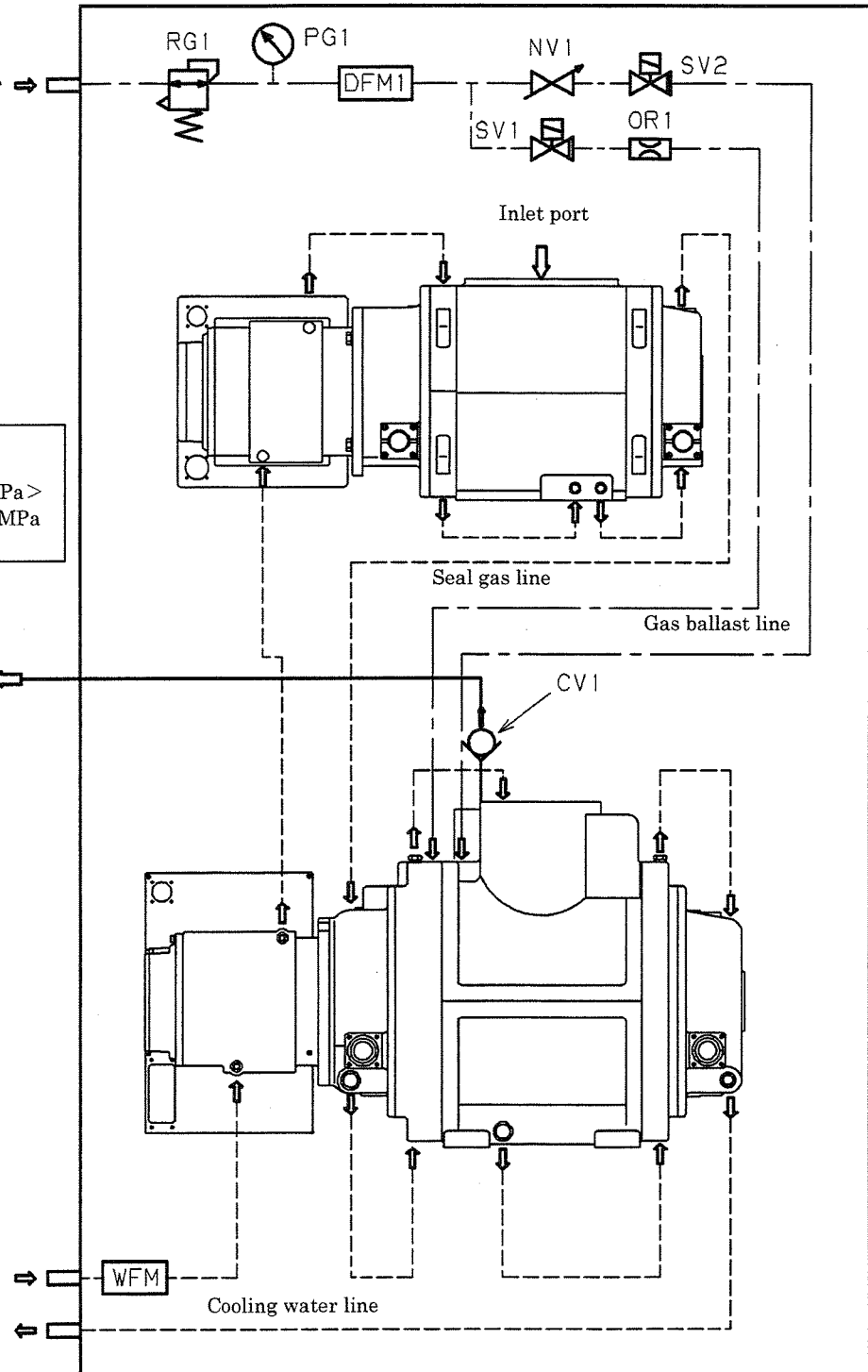
Cooling water port : Rc3/8
Supply hydraulic pressure : 0.1–0.5MPa
Gateway difference pressure : 0.1MPa<
Proper water temperature : 10–30°C
Proper flowing quantity : 4.0L/min



N2 purge gas introduction port
SS400 SwegeLock
Proper supply pressure : 0.1–0.5MPa
Set pressure : 0.1MPa(Running State)
Range of set flowing quantity : 0–50SLM

Outlet port
NW50
Proper exhaust pressure : 0.1MPa >
Exhaust pressure limit : 0.12MPa
(Absolute pressure)

Cooling water port : Rc3/8
Supply hydraulic pressure : 0.1–0.5MPa
Gateway difference pressure : 0.1MPa <
Proper water temperature : 10–30°C
Proper flowing quantity : 4.0L/min

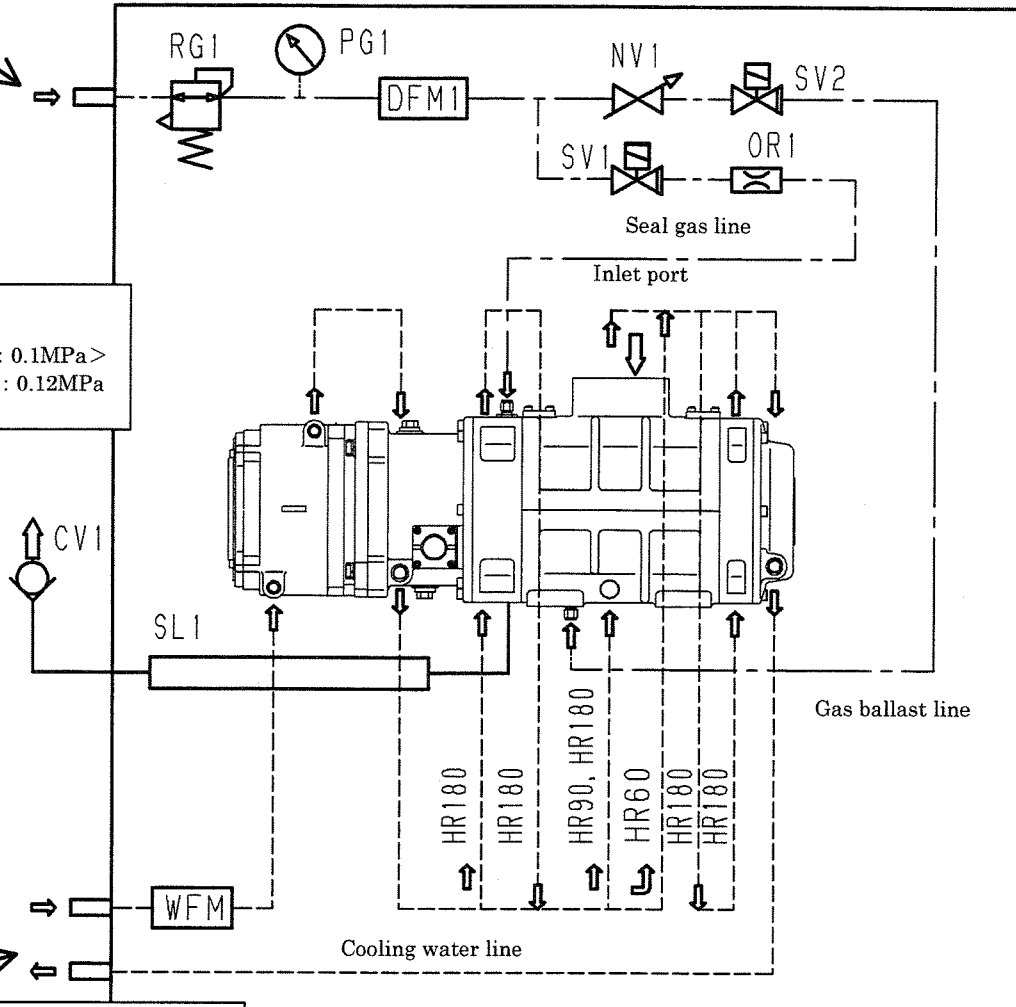


HR60, HR90, HR180

N2 purge gas introduction port
SS400 SwegeLock
Proper supply pressure : 0.1–0.5MPa
Set pressure : 0.1MPa(Running State)
Range of set flowing quantity : 0–50SLM

Outlet port
NW40
Proper exhaust pressure : 0.1MPa >
Exhaust pressure limit : 0.12MPa
(Absolute pressure)

Cooling water port : Rc3/8
Supply hydraulic pressure : 0.1–0.5MPa
Gateway difference pressure : 0.1MPa <
Proper water temperature : 10–30°C
Proper flowing quantity : 4.0L/min

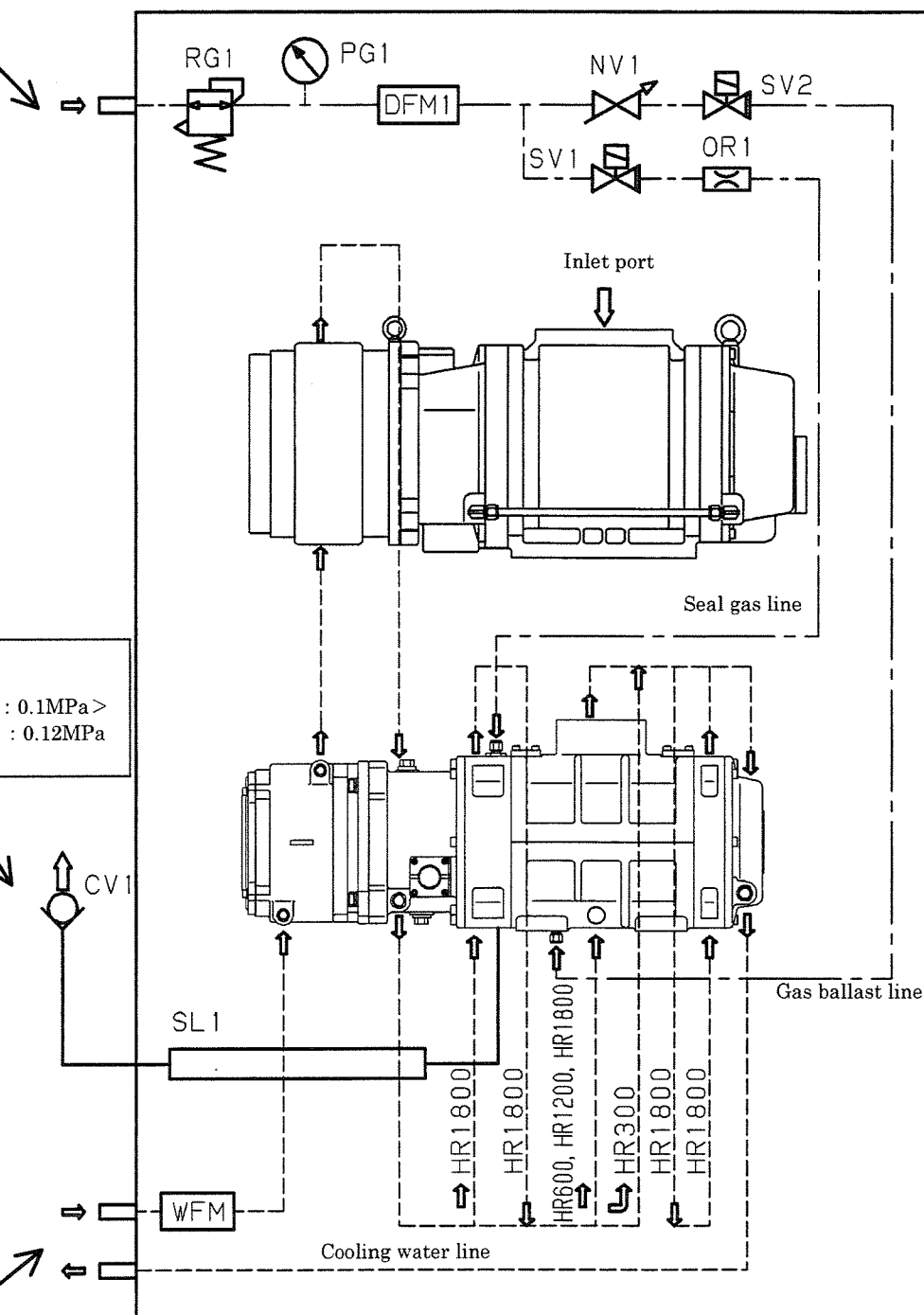


HR300, HR600, HR1200, HR1800

N2 purge gas introduction port
SS400 SwegeLock
Proper supply pressure : 0.1–0.5MPa
Set pressure : 0.1MPa(Running State)
Range of set flowing quantity : 0–50SLM

Outlet port
NW40
Proper exhaust pressure : 0.1MPa>
Exhaust pressure limit : 0.12MPa
(Absolute pressure)

Cooling water port : Rc3/8
Supply hydraulic pressure : 0.1–0.5MPa
Gateway difference pressure : 0.1MPa<
Proper water temperature : 10–30°C
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 current 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).

* Please refer to attached material (b-3 Electrical system chart : P107) for the electrical system chart of each model.

1.2 Specifications for utilities

Specification

Spec	Model	LR/HR60	LR/HR90	LR/HR180	LR420
Maximum pumping speed (m3/hr)		60	90	180	420
Maximum inlet pressure (Pa)		Atmospheric pressure			
Ultimate pressure (Pa)		5.0 ²⁾			
Maximum exhaust pressure		Atmospheric pressure			
Inlet diameter	Standard	VG50	VG80	VG80	VG100
	SEM I	NW40	NW50	NW50	...
Outlet diameter		NW40			VG50
Lubricating oil		FORBLIN YL VAC 25/6, BARIERTA J100F			
		0.5L	0.9L	1.5L	2.5L
Grease		BARIERTA JFE552HV			
		23.8g	30.0g	37.4g	...
Weight (kg)		180kg	245kg	335kg	415kg

Spec	Model	LR/HR300	LR/HR600	LR/HR1200	LR/HR1800	LR3600
Booster Pump		PRC-003A	PRC-006A	PRC-012A	PRC-018A	PRC-036A
Primary Pump		LR/HR60	LR/HR90	LR/HR90	LR/HR180	LR420
Maximum pumping speed (m3/hr)		300	600	1200	1800	3200
Maximum inlet pressure (Pa)		Atmospheric pressure or 200Pa ¹⁾				
Ultimate pressure (Pa)		0.67 ²⁾				
Maximum exhaust pressure		Atmospheric pressure				
Inlet diameter	Standard	VG80	VG80	VG100	VG150	VG150
	SEM I	NW80	NW80	NW100	NW100	...
Outlet diameter		NW40				NW50
Lubricating oil Grease	PRC	FOMBLIN YL VAC 14/6				FOMBLIN YL VAC 25/6
		BARIERTA J60F				BARIERTA J100F
		0.7L	1.5L	1.9L	1.9L	1.1L
	HR	FOMBLIN YL VAC 25/6, BARIERTA J100F				
		0.5L	0.9L	0.9L	1.5L	2.5L
		BARIERTA JFE552HV				
		23.8g	30.0g	30.0g	37.4g	...
Weight (kg)		275kg	370kg	420kg	545kg	720kg

1) Maximum inlet pressure of HR300, HR600, HR1200, and HR1800 is 200Pa. Other models are atmospheric pressure.

2) The ultimate pressure is a value when the seal gas is 5SLM and the gas ballast gas is 0SLM.

Utility Requirements

Power		3 phase : 200 VAC, 50/60 Hz : 220 VAC, 60 Hz			
Current ³⁾	Model name	LR/HR60	LR/HR90	LR/HR180	LR420
	At max. load (A) LR/HR (60Hz)	7.0/7.3	11.8/11.8	20.6/21.1	55.9
	At ultimate pressure (A) LR/HR(60Hz)	6.9/7.1	11.2/11.2	18.9/19.6	31.0
Cooling water	Supply pressure (MPa)	0.1 to 0.3			
	In/out difference pressure (MPa)	0.1			
	Flow rate (L/min)	5.0			
	Supply water temperature (°C)	10 to 30 ⁴⁾			
Purge gas	Supply pressure (MPa: gauge pressure)	0.1 to 0.5			
	Regulated pressure (MPa: gauge pressure)	0.05 (Regulated pressure in pump)			
	Flow rate	Shaft seal (SLM)	5		
		Gas ballast (SLM)	0 to 50		

Power		3 phase : 200 VAC, 50/60 Hz : 220 VAC, 60 Hz				
Current ³⁾	Model name	LR/HR300	LR/HR600	LR/HR1200	LR/HR1800	LR3600
	At max. load (A) LR/HR (60Hz)	9.6/8.1	19.0/13.8	24.2/18.9	39.8/29.7	78.0
	At ultimate pressure (A) LR/HR(60Hz)	7.0/7.8	12.3/12.9	13.7/15.4	21.4/24.0	37.2
Cooling water	Supply pressure (MPa)	0.1 to 0.3				
	In/out difference pressure (MPa)	0.1				
	Flow rate (L/min)	5.0				
	Supply water temperature (°C)	10 to 30 ⁴⁾				
Purge gas	Supply pressure (MPa: gauge pressure)	0.1 to 0.5				
	Regulated pressure (MPa: gauge pressure)	0.05 (Regulated pressure in pump)				
	Flow rate	Shaft seal (SLM)	5 ⁵⁾			
		Gas ballast (SLM)	0 to 50			

3) The current at the maximum load of HR300/600/1200/1800 has described the maximum current in the use-pressure range(Atmospheric pressure to 200 Pa).

4) Not condensing.

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

Chemical matters used in this pump



Primary pump

- Pump oil BARRIERTA J100F (NOK KLUBER) or YL-VAC25/6(AUSIMONT)
- Bearing grease BARRIERTA JFE552HV (NOK KLUBER)

Booster pump (LR/HR300, LR/HR600, LR/HR1200, LR/HR1800)

- Pump oil YL-VAC14/6(SOLVAY SOLEXIS)

Booster pump (LR3600)

- Pump oil BARRIERTA J100F (NOK KLUBER) or YL-VAC25/6(AUSIMONT)

Above oils are used for bearing lubrication. LR/HR 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.

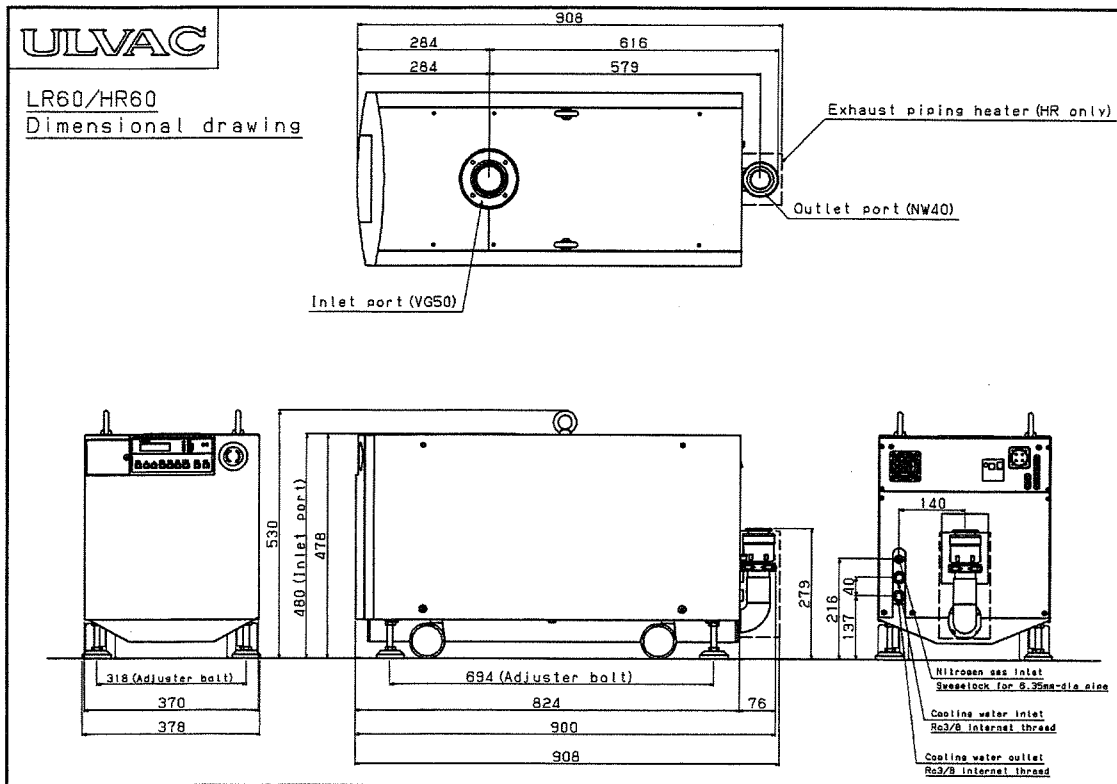
For the detailed properties, please refer to the attached a-MSDS at the end of this manual.

Please contact ULVAC when you will abandon these pumps.

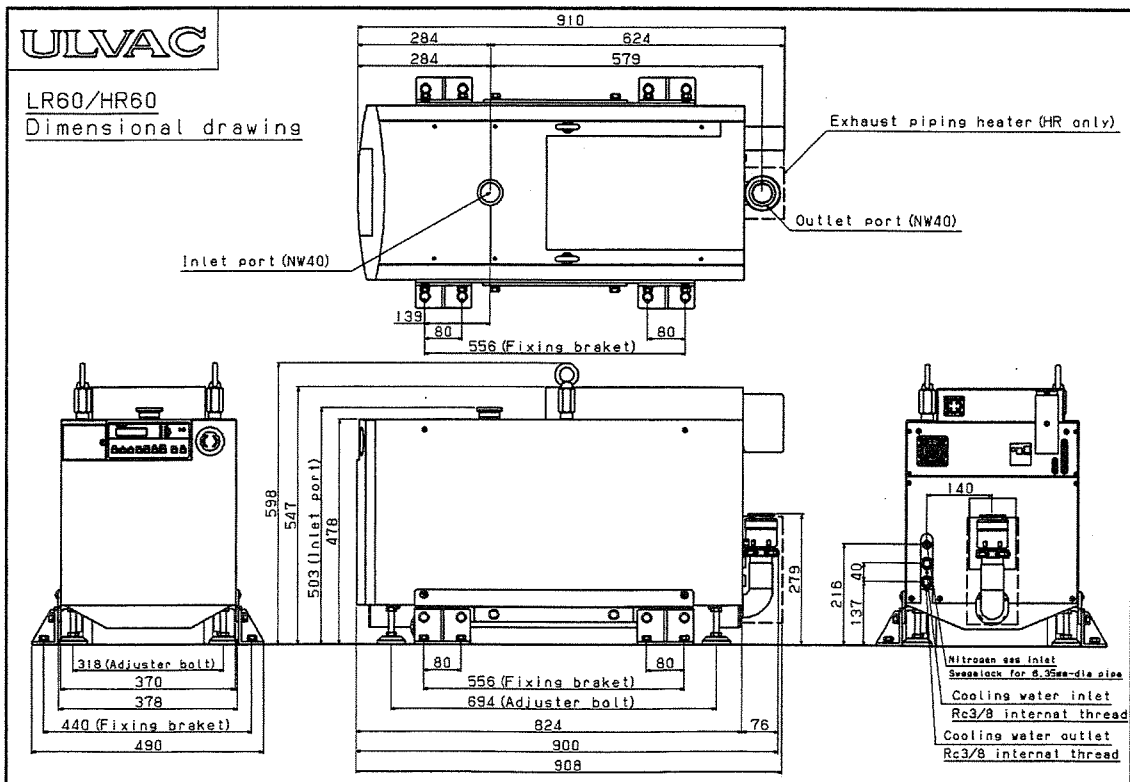
Parts which can be reproduced are recycled. Moreover, ULVAC safely processes the chemical such as oil. (This service is for a fee. It is not likely to be able to correspond according to the region. Please consult.)

1.3 Dimensional Drawings

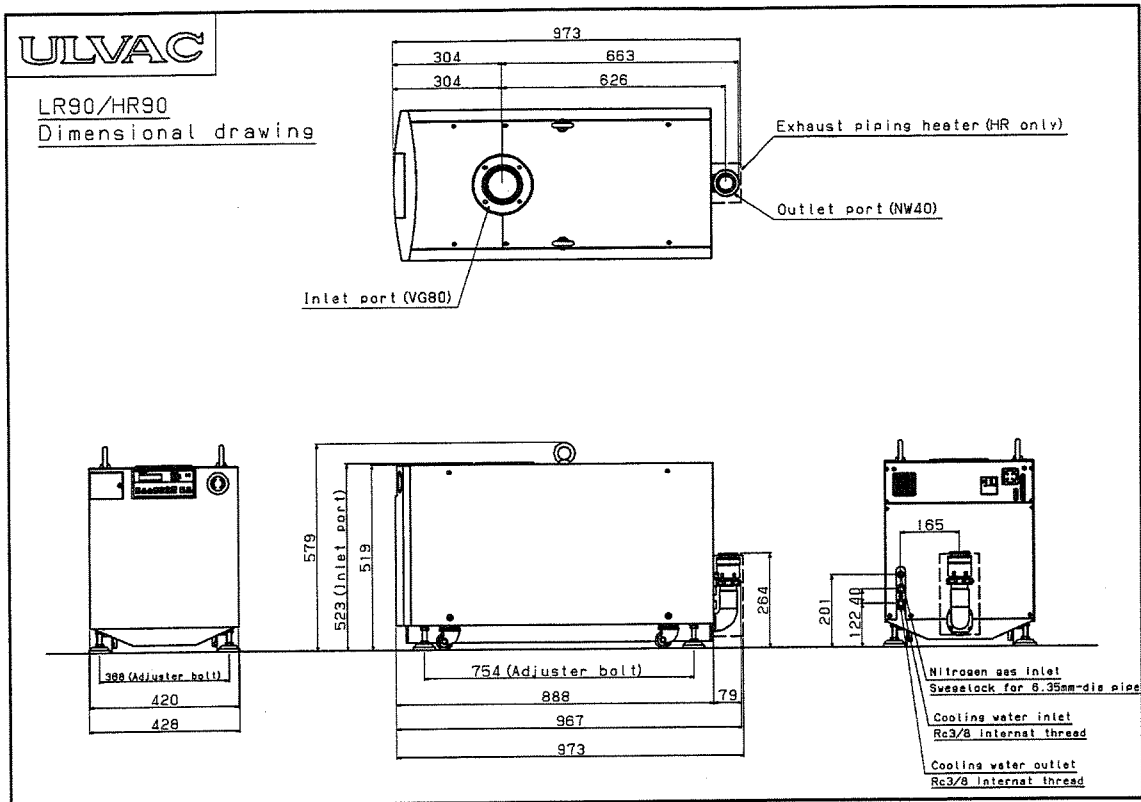
Standard type



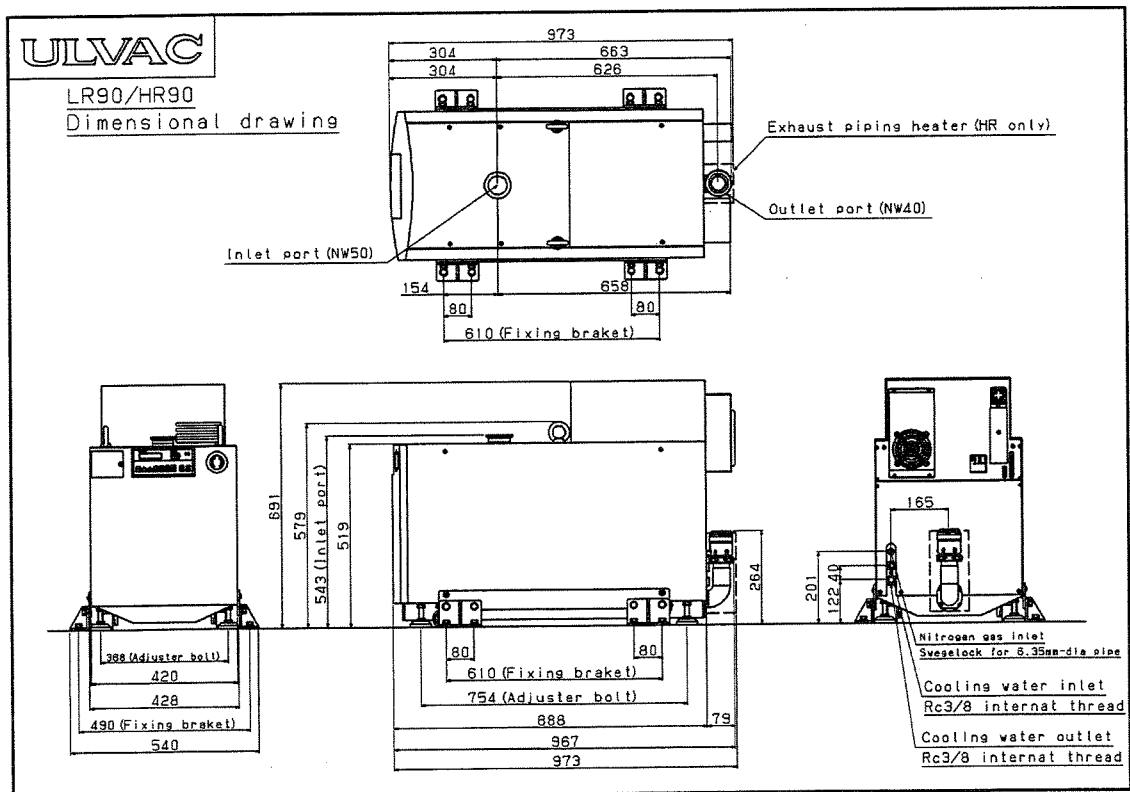
SEMI type



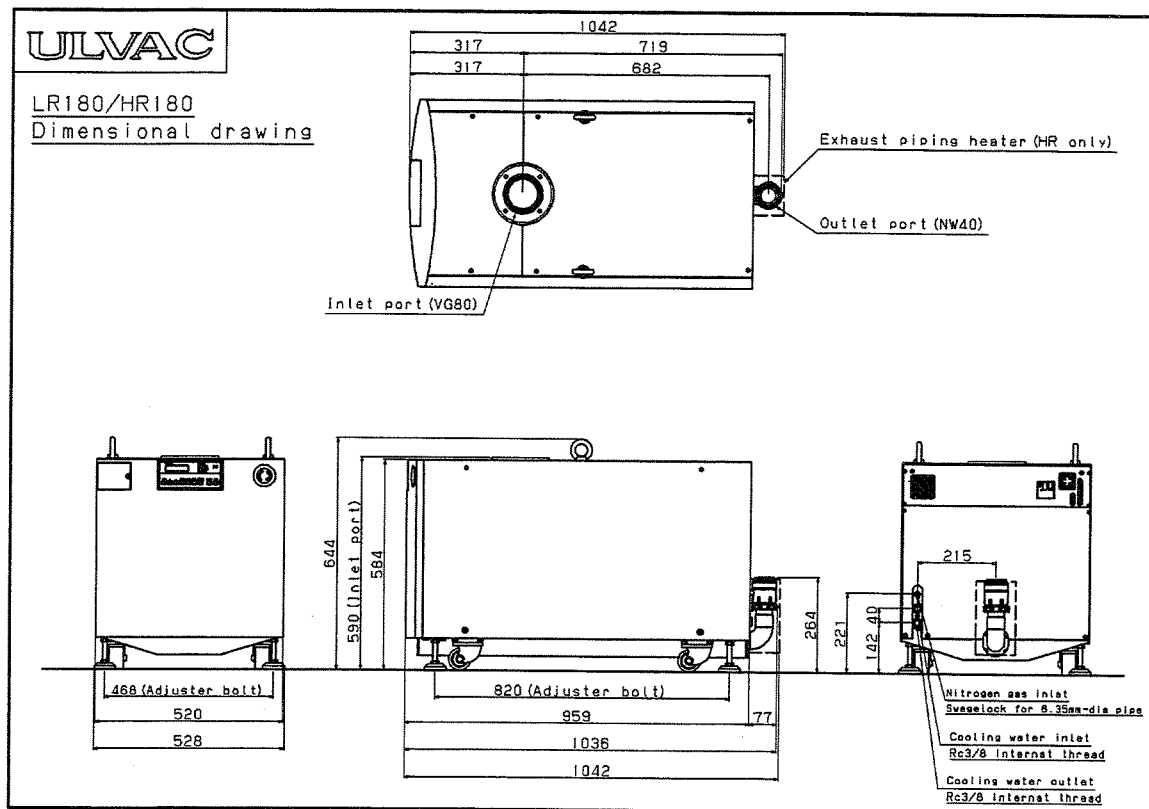
Standard type



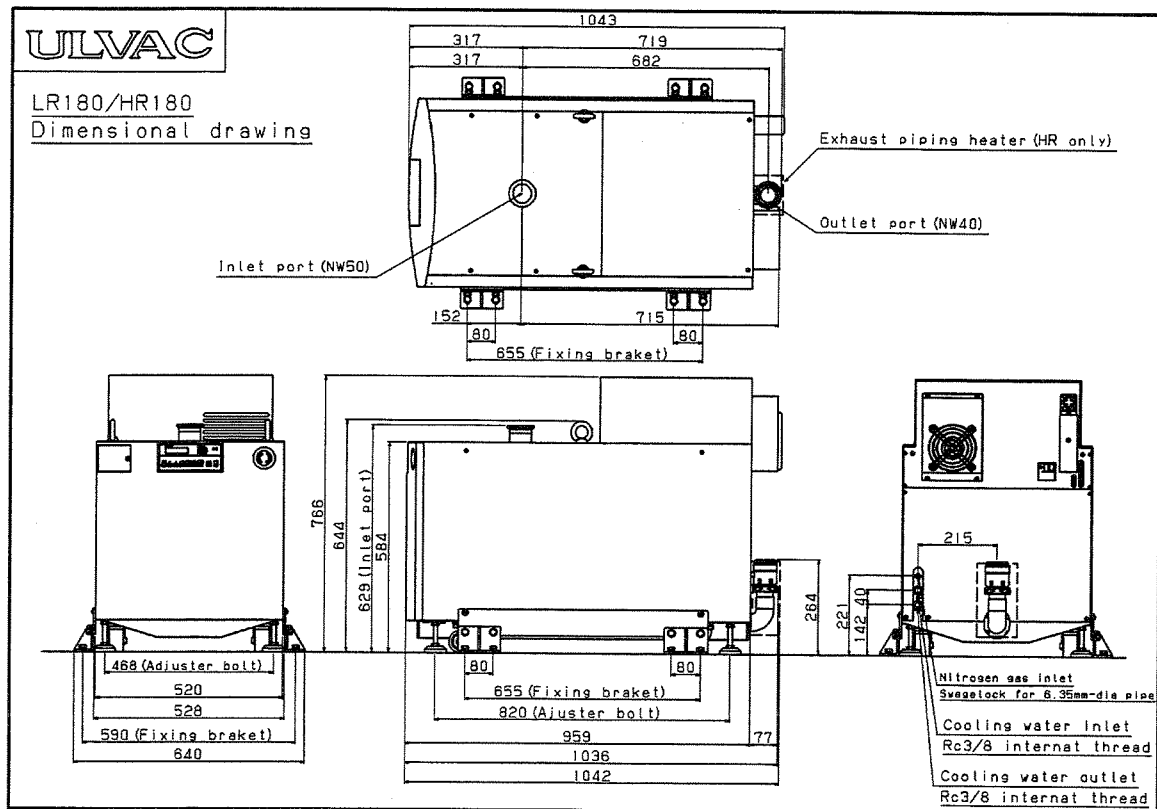
SEMI type



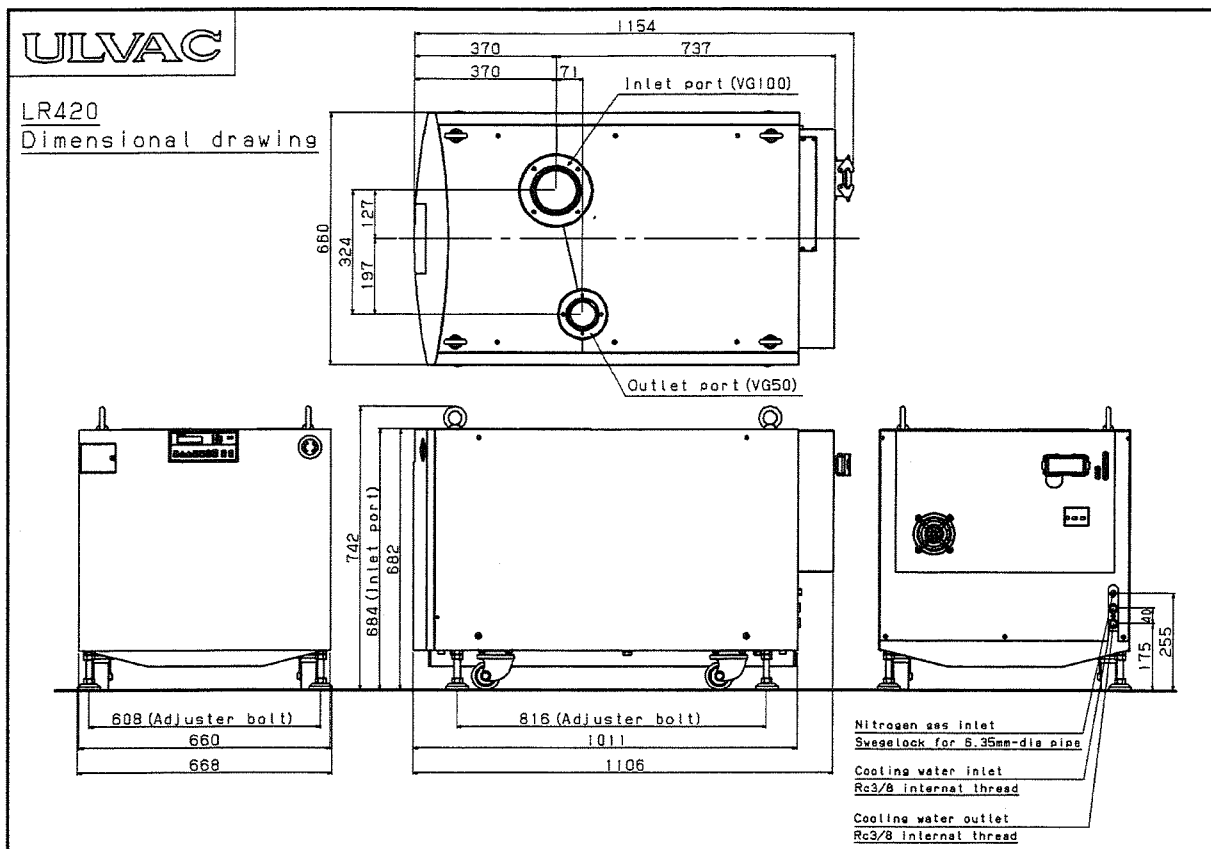
Standard type



SEMI type

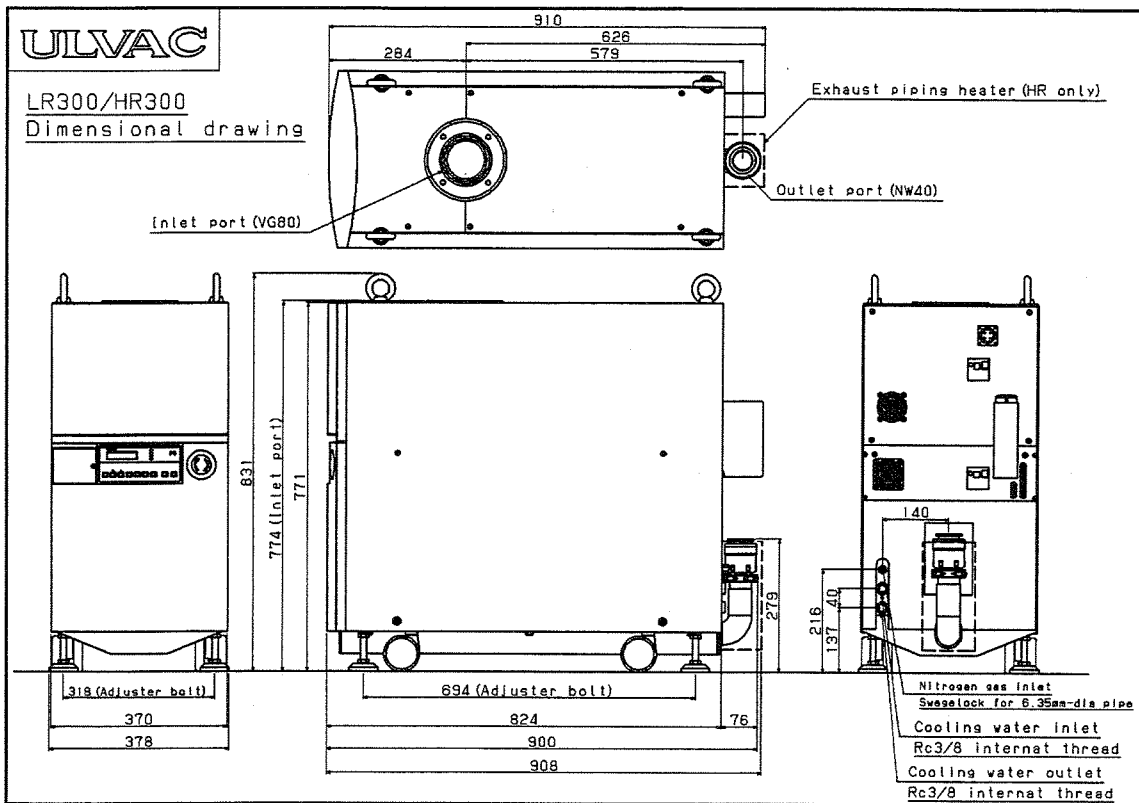


Standard type

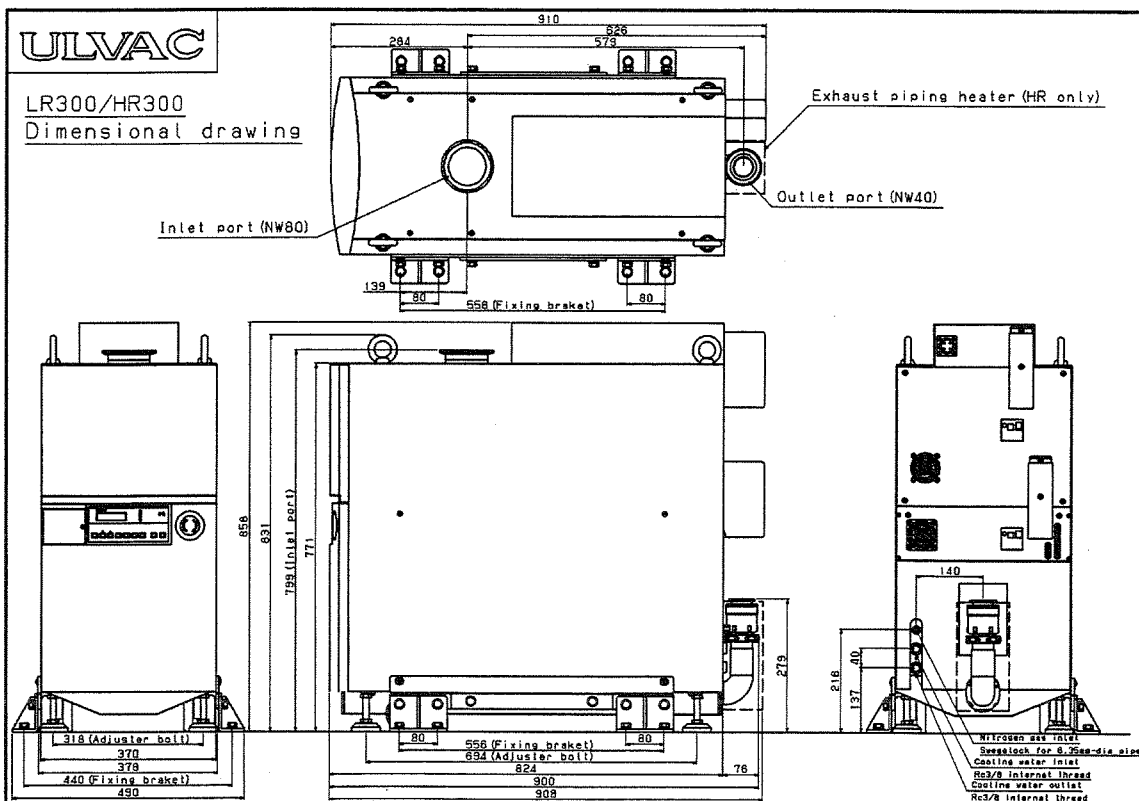


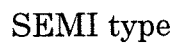
* There is no SEMI specification of LR420 now.

Standard type

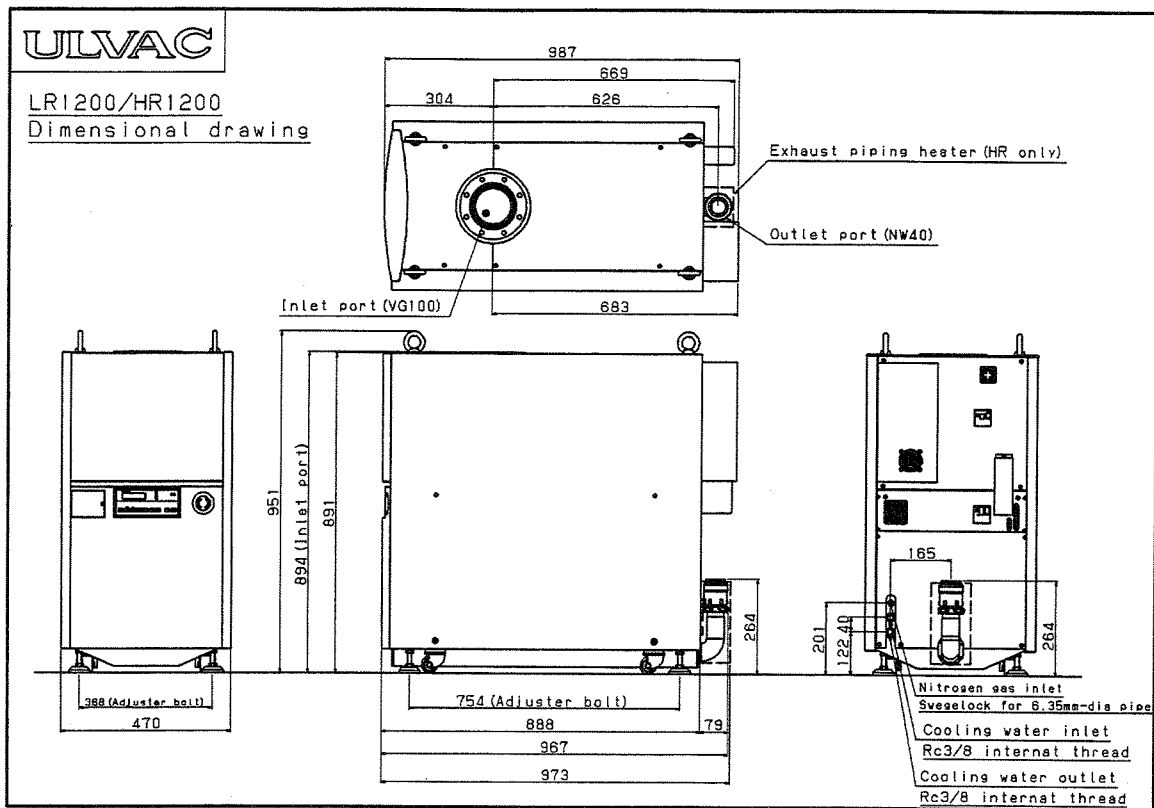


SEMI type

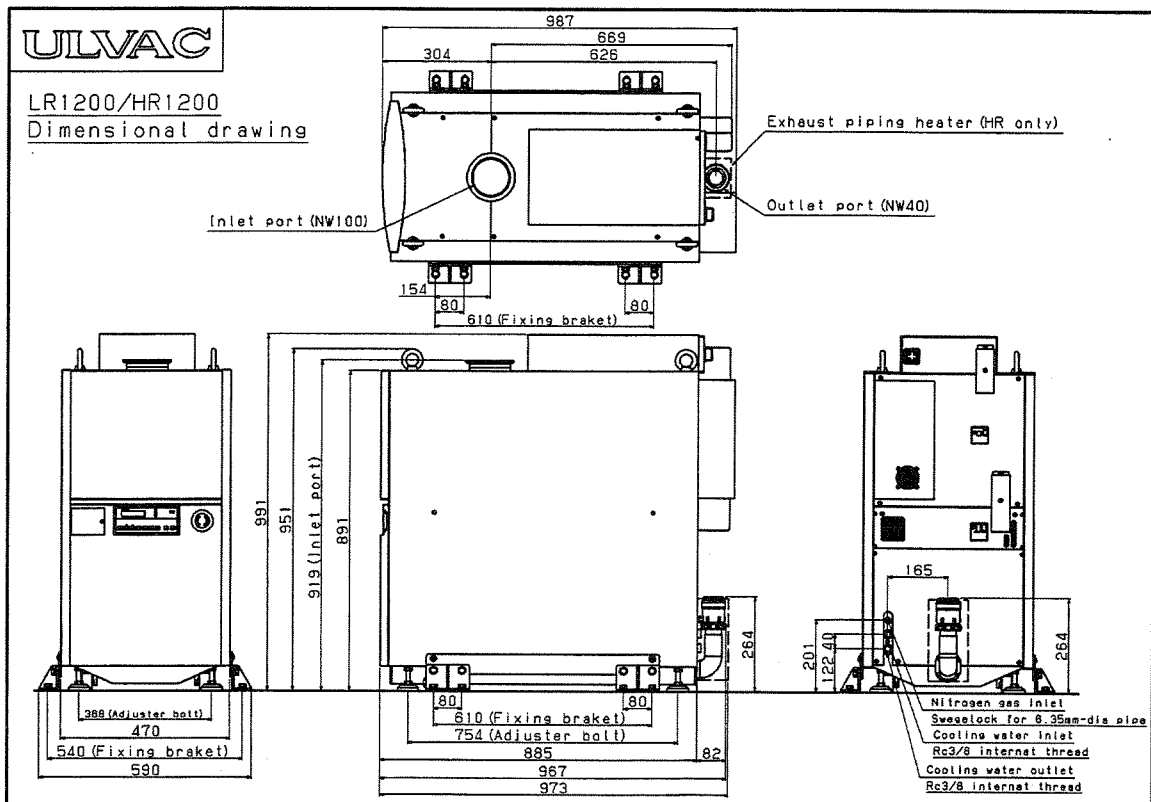




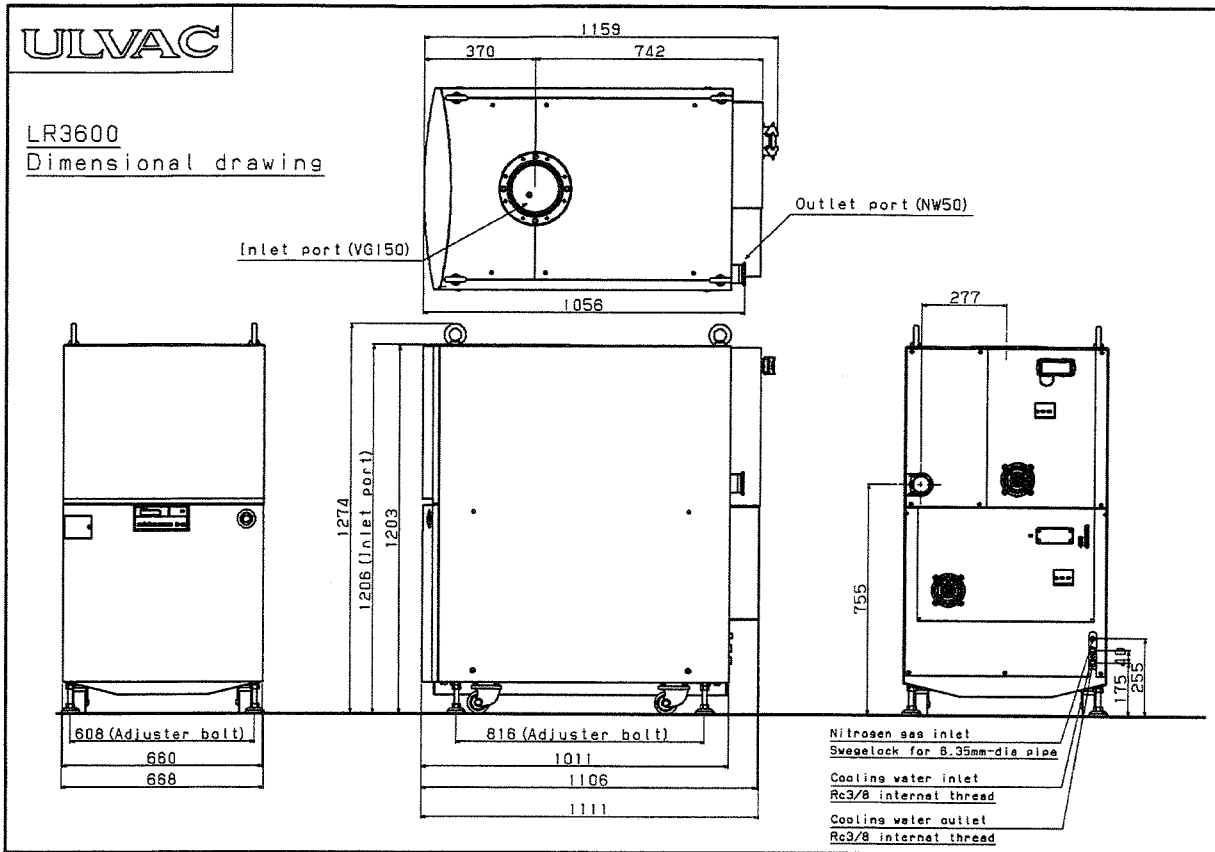
Standard type



SEMI type

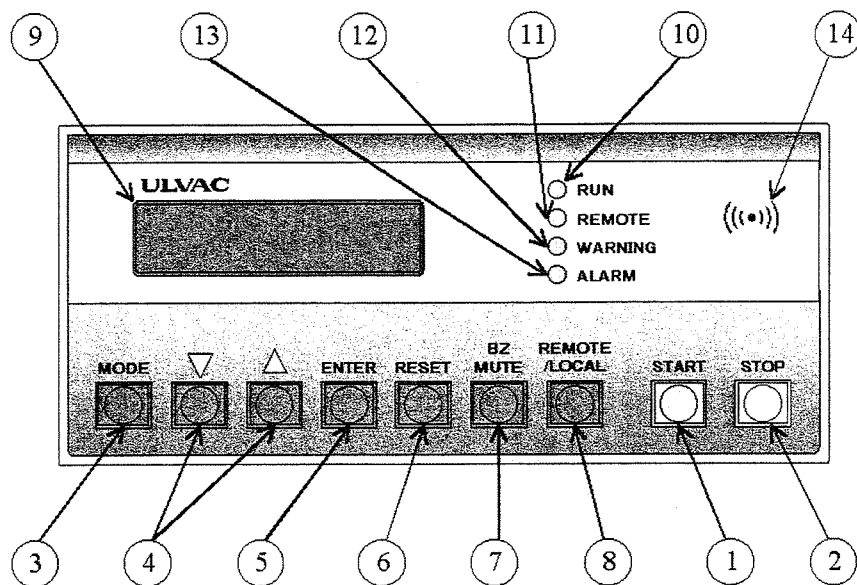


SEMI type



* There is no SEMI specification of LR3600 now.

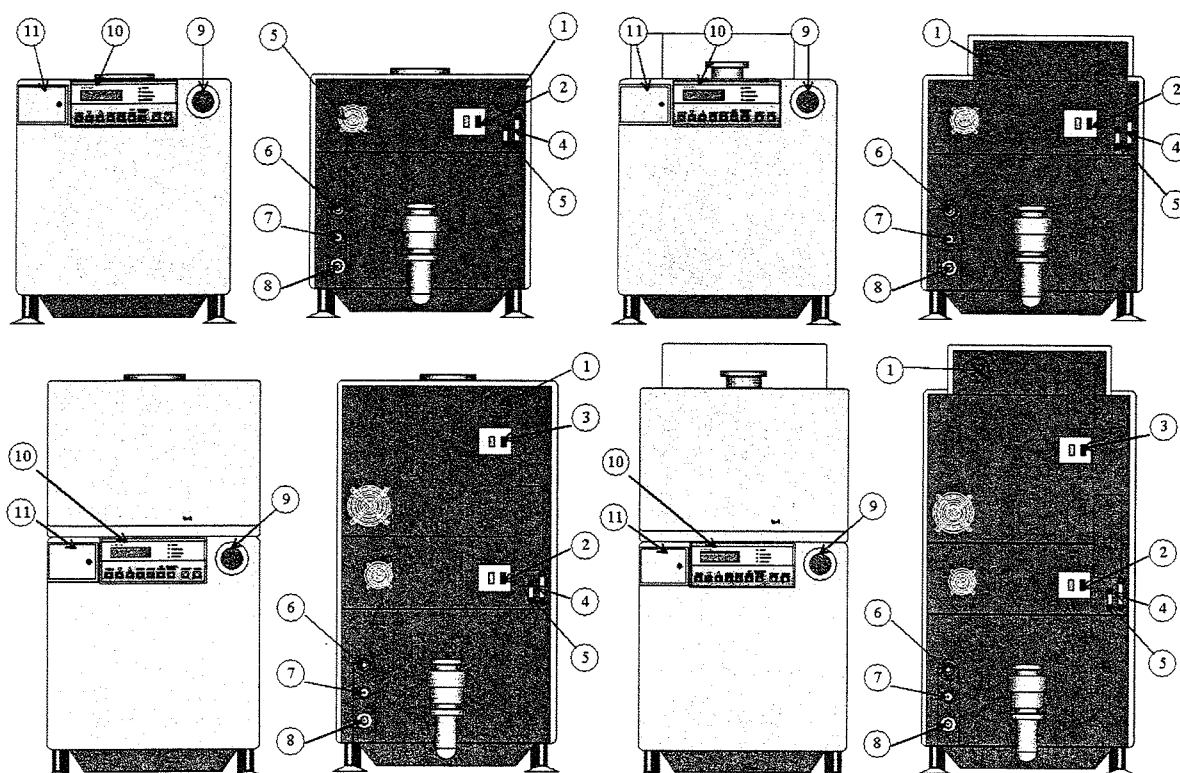
1.4 Description of Controller



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.

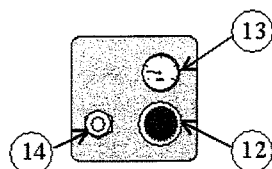
When any trouble occurs, LED3 (orange : No12) and LED4 (red : No13) on the controller will light and warning buzzer sounds. Detailed information will be indicated on the LCD

1.5 Utility Panel



Standard type

SEMI type



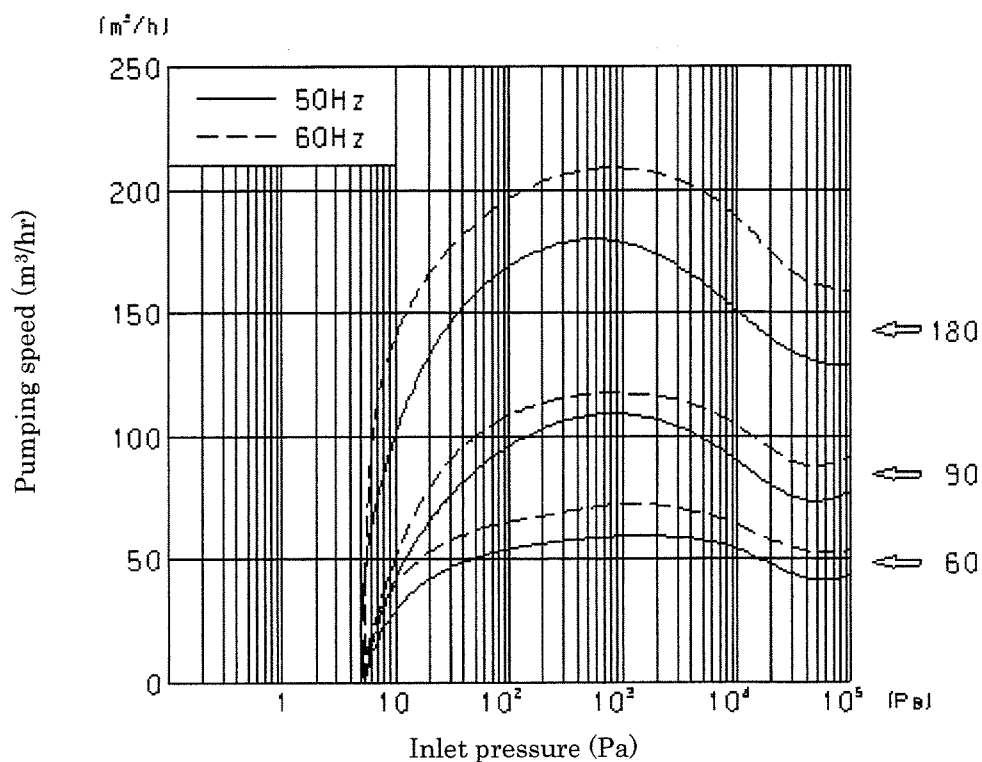
No 11 Inside

No.	Controls	Sign	Functions
1	POWER	CNI1	Applies 200VAC power.
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.
8	WATER OUTLET	---	Cooling water outlet port.
9	STOP Button	---	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.

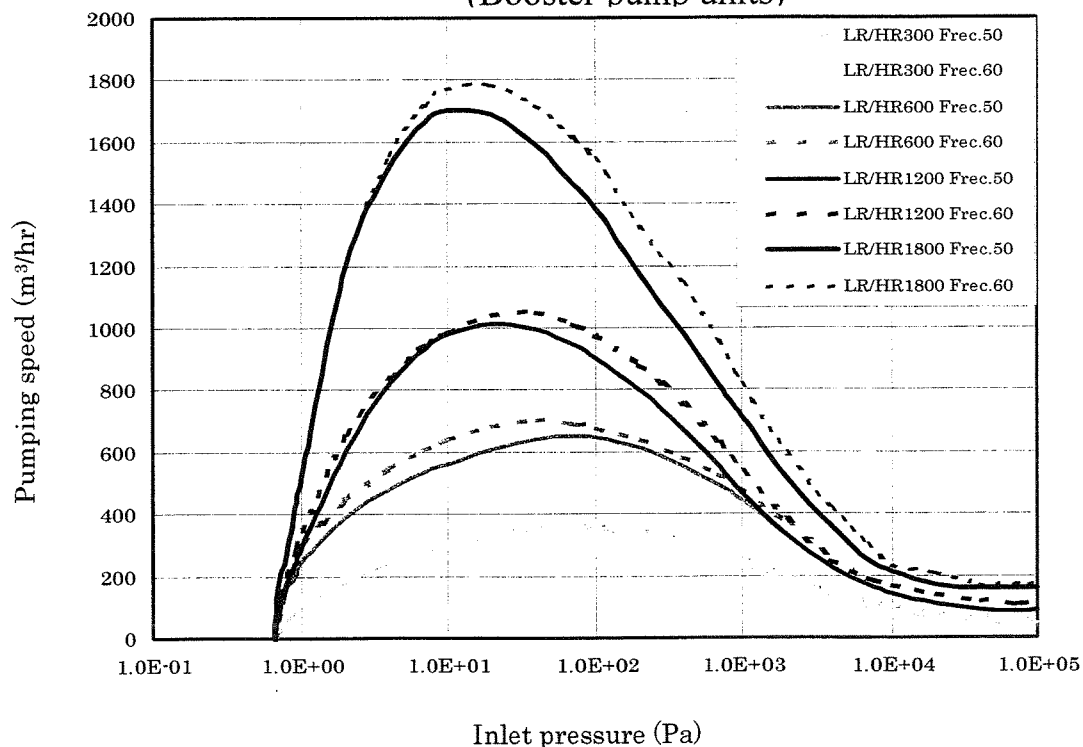
* Refer to the System chart

1.6 Performance Curve

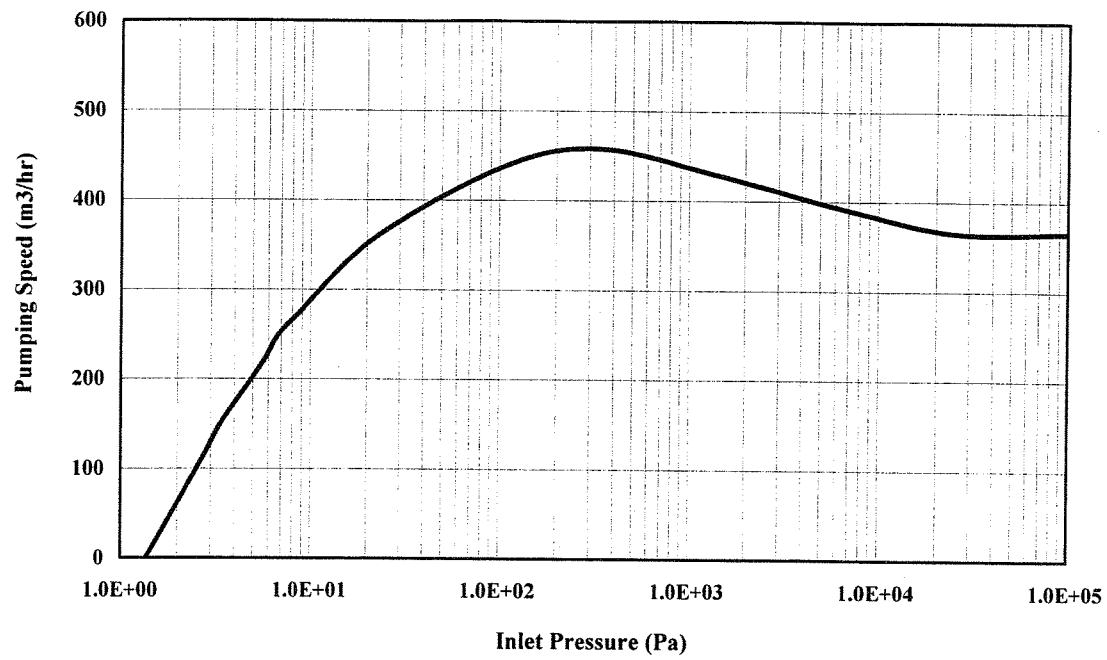
Pumping speed curve
(Primary pump units)



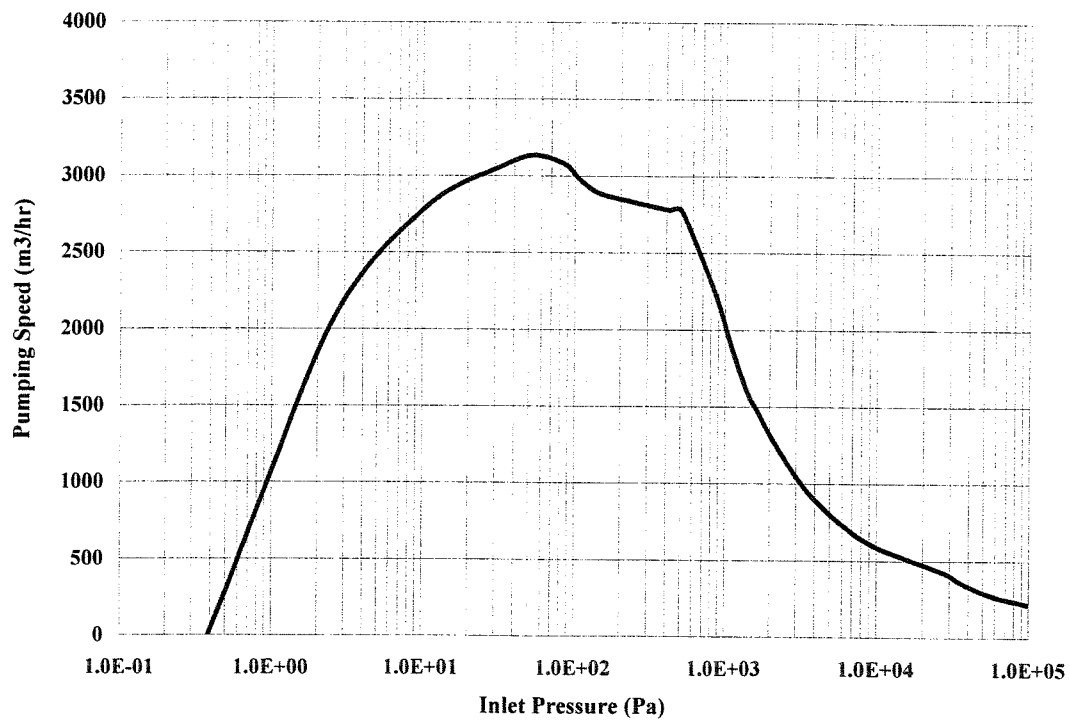
Pumping speed curve
(Booster pump units)



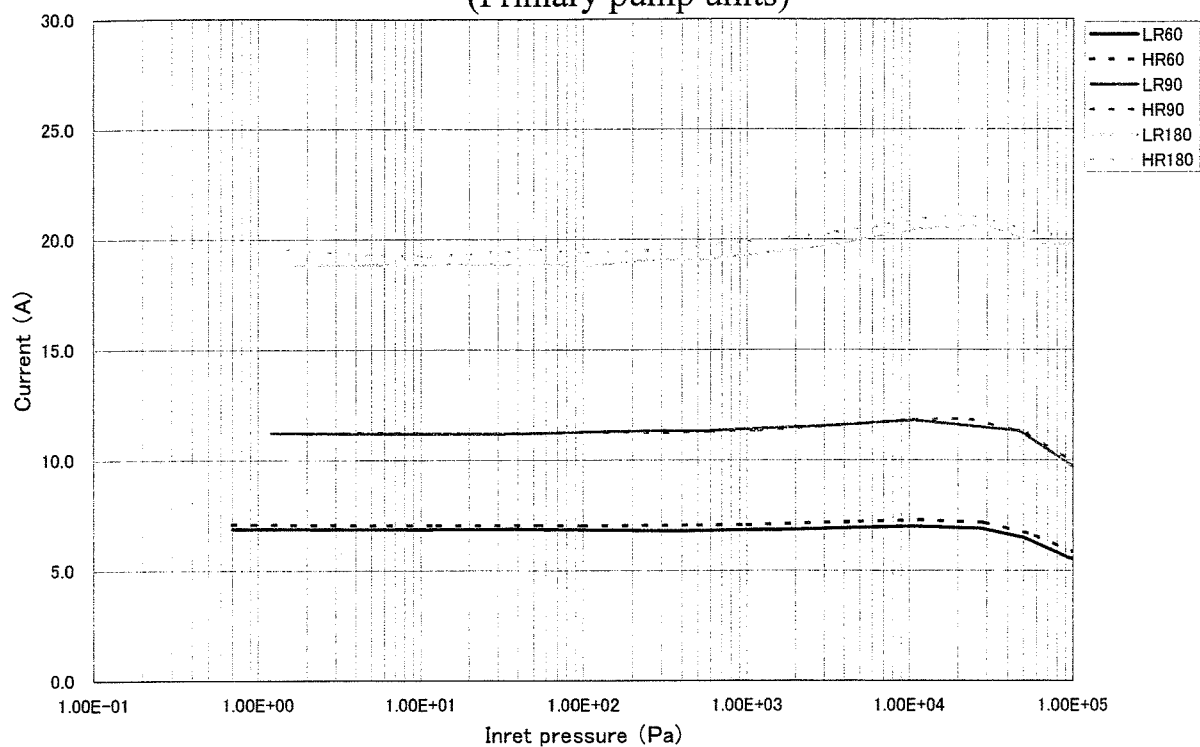
LR420 Pumping speed curve
(Primary pump unit)



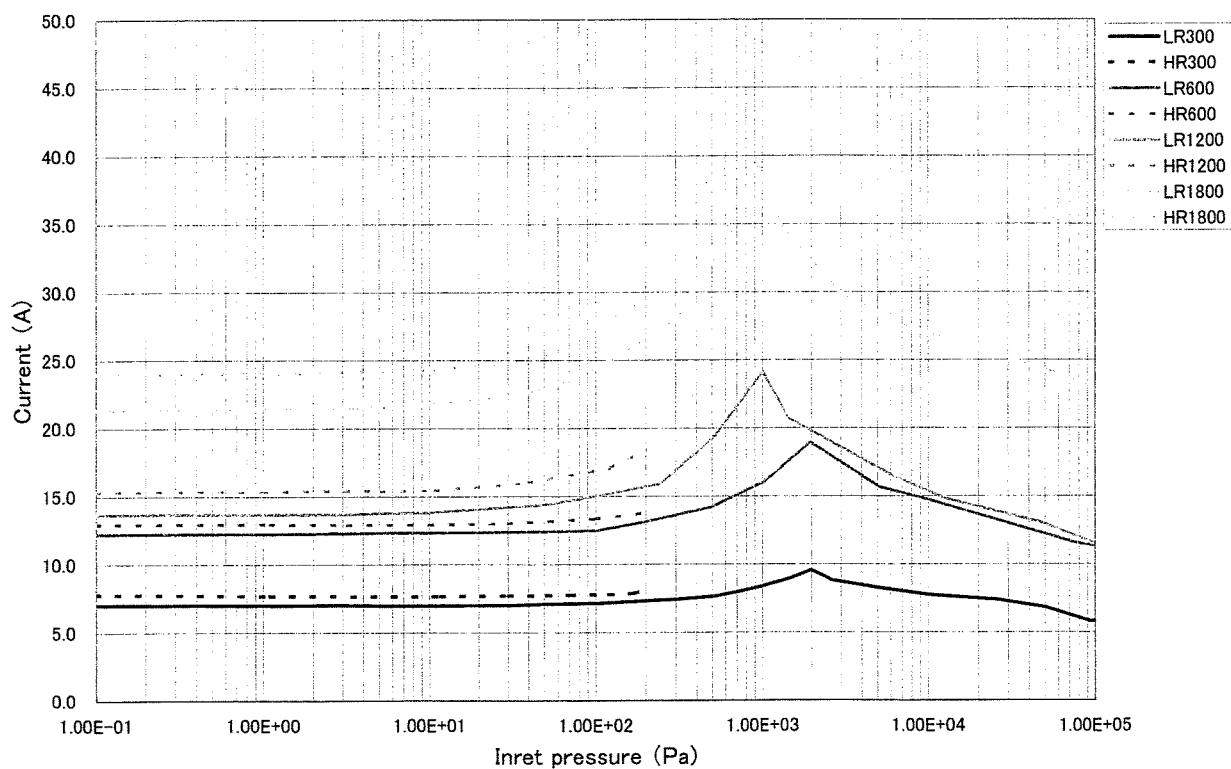
LR3600 Pumping speed curve
(Booster pump unit)



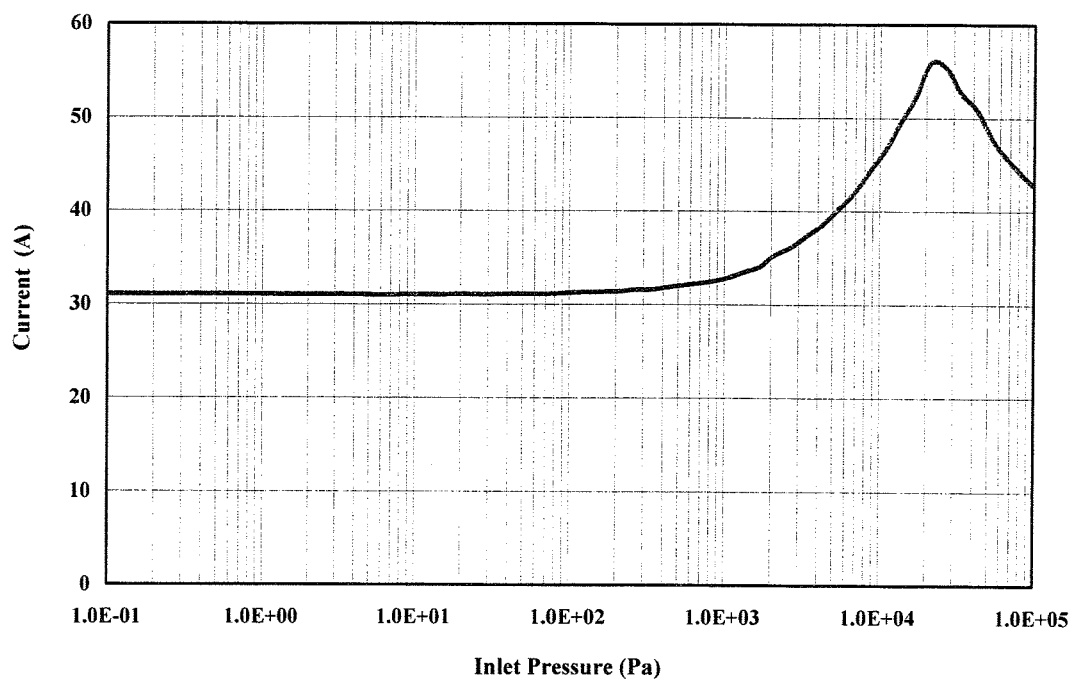
Current - pressure curve
(Primary pump units)



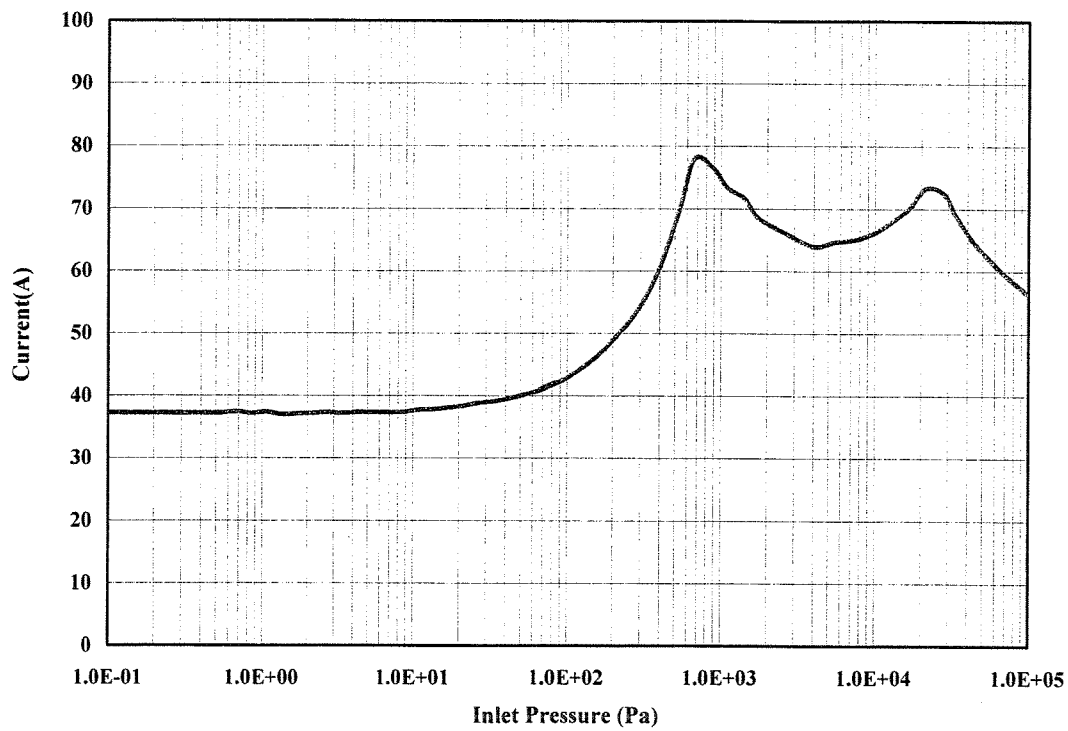
Current - pressure curve
(Booster pump units)



LR420 Current-pressure curve
(Primary pump unit)



LR3600 Current-Pressure curve
(Booster pump unit)



2. Installation

2.1 For Safety Use

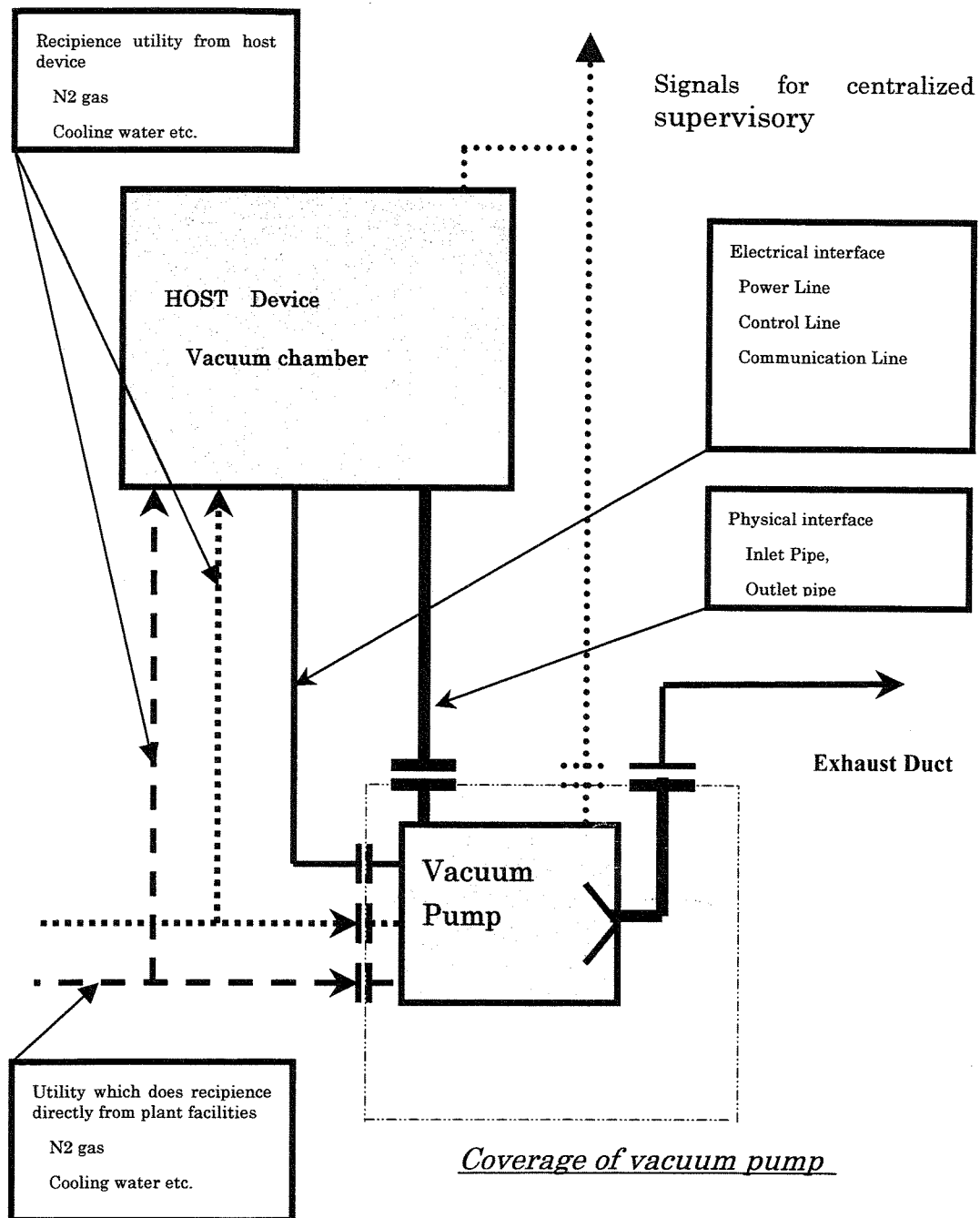


This LR/HR series models are maintenance free except when to connect with the host equipment, or disconnect from it, and to regulate N₂ gas flow at the time of operation. Overhaul or repair work is performed at ULVAC. When any trouble occurs, please contact with your local ULVAC service station (please refer to the ULVAC address list at the end of this manual).

- The interlock system and control system of the LR/HR series pumps are expected to be connected with the host equipment.
- The LR/HR 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 LR/HR series with the EMO system of the host equipment.
- The gas which can be exhausted with this LR/HR series pump, it provides for inert gas(Air,N₂,Ar).
- Do not exhaust other gases (toxicity gas, combustion gas, corrosion gas, and explosiveness gas).
- Set up this LR/HR 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. fire fighting 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.).

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

Location of vacuum pump in host device



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

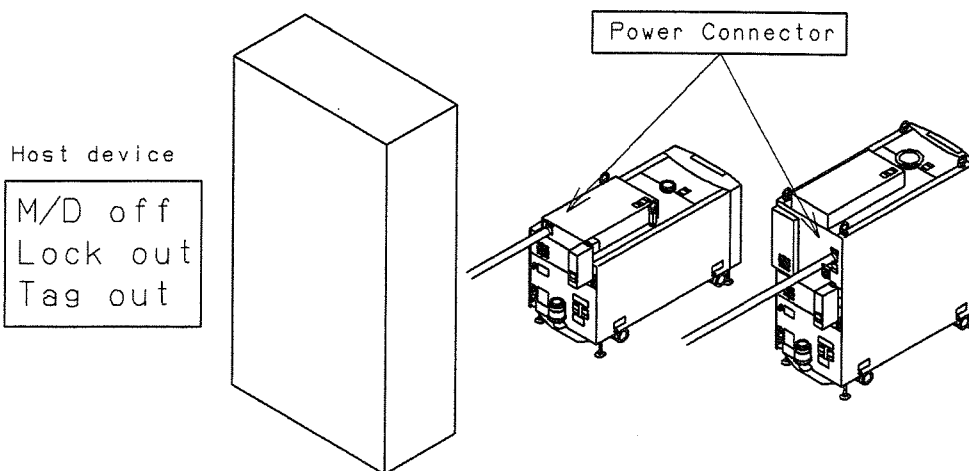
- This LR/HR series pump is locked out in intercepting cooling water, the N2 gas, and the power line. Give the system which can lock out on the host equipment.
- Material selection, installation and operation of wiring should be done according to the rules and codes applied in your country (e.g. fire fighting 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 (MCB1, MCB2 (LR/HR300, LR/HR600, LR/HR1200, LR/HR1800, LR3600)), inner wiring from power connector through the breaker (MCB1, MCB2) is keeping hot. To completely shutoff the electricity, provide a breaker (M/D: AIC 10kAV or above) to the host equipment.
- Heater (AC200V) is installed in the exhaust pipe. Obtain the protection cover according to "finger safe" which are the rule and the law concerning safety in the country.
- When to perform installation or removal of these products, the power should be shutoff completely according to the following diagram.



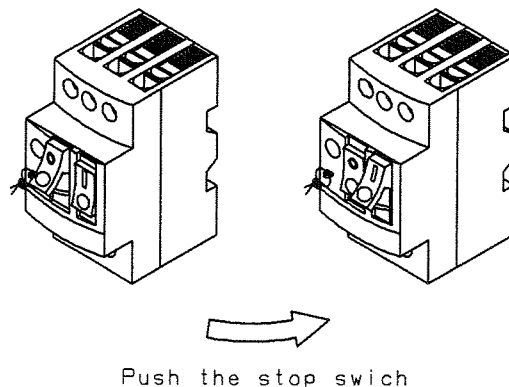
<< Possible electric shock hazard>>

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

1. Shut off the breaker (MCB1, MCB2 (LR/HR300, LR/HR600, LR/HR1200, LR/HR1800, LR3600)) 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 Operational procedure

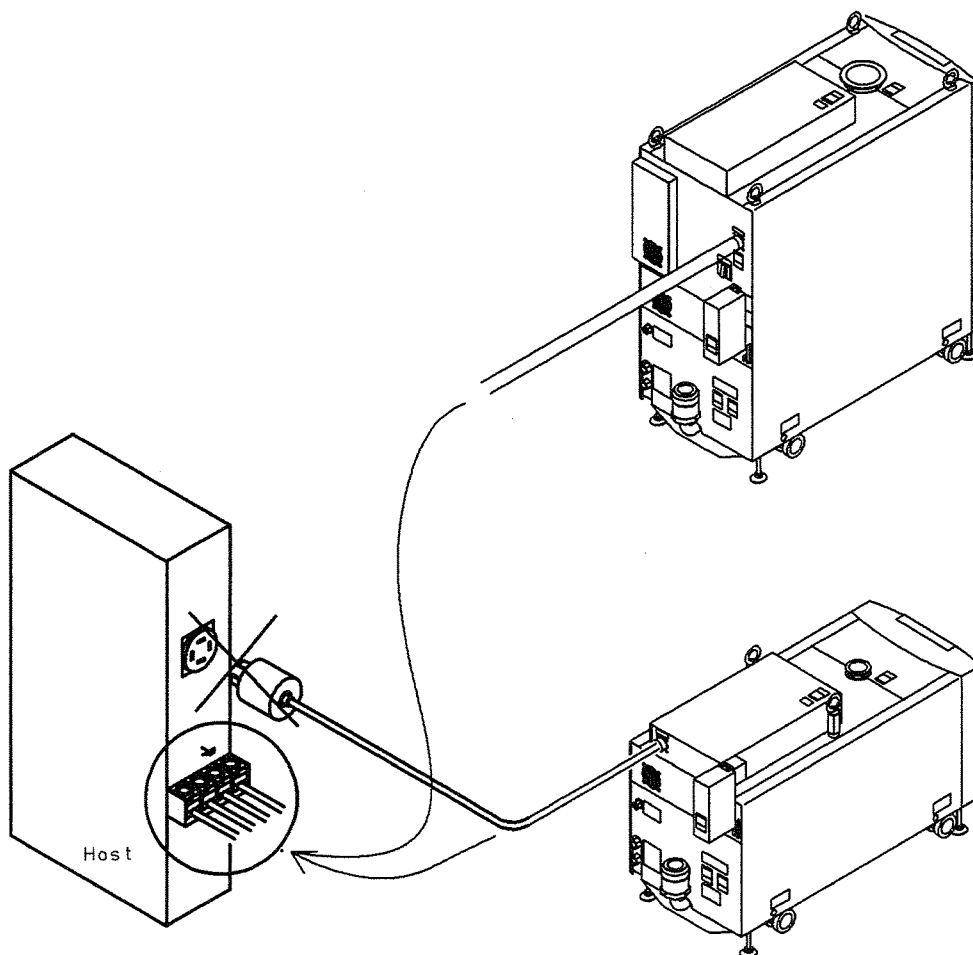


- The noise filter etc. are used to maintain the tolerance to the electrical noise to these products. The electrical noise (current) is leaked from the noise filter to the ground line. Therefore, a certain earth of the ground line is necessary.
- These products are classified with the "High Leakage Current" product, and the plug connection 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

- LR/HR 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

- LR/HR 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 LR/HR 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.

- ULVAC 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

- The temperature of the intake pipe and the exhaust pipe becomes 70°C or more. Set up the protection cover when the connection of the piping of the intake and the exhaust ends.
- Moreover, the protection cover is preparatory by the option.
- LR/HR 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 24Vdc.

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 LR/HR 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 Safety Denotation

For this manual and for warning denotation of LR/HR 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.

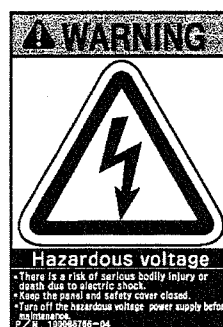


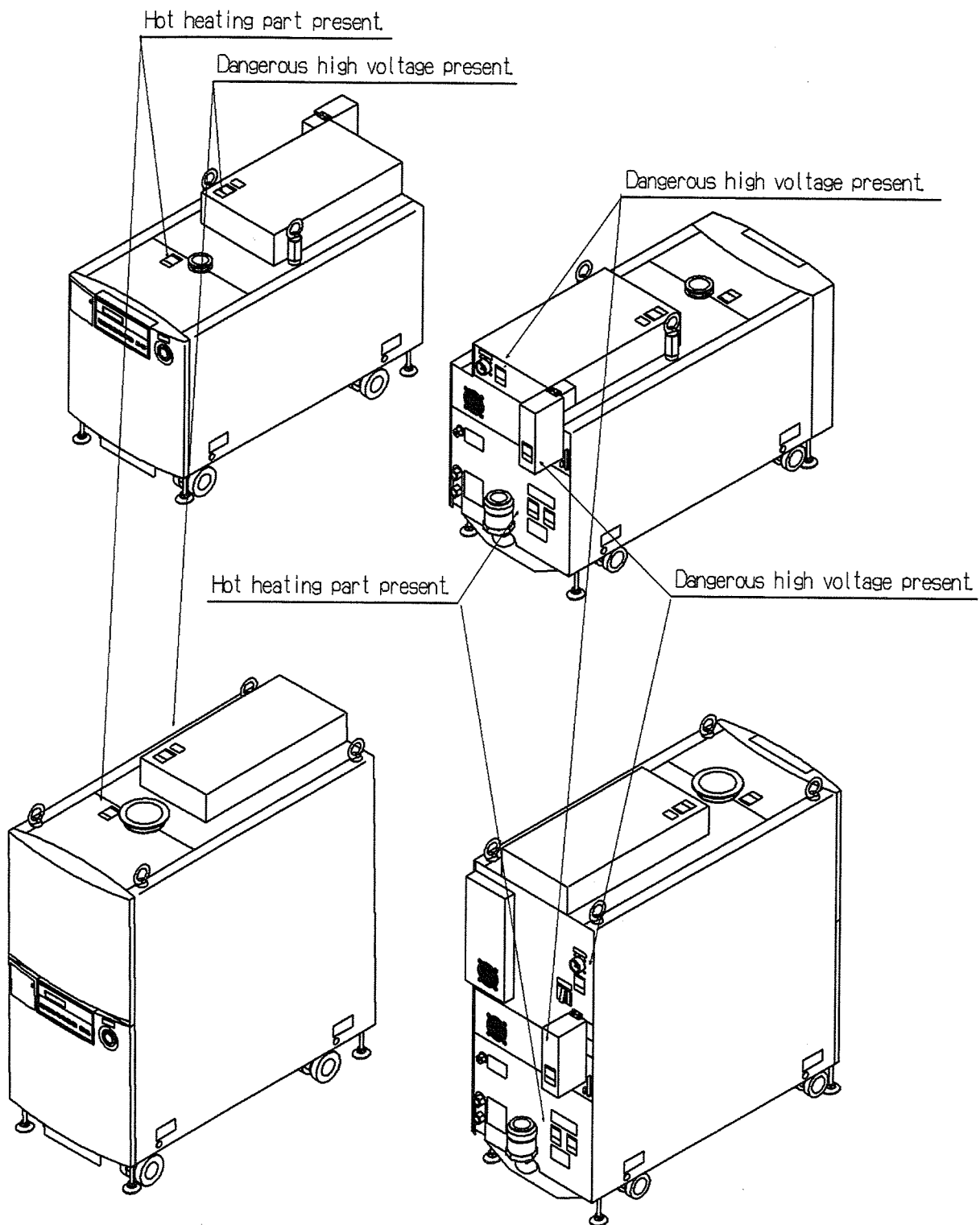
CAUTION

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

2.3 Warning Label

Following warning labels are attached on these products at the positions where potential hazards are expected.





2.4 Installation and Storage Requirements

2.4.1 Unpack

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

**WARNING**

: 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.

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.

**CAUTION**

- Instruct the workers to wear leather gloves and use proper tool to avoid injuries caused wood frame debris and nails.

- 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 pc.
Power connector	1 pc.
Remote operation connector	1 pc.
RS-232C/RS-485 communication connector	1 pc.
Instruction manual	1 copy

**CAUTION**

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

2.4.2 Transit



WARNING

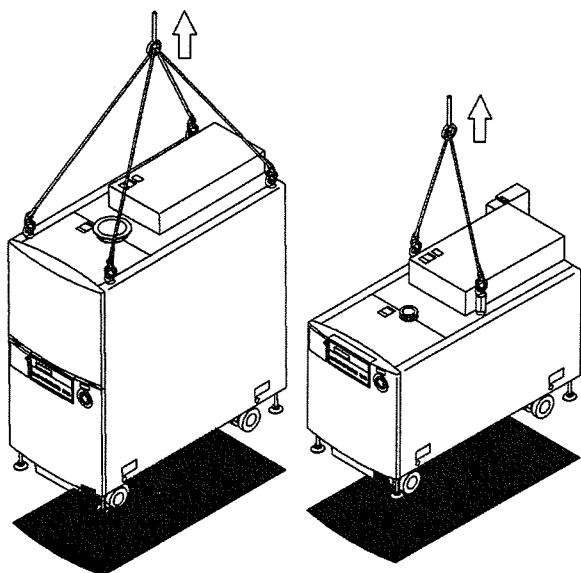
: Although this pump is provided with casters, do not move it a long distance using these casters. If you move this pump in such a way, the load exceeds the safety criterion. You could hurt your waist.

When to transit the pump, you should use loading machines (e.g. moving crane) and hang it, or load and fix the pump on a pallet, then transit it by pallet truck.



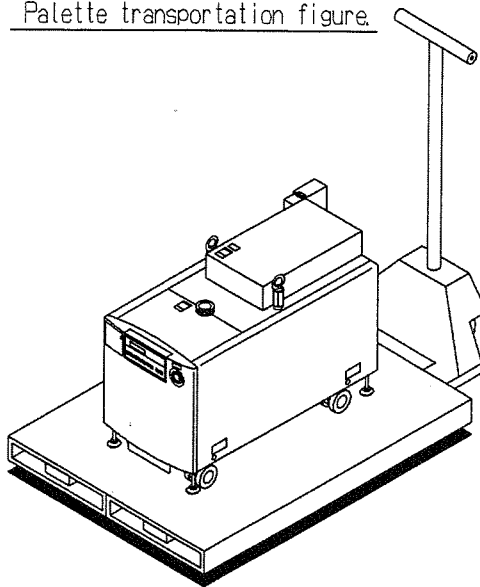
CAUTION

- Do not tilt the pump by more than 10° .
- Pallet truck should not directly be placed under the pump base bottom. This could topple the pump.



Crane hanging figure.

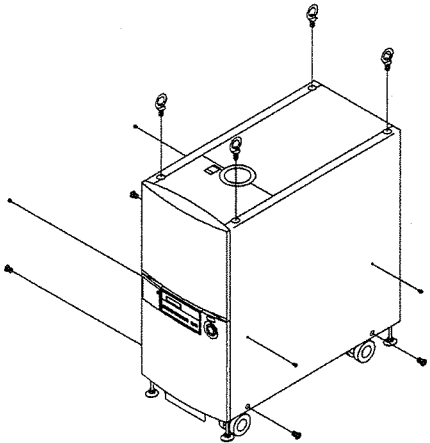
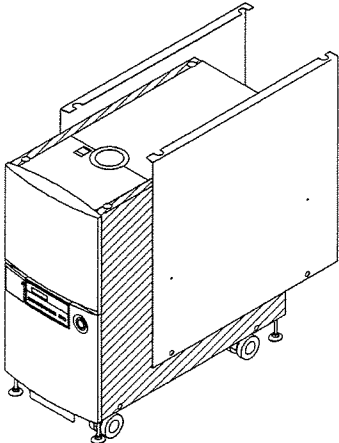
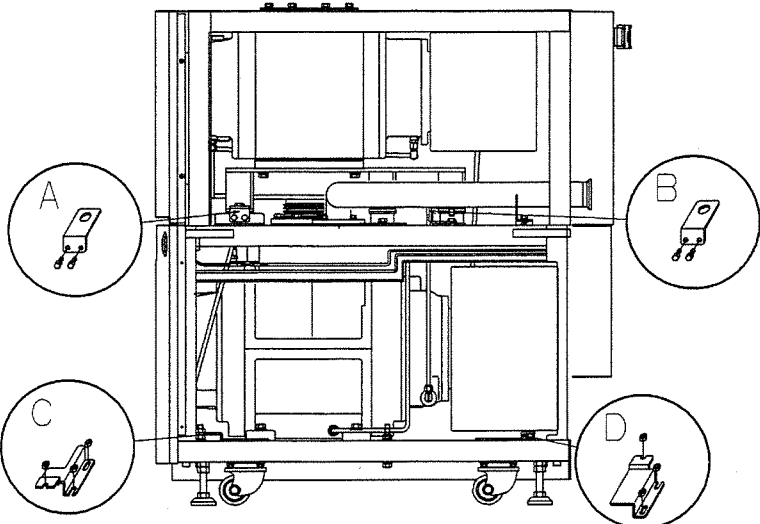
Palette transportation figure.



2.4.3 Removing of fixed bracket for transportation (LR3600)

- To protect internal parts from the impact when transported, LR3600 equips with the bracket.
- Please remove the bracket according to 『Fixed bracket removing procedure』 after transporting the pump.
- Please keep removed bracket, bolt, and nut. Again until they are used.

LR3600 Fixed bracket removing procedure

	
①Please remove four eyebolts from the pump. ②Please remove the screws and bolts which are fixing the side panels .	③Please remove the side panel.
	
④Please remove bolt (M8×16) which repairs the bracket of A and B in figure. ⑤Please remove four brackets of A and B in figure. ⑥Please remove two M8 nuts and one M12 nut which are fixing the bracket of A and B in figure. However, there is no M12 nut in the bracket on DRIVER BOX side of D in figure. ⑦Please remove four brackets of C and D in figure.	
⑧Please install the side panel.	
⑨Please install the screws and bolts which are fixing the side panels .	
⑩Please install four eyebolts from the pump.(Work end)	



CAUTION

●Please remove the bracket before setting up, and driving the pump.

When the pump is driven with the bracket put up, it causes an abnormal vibration and an abnormal sound.

2.4.4 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

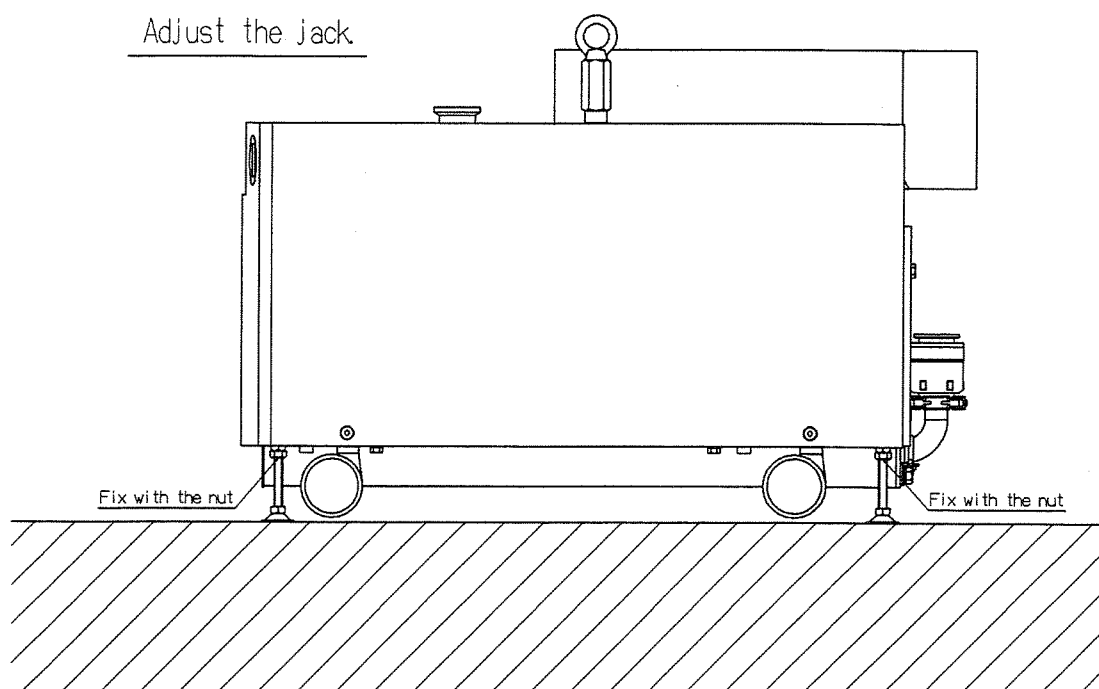
* Not condensing

2.4.5 Other Requirements



CAUTION

- Set up and keep this LR/HR 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, adjust the jack to set it in a horizontal position (adjustable range is + 10 mm).
- Do not tilt the pump by more than 10° when moving it.



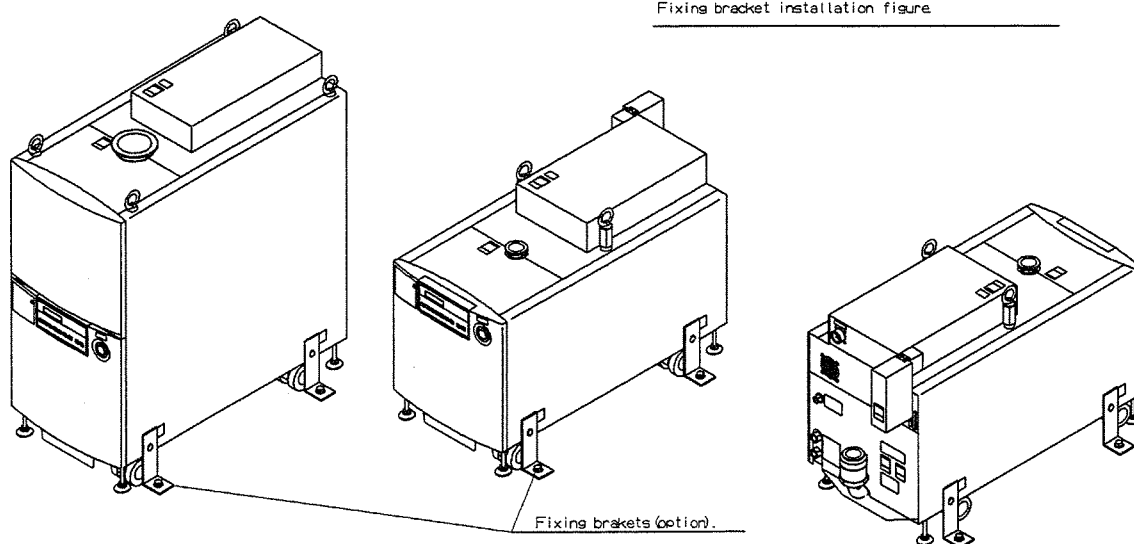
2.4.6 Earthquake Resistant Measures



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.

- 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.

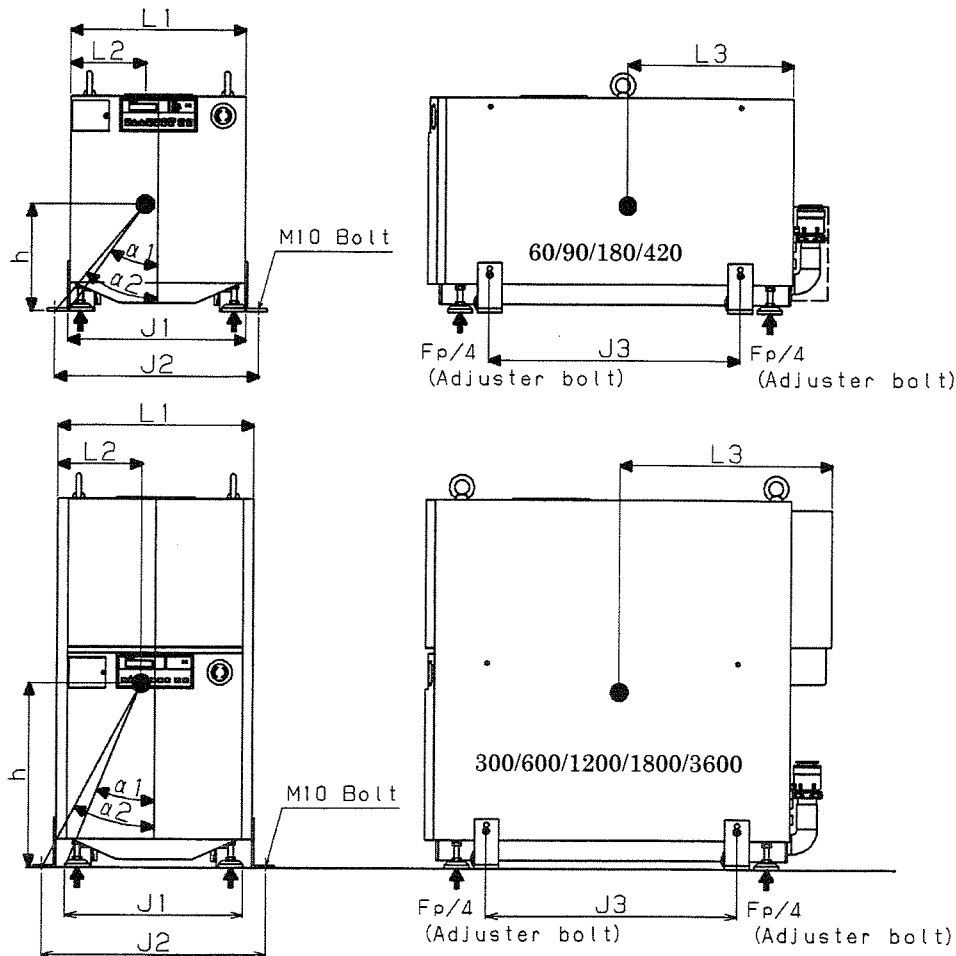


Earthquake-proof strength was examined based on the demands postulated of 1997 version United States union construction standard (UBC).

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

Antiearthquake procedures

		unit	LR/HR60	LR/HR90	LR/HR180	LR420	LR/HR300	LR/HR600	LR/HR1200	LR/HR1800	LR3600
The maximum width on surface of projection which falls easily	L1	mm	370	420	520	660	378	470	470	520	660
Short distance from fulcrum on surface of projection which falls easily to center of gravity position	L2	mm	161	180	222	330	161	205	200	223	330
The distance from rear panel to center of gravity position	L3	mm	383	403	465	717	491	529	517	661	719
Height from floor side to center of gravity position	h	mm	242	258	307	380	445	488	580	606	796
Weight of device	Wp	kg	180	245	335	415	275	370	420	545	720
Horizontal pressure(Adjuster) $Fp=0.94 \cdot Wp$	$Fp/4$	kg	42.3	57.6	78.7	97.5	64.6	87.0	98.7	128.1	169.2
$0.94 \cdot h >= 0.85 \cdot L2$			OK	OK	OK	OK	OK	OK	OK	OK	OK
Fall power $R=(Wp \cdot (0.94h - 0.85L2)) / (2 \cdot L1)$	R	kg	22.0	26.1	32.2	24.1	102.4	111.9	167.6	199.3	254.9
Shearing power of anchor bolt (M10)	τ		1537	1537	1537	1537	1537	1537	1537	1537	1537
$Fp < \tau$			OK	OK	OK	OK	OK	OK	OK	OK	OK
Tensility of anchor bolt(M10)	σ		2300	2300	2300	2300	2300	2300	2300	2300	2300
$R < \sigma$			OK	OK	OK	OK	OK	OK	OK	OK	OK
Jack interval	J1	mm	378	428	528	608	378	428	428	528	608
Earthquake-proof Bracket interval	J3	mm	556	610	655	706	556	610	610	655	706
Fall angle	$\alpha 1$	deg	38.0	39.7	40.7	38.7	23.0	23.7	20.3	23.5	20.9
Earthquake-proof Bracket interval	J2	mm	440	490	590	730	440	540	540	590	730
Fall angle	$\alpha 2$	deg	42.3	43.5	43.9	43.8	26.3	29.0	25.0	25.9	24.6
$\alpha > 15 \text{deg}$			OK	OK	OK	OK	OK	OK	OK	OK	OK



2.5 Piping

2.5.1 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**

: 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 removed the matter from the pump, so contact with the your local service station.

The pump flange should not be loaded directly (refer to 2.4.5 Earthquake Resistance Measures).

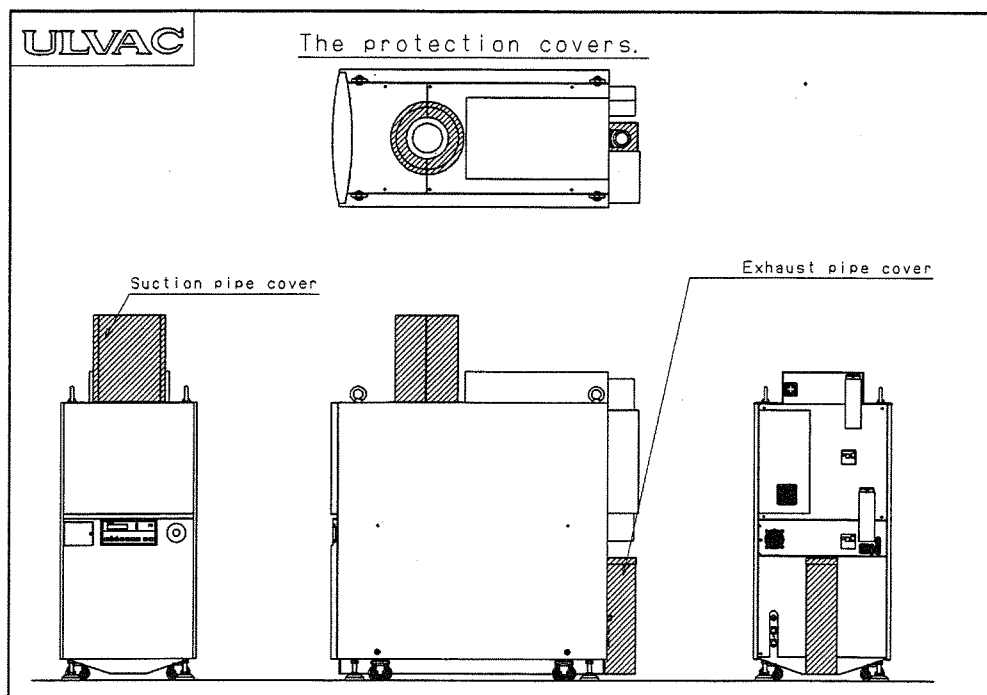
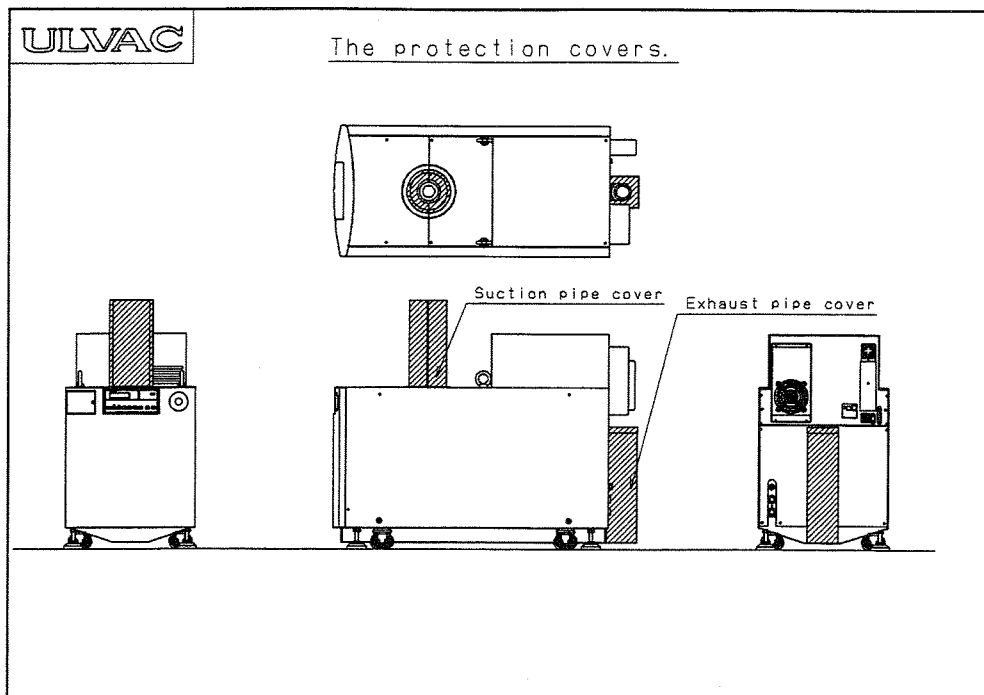
Be careful not to damage the gasket surface. After the completion of the piping work, perform gas leak test for the whole system.

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°C or more. Set up the protection cover when the connection of the piping of the intake and the exhaust ends.

When the pump is driven, AC200V is energized to the exhaust pipe heater. Obtain the protection cover so that the hand should not touch the heater part after connecting the exhaust pipe.

Moreover, the protection cover is preparatory by the option.



- - Installation protection cover to the exhaust heating element.
- - Specification for Connection : refer to 1.3 Dimensional Drawings.
- - Compatible Piping : Use pipe materials which compatible with your local rules and laws concerning to safety.

Piping should not produce rust. Heat resistance performance should be more than 100° C.

2.5.2 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 : Swage-lock for 6.35mm-diameter pipe
- - Proper Piping : Use SUS pipe of outside diameter of 6.35mm-diameter with more than 0.9mPa pressure proof joints.

Nitrogen gas	Supply gas pressure (MPa: reading on gauge)		0.1 to 0.5
	Regulated pressure (MPa: reading on gauge)		0.05 (Regulated pressure in pump)
	Flow rate	Shaft seal (SLM)	0 to 5
		Gas ballast (SLM)	0 to 50

2.5.3 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.



CAUTION

- 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.

■ - Connector Requirement : Connector port Rc3/8 female

■ - Compatible piping : Joint and pipe should have water pressure resistance of more than 0.9Mpa, and heat resistance of more than 100°C.

Cooling water	Supply pressure (MPa)	0.1 to 0.3
	Inlet-outlet pressure difference (MPa)	0.1
	Flow rate (L/min)	5.0
	Supply temperature	10 to 30 1)

1) Not condensing

2.6 Wiring

2.6.1 Power wiring

Object model: LR/HR60, LR/HR90, LR/HR180

: LR/HR300, LR/HR600, LR/HR1200, LR/HR1800



WARNING

: 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.

Pin assignment	
Pin No.	Specification
A	R phase
B	S phase
C	T phase
D	PE/GND

Specifications

Pump model (LR/HR Series commonness)	LR/HR60	LR/HR90	LR/HR 180	LR/HR 300	LR/HR 600	LR/HR 1200	LR/HR 1800
Receptacle maker	Dai-Ichi Electronic Inc. Ltd.						
Receptacle part No.	CE05-2A22-22PD-B						CE05-2A32-17PD-B
Compatible plug (direct type)	CE05-6A22-22SD-B-BSS						CE05-6A32-17SD-B-BSS
Compatible wire size	Maximum 10AWG/4 Conductors Outside diameter of insulation coating ϕ 4.5mm						Maximum 6AWG/4 Conductors Outside diameter of insulation coating ϕ 7.0mm
Rated current (50/60 Hz)	46A						80 A



CAUTION

- 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.

Object model: LR420, LR3600

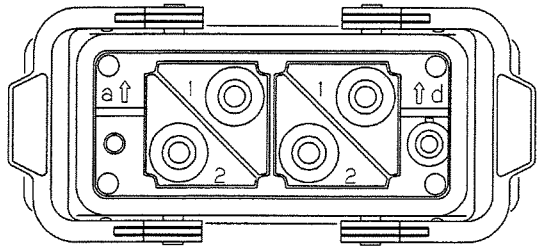


WARNING

: 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.

 Pump side	Pin assignment	
	Pin No.	Specification
	2 (a ↑ side) *	L1/R phase
	1 (a ↑ side) *	L2/S phase
	2 (↑ d side) *	L3/T phase
	a ↑	PE/GND

* There are the one displayed in the frame as (a ↑ , ↑ d) and the one displayed in the frame as (a/b ↑ , ↑ c/d) in the connector.

Specifications

Pump model	LR420	LR3600
Connector maker	HARTING®	
Connector part No.	Han 100A module 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 16mm ² (for PE extension): 09 14 000 9912	
Acceptable Connector	Han 100A module 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 : 19 30 016 0428	
	Cable shoe 16mm ² (for PE extension): 09 14 000 9912	
	Universal cable protection: 2456d36	
Size of acceptable electric wire	16-35mm ²	
Ratings current (maximum)	100A	

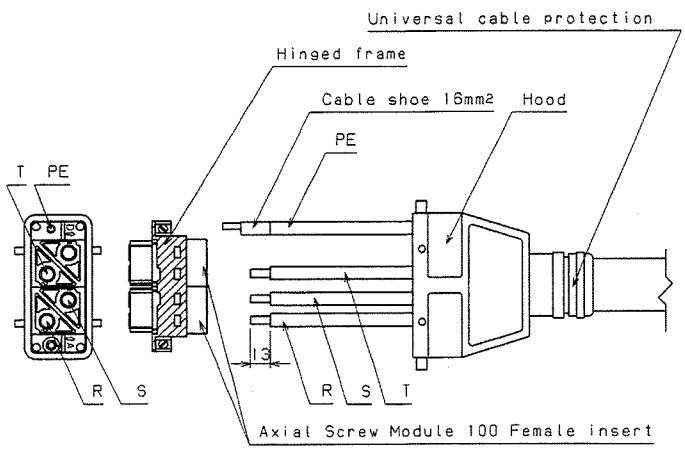
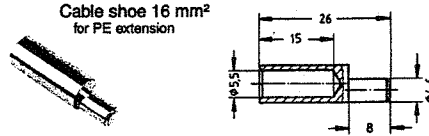
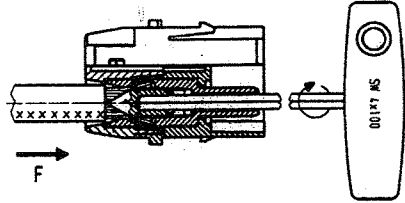
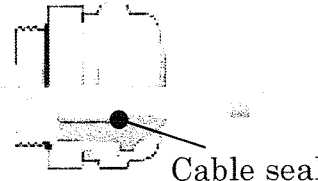


CAUTION

- 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.

Method of wiring for attached connector

Object model: LR420, LR3600

 Front Side * There are the one displayed in the frame as (D ↑, ↑ A) and the one displayed in the frame as (D/C ↑, ↑ B/A) in the connector.	
Method of fixing Cable shoe Please strip off the coating of the ground line by 15mm. Please fix Cable shoe to wiring for the earth with the tool. And, please confirm neither Cable shoe nor the ground line come off.	
Method of fixing wiring Please strip off the coating of wiring by 13mm. Please insert wiring in the inside until becoming a position where the coating is the same as the point of the contact part. Please tighten from connected side of the connector by the torque of 6Nm with a hex-head wrench or a torque wrench when you insert wiring.	
Use of cable seal Please use a gray cable seal when externals of the cable used are $\Phi 27$-32mm. Please use a pink cable seal when externals of the cable used are $\Phi 32$-36mm.	



CAUTION

- 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.

2.6.2 Wiring for remote control

**WARNING**

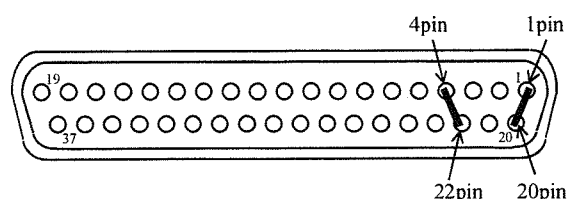
- Before start the work, ensure that all hazardous energies are shutoff. Refer to the Section 2.1 For safety Use.

- Wiring work should be performed by licensed worker.

Pin assignment				
Pin No.	I/O	Item	Specifications	
1	IN	External interlock	CLOSE: Normal	OPEN: External interlock stop
2		N. C.		
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		N. C.		
7	IN	Seal gas valve	CLOSE: Valve open	OPEN: Valve close
8		N. C.		
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	N. C.	CLOSE: In standby run	OPEN: In normal run
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		N. C.		
18		N. C.		
19	OUT	OUT 9 - 16 COM		
20	IN	IN 1 COM		
21		N. C.		
22	IN	IN 3-7 COM		
23		N. C.		
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 current value alarm	CLOSE: Normal	OPEN: Alarm
29	OUT	DRP current value warning	CLOSE: Normal	OPEN: Warning
30	OUT	MBP current value alarm	CLOSE: Normal	OPEN: Alarm
31	OUT	MBP current value warning	CLOSE: Normal	OPEN: Warning
32	OUT	Pumping pressure alarm	CLOSE: Normal	OPEN: Alarm
33	OUT	Pumping pressure warning	CLOSE: Normal	OPEN: Warning
34	OUT	System error	CLOSE: Normal	OPEN: Alarm
35		N. C.		
36		N. C.		
37	OUT	OUT 24 - 34 COM		

Connector maker	Dai-ichi Denshi Ind., Ltd.
Connector part No.	17JE-13370-02 (D1) connector
Compatible connector	17JE-23370-02 (D8A) connector
Compatible wire size	AWG #22 Use the shielded cable.

- 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 20 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.



- A voltage of 24VDC 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.
- Operable voltage: Less than 24 VDC, contact capacity: 50mA (per one contact)
- 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.

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.

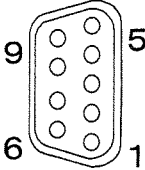
Pin No.14 Ready status check (READY)

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.

For the run mode, refer to "3.3 How to Confirm Pump Run Status". 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. (In standard, LR is set in run mode 2 and HR is set in run mode 3.)

2.6.3 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	EVN
	5	GND		Stop	1 bit
	6	RS-485 A(+)	Data Configuration		BCD code
	7			Terminator	CR code
	8	RS-485 Terminator			
	9	RS-485 Terminator			

Specifications

Connector maker	Dai-ichi Denshi Ind., Ltd.
Connector part No.	17JE-13390-02 (D1) connector
Compatible connector	17JE-23090-02 (D8A) connector
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.(c. Supplementation of the communication system P101~107).

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.

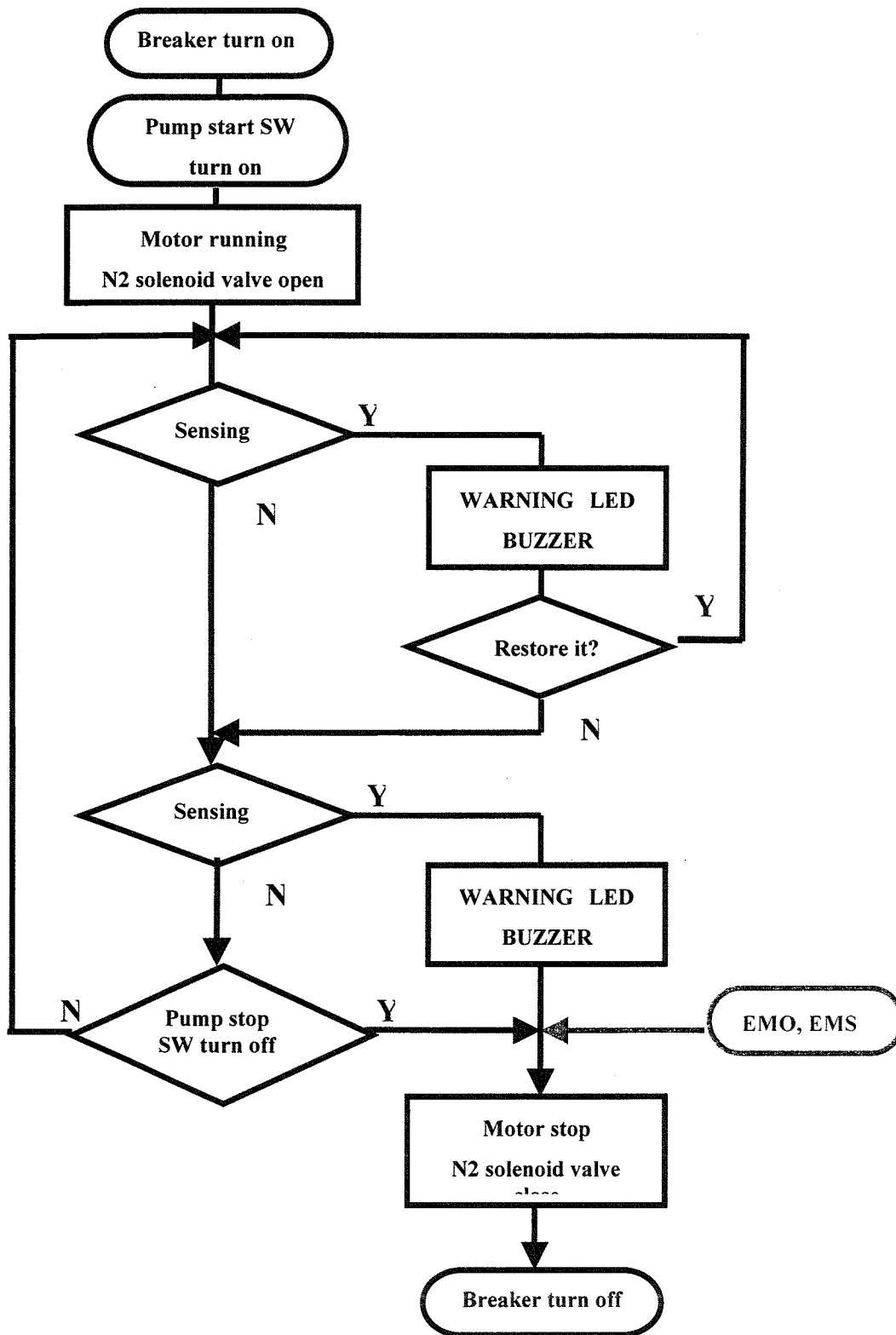
- Please input the 3 digits of “ : n n” before the command when you order the command from the host side.

: 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.

3. Operation Procedure

3.1 Flowchart for operation



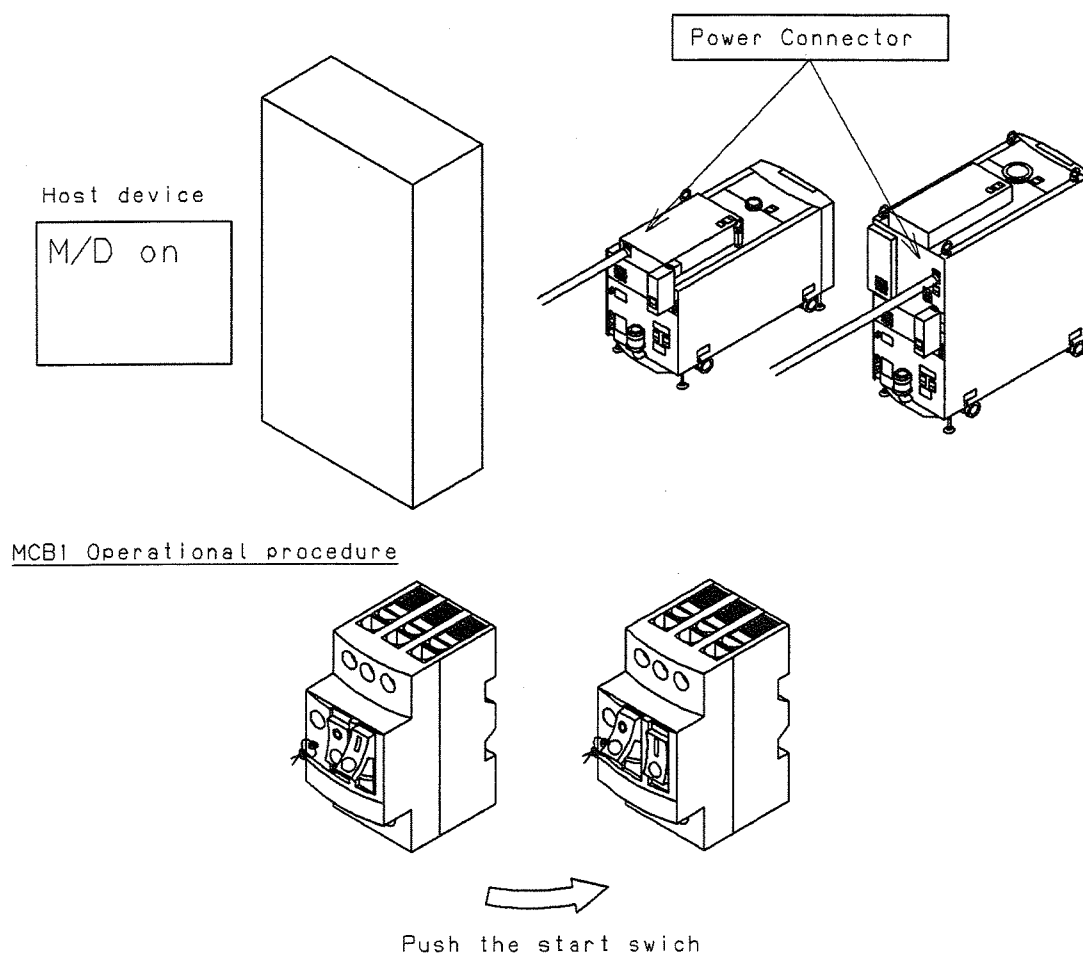
3.2 Prior Operation

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 (MCB1, MCB2 (LR/HR300, LR/UR600, LR/HR1200, LR/HR1800, LR3600)) on the pump.



CAUTION

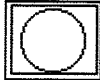
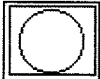
- "Initialize" is displayed for initialization and operation cannot be performed immediately after the breaker is turned ON. Perform the following operation after verifying that "Waiting" appears about 30 seconds later.



3.3 Selecting LOCAL (manual)/REMOTE

(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.	Switch to use REMOTE /LOCAL 
---	---

3.4 Start and Stop

LOCAL operation		
Run	1. [CONDITION /STAND-BY] or status is displayed on the controller display.	Switch to use START 
	2. Press the [START] switch on the controller.	
	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 [△] switch. ▽  △ 	N2 Purge Flow 4.3 SLM ↓ Water Flow 3.0 L/min ↓ DRP Pump TEMP 55°C

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 N ₂ purge gas (seal, ballast) flow rate.	SLM
WATER FLOW	Displays cooling water flow rate.	L/min
EX. PRESS.	Displays the pressure of exhaust pipe.	M Pa
MBP revolution	Displays the booster pump run frequency	rpm
DRP CURRENT	Displays the motor input current of primary pump.	A
MBP CURRENT	Displays the motor input current of booster pump.	A
DRP PUMP TEMP	Displays primary pump temperature.	°C
MBP PUMP TEMP	Displays booster pump temperature.	°C
EX. PIPE TEMP	Displays exhaust pipe 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 UR sires.
- 『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 can not be changed because it is related to the performance of the pump.

Method of changing set value.

- ① A set item of the table below is managed by 『SET-UP 1』. 『SET-UP 1』 is displayed in LCD by pressing [MODE]. 『SET-UP 1』 can be selected by pressing [ENTER].
- ② The change item is displayed in LCD by pressing [Δ],[▽]. The change item can be selected by pressing [ENTER].
- ③ A set value is changed pressing [Δ],[▽].The change of a set value ends when fixing it pressing [ENTER].
- ④ Display the Pump Run Status in LCD by pressing [MODE] when the change of a set value ends.

Set item managed by 『SET-UP 1』	
1	『CONTACT』
2	『Time』
3	『LANGUAGE』
4	『RS BAUD』
5	『RS485 ADDRESS』

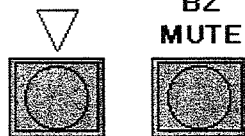
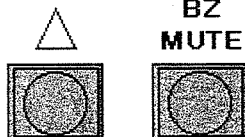

CAUTION

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 station.

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

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	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.	
The seal gas valve (SV1) can be opened/closed by pressing [△] and [BZ.MUTE] switches on the controller simultaneously.	

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.

MODEL No.6 LR60

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 0000 rpm, rated revolution 0000 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 current WARNING	9.0A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	10.0A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	0.0 A	Higher limit alarm fixed	0 sec		5 sec after run to run stop
13	MBP current ALARM	0.0 A	Higher limit alarm fixed		0 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 60°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	2				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

MODEL No.7 LR90

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 0000 rpm, rated revolution 0000 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 current WARNING	13.6A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	15.6A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	0.0 A	Higher limit alarm fixed	0 sec		5 sec after run to run stop
13	MBP current ALARM	0.0 A	Higher limit alarm fixed		0 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 75°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	2				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

Model No. 8 LR180

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 0000 rpm, rated revolution 0000 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 current WARNING	21.0A	Higher limit alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	22.0A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	0.0 A	Higher limit alarm fixed	0 sec		5 sec after run to run stop
13	MBP current alarm	0.0 A	Higher limit alarm fixed		0 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 85°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	2				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

Model No. 27 LR420

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 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	MBP current WARNING	0.0 A	Higher limit alarm fixed	0 sec		5 sec after run to run stop
11	MBP current alarm	0.0 A	Higher limit alarm fixed		0 sec	5 sec after run to run stop
12	BOX analog input spare 1 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
13	BOX analog input spare 2 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
14	DRP temperature	Higher limit 115°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
15	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
16	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
17	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Spare switch on box	b contact open alarm fixed		5 sec fixed	0 sec	5 sec after run to run stop
19	Run mode	2				
20	Optional valve	None				
21	Auto purge time	600 sec				
22	A/B contact	B contact				
23	English/Japanese	English				
24	Baud rate setting	9600 bps power ON at all times				
25	RS485 address setting	00				

Model No. 9 LR300

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 0000 rpm, rated revolution 0000 rpm				
7	MBP_INV frequency	Intermediate revolution 3600 rpm, rated revolution 3600 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 current WARNING	9.0A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	10.0A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	3.5 A	Higher limit alarm fixed	10 sec		5 sec after run to run stop
13	MBP current ALARM	4.5 A	Higher limit alarm fixed		10 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 60°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	2				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 0000 rpm, rated revolution 0000 rpm				
7	MBP_INV frequency	Intermediate revolution 3600 rpm, rated revolution 3600 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 current WARNING	13.6A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	15.6A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	9.0 A	Higher limit alarm fixed	10 sec		5 sec after run to run stop
13	MBP current ALARM	10.0 A	Higher limit alarm fixed		10 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 75°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	2				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

Model No. 11 LR1200

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 0000 rpm, rated revolution 0000 rpm				
7	MBP_INV frequency	Intermediate revolution 3600 rpm, rated revolution 3600 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 current WARNING	13.6A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	15.6A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	13.6 A	Higher limit alarm fixed	10 sec		5 sec after run to run stop
13	MBP current alarm	15.6 A	Higher limit alarm fixed		10 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 75°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	2				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

Model No. 12 LR1800

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 sec	5 sec after run to run stop
6	DRP_INV frequency	Intermediate revolution 0000 rpm, rated revolution 0000 rpm				
7	MBP_INV frequency	Intermediate revolution 3600 rpm, rated revolution 3600 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 current WARNING	21.0A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	22.0A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	21.0A	Higher limit alarm fixed	10 sec		5 sec after run to run stop
13	MBP current ALARM	22.0A	Higher limit alarm fixed		10 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 85°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	2				
22	Optional valve	None				
23	Auto purge time	600 sec				
24	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

Model No. — LR3600

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0.000 MPa	Higher limit alarm fixed	0 sec		5 sec after run to run stop
5	Pumping pressure ALARM	0.000 MPa	Higher limit alarm fixed		0 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 6000 rpm, rated revolution 6000 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	BOX analog input spare 1 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
11	BOX analog input spare 2 (10 V)	0 V	Lower limit alarm	5 sec fixed	0 sec	5 sec after run to run stop
12	DRP temperature	Higher limit 115°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
13	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
14	Exhaust pipe temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
15	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
16	Spare switch on box	b contact open alarm fixed		5 sec fixed	0 sec	5 sec after run to run stop
17	Run mode	2				
18	Optional valve	None				
19	Auto purge time	600 sec				
20	A/B contact	B contact				
21	English/Japanese	English				
22	Baud rate setting	9600 bps power ON at all times				
23	RS485 address setting	00				

MODEL No.13 HR60

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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 0000 rpm, rated revolution 0000 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 current WARNING	9.0A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	10.0A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	0.0 A	Higher limit alarm fixed	0 sec		5 sec after run to run stop
13	MBP current ALARM	0.0 A	Higher limit alarm fixed		0 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 115°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 120°C Ready 80°C Heater control 100°C		5 sec fixed	180 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

MODEL No.14 HR90

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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 0000 rpm, rated revolution 0000 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 current WARNING	13.6A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	15.6A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	0.0 A	Higher limit alarm fixed	0 sec		5 sec after run to run stop
13	MBP current ALARM	0.0 A	Higher limit alarm fixed		0 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 120°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 120°C Ready 80°C Heater control 100°C		5 sec fixed	180 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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 0000 rpm, rated revolution 0000 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 current WARNING	21.0A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	22.0A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	0.0 A	Higher limit alarm fixed	0 sec		5 sec after run to run stop
13	MBP current alarm	0.0 A	Higher limit alarm fixed		0 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 85°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 0°C Ready 0°C Heater control 0°C		5 sec fixed	0 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 120°C Ready 80°C Heater control 100°C		5 sec fixed	180 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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 0000 rpm, rated revolution 0000 rpm				
7	MBP_INV frequency	Intermediate revolution 3600 rpm, rated revolution 3600 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 current WARNING	9.0A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	10.0A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	3.5 A	Higher limit alarm fixed	10 sec		5 sec after run to run stop
13	MBP current ALARM	4.5 A	Higher limit alarm fixed		10 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 115°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 140°C Ready 0°C Heater control 90°C		5 sec fixed	180 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 120°C Ready 80°C Heater control 100°C		5 sec fixed	180 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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 0000 rpm, rated revolution 0000 rpm				
7	MBP_INV frequency	Intermediate revolution 3600 rpm, rated revolution 3600 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 current WARNING	13.6A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	15.6A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	9.0 A	Higher limit alarm fixed	10 sec		5 sec after run to run stop
13	MBP current ALARM	10.0 A	Higher limit alarm fixed		10 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 120°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 140°C Ready 0°C Heater control 90°C		5 sec fixed	180 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 120°C Ready 80°C Heater control 100°C		5 sec fixed	180 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

Model No. 18 HR1200

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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	0 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 0000 rpm, rated revolution 0000 rpm				
7	MBP_INV frequency	Intermediate revolution 3600 rpm, rated revolution 3600 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 current WARNING	13.6A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	15.6A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	13.6 A	Higher limit alarm fixed	10 sec		5 sec after run to run stop
13	MBP current alarm	15.6 A	Higher limit alarm fixed		10 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 120°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 140°C Ready 0°C Heater control 90°C		5 sec fixed	180 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 120°C Ready 80°C Heater control 100°C		5 sec fixed	180 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

	Name	Alarm set value	Higher/lower limit alarm	Warning time	Alarm time	Monitor range
1	N2 purge gas	0.5 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 0000 rpm, rated revolution 0000 rpm				
7	MBP_INV frequency	Intermediate revolution 3600 rpm, rated revolution 3600 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 current WARNING	21.0A	Higher alarm fixed	10 sec		15 min after run to run stop
11	DRP current ALARM	22.0A	Higher limit alarm fixed		10 sec	3 min after run to run stop
12	MBP current WARNING	21.0A	Higher limit alarm fixed	10 sec		5 sec after run to run stop
13	MBP current ALARM	22.0A	Higher limit alarm fixed		10 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 85°C Ready 0°C Heater control 0°C		5 sec fixed	180 sec	5 sec after run to run stop
17	MBP temperature	Higher limit 140°C Ready 0°C Heater control 90°C		5 sec fixed	180 sec	5 sec after run to run stop
18	Exhaust pipe temperature	Higher limit 120°C Ready 80°C Heater control 100°C		5 sec fixed	180 sec	5 sec after run to run stop
19	Option temperature	Higher limit 0°C Ready 0°C Heater control 0°C		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	A/B contact	B contact				
25	English/Japanese	English				
26	Baud rate setting	9600 bps power ON at all times				
27	RS485 address setting	00				

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 "N₂ 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 "N₂ 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 "DRP CURRENT" WARNING if the motor power has exceeded the WARNING set value of 13.5A (HR90) and this condition continues for more than WARNING set time of 10 sec. If the ALARM set value of 15.5A (HR90) is exceeded for the ALARM set time of 10 seconds, 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 $\pm 3^{\circ}\text{C}$.
- (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 RS485/232C is used.
- (7) The address is the No. of the branch-wired pump when RS485/232C is used. Up to maximum 16 can be branched.

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.

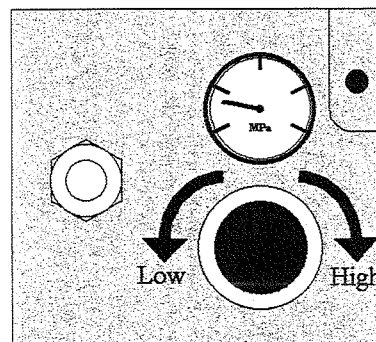
The regulator is factory locked. Pull the knob until it clicks to unlock it and regulate the pressure on the pump side to 0.05 to 0.10 MPa (gauge pressure).



CAUTION

If pressure is increased to above 0.9 MPa, 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 – 0.10MPa 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 to 0.1 MPa. Regulation is not required.

3.8.3 Setting the gas ballast gas flow rate (in mode 3)

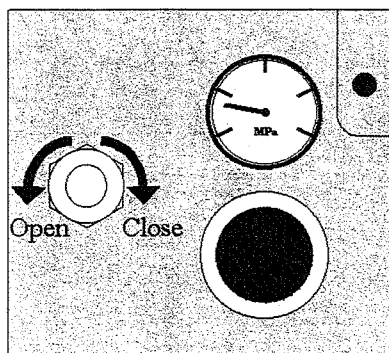
After the pump has started, set the gas ballast gas flow rate according to the process.



CAUTION

If gas ballast gas is fed, the ultimate pressure will higher (about 10 Pa at 50 SLM).

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



3.8.4 Setting the cooling water flow rate

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 5.0 L/min or more using the primary pressure or cooling water flow rate control valve in the system.

3.9 stop

Stop the pump.

**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°C or more. Remove the protection cover after about one hour after the pump is shut down.

3.10 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 after the pump has stopped.

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 absolute 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.

3.11 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 [Δ] 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 TROUBLE SHOOTING.

- When the pump is contaminated, wipe out it with a dry rag.

4.2 Maintenance

- These LR/HR products are maintenance free except when to connect with the host equipment, or disconnect from it, and to regulate N2 gas flow at the time of operation. Overhaul or repair work is performed at ULVAC. When any trouble occurs, please contact with your local ULVAC service station (please refer to the ULVAC 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.

When overhaul is required, please contact with your local ULVAC service station. All overhaul will be performed at the ULVAC.

< Removal procedure >

Power wiring



WARNING

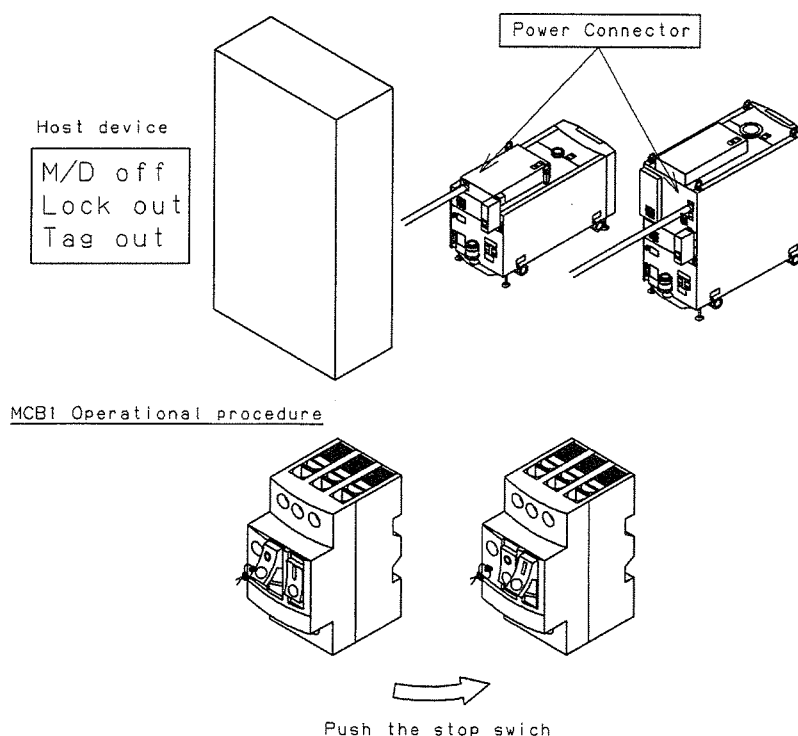
: Shutoff the power securely according to the diagram below before starting installation or removal work.



<< Electric shock is possible >>

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

1. Shut off the breaker (MCB1, MCB2 (LR/HR300, LR/HR600, LR/HR1200, LR/HR1800, LR3600)) 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.



Cooling water**WARNING**

- 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.

Remove piping

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』 .

**WARNING**

When compress air is introduced from 『Cooling water inlet』 ,the cooling water sensor might be damaged by the load of compress air. Therefore, please introduce compress air from 『Cooling water outlet』 .

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.**Suction and exhaust gases.**

<< High temperature surface >>

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

**WARNING**

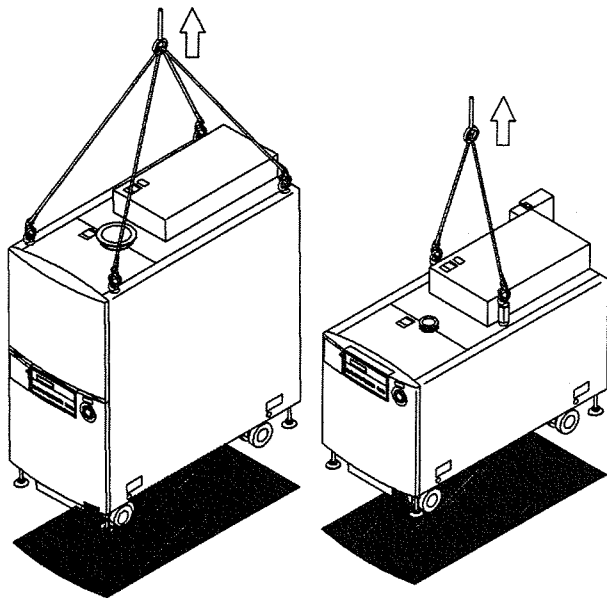
- Remove the piping according to the manual provided for the host equipment.
- Suction and exhaust pipe is very hot for some time after pump stop. Remove the protection cover after about one hour after the pump is shut down.
- Completely close the inlet and outlet ports with using closing flange

Shipping



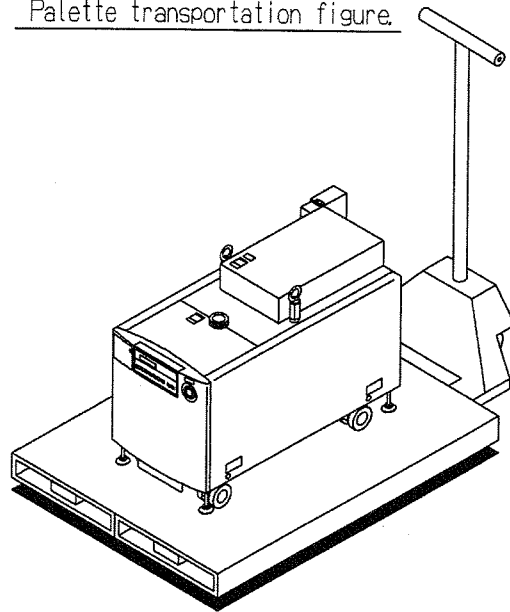
WARNING

: 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.



Crane hanging figure.

Palette transportation figure.



When to transit the pump, you should use loading machines (e.g. moving crane) and hang it, or load and fix the pump on a pallet, then transit it by pallet truck.



CAUTION

: Do not tilt the pump by more than 10° .

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



CAUTION

: For LR3600.

Please install a fixed bracket for transportation when you carry out the pump.

4.3 TROUBLESHOOTING

4.3.1 Major Troubles

Symptom	Check	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 can not activates the Pump.	LOCAL mode is not selected.	Press REMOTE/LOCAL switch on controller.
	Emergency stop switch is turned on.	Turn off emergency 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 station 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 station 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.
The temperature does not increase. (only HR series)	Booster pump operating temperature is not static.	Operating for one hour. Turn on the bimetal switch because the bimetal switch has been turned off when the temperature does not increase after of the temperature error.
	Exhaust pipe operating temperature is not static.	Operating for one house. Exchange the mantle heater because the temperature fuse has been cut when the temperature does not increase after of the temperature error.

4.3.2 In Case of Alarm Signal

Display	Symptom	Check item	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 station. Repair by ULVAC
		Leak in joint	
		Failure of instrument	Contact with service station, 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 station. Repair by ULVAC
		Leak in joint	
		Failure of instrument	Contact with service station. Repair by ULVAC
PUMP TEMP HIGH ALARM E 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 station. 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.
		E ALARM: Display when temperature sensor has burnt out	
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)

Display	Symptom	Check item	Corrective action
DRP CURRENT HIGH ALARM E ALARM	Overload of motor	Increase of backing pressure	Clean and wash piping at downstream of pump
		Failure of instrument	Contact with service station. Repair by ULVAC
		Rotation disabled by foreign substance	
		Rotation disabled by low flow rate	
		Rotation disabled by damaged bearing	
		E ALARM: Display when protective circuit other than current sensor is actuated (thermal relay or inverter trip or failure).	
MBP CURRENT HIGH ALARM E ALARM	Overload of motor	Increase of backing pressure	Clean and wash piping at downstream of pump
		Failure of instrument	Contact with service station. Repair by ULVAC
		Rotation disabled by foreign substance	
		Rotation disabled by low flow rate	
		Rotation disabled by damaged bearing	
		E ALARM: Display when protective circuit other than current sensor is actuated (thermal relay or inverter trip or failure).	
RS232C ERROR	Communication error between controller and main PC		
		ROM/RAM data destroyed by static electricity, etc.	Contact with service station. Repair by ULVAC
		Failure of instrument	
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 station. Repair by ULVAC
		Short-circuit of 24VDC line	
		Short terminal of program down-load JP1 misconnection	

5.WARRANTY TERMS

5.1 Warranty of Quality

The pump is warranted free from defects in design, material and workmanship for a period of twelve (12) months from the date of delivery. If any trouble imputable to the above defects should occur during pumping of air or nitrogen gas, ULVAC will correct it free of charge. Troubles that may occur during pumping a gas other than the above are not covered by this warranty.

The scope of warranty is limited to the pump only.

Troubles caused by the following are excluded from warranty.

- Acts of God or force majored such as earthquake, fire, flood, etc.
- Special environment
- Operating conditions not given in this instruction manual
- Modification not authorized by ULVAC

5.2 Maintenance after Warranty Period

Contact your local ULVAC representative for maintenance.

5.3 Servicing

If you come up with any trouble or question about this pump or this manual, contact your local ULVAC representative with the serial number of your pump.

* The contents of this manual are subject to change without notice.

Attached material

a. MSDS

a-1 BARRIERTA J100F(NOK KLUBER)

(1/2)

MATERIAL SAFETY DATA SHEET

SECTION I

PRODUCT NAME OR NUMBER (as it appears on label)	DATE PREPARED
BARRIERTA J100 FLUID	14 January 2000
MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
NOK KLUBER Co., LTD	0293-42-5365 (Japan)
ADDRESS (Number, Street, City and Zip Code)	
955-4, AZA OHISHI, ISOHARA, ISOHARA MACHI, KITAI BARAKI, IBARAKI PREF. JAPAN	
CHEMICAL FAMILY	FORMULA (Molecular Weight)
Lubricant oil (Fluorinated polyether oil)	Proprietary (approx 3500)

SECTION II - INGREDIENTS

CAS REGISTRY NO.	%W	%V	CHEMICAL NAME(S)
_____	100		Perfluoropolyether

SECTION III - PHYSICAL DATA

BOILING POINT	no data available	SPECIFIC GRAVITY (H ₂ O = 1)	approx. 1.89	VISCOSITY (at 40°C)	approx 100 cSt
VAPOR PRESSURE (at 20°C)	approx 6.5 × 10 ⁻⁶ Pa	PERCENT VOLATILE BY VOLUME (%)	0	PERCENT SOLID BY VOLUME (%)	0
VAPOR DENSITY (AIR = 1)	no data available	EVAPORATION RATE (Butyl Acetate = 1)	no data available		
SOLUBILITY IN WATER	negligible	PH=	7		
APPEARANCE AND ODOR	Clear colorless and slightly oil odor				IS MATERIAL ☒ liquid ☐ solid
					gas paste powder

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT	cleveland open cup method used not flammable	FLAMMABLE LIMITS	LEL _____	UEL _____
		no data available		
EXTINGUISHING MEDIA	Foam, Dry chemical, CO ₂ , sand or earth are suitable when nearby materials are involved in fire.			
SPECIAL FIRE FIGHTING PROCEDURES	Wear self-contained breathing apparatus. Wear full protective equipment. Move exposed containers from fire area, if it can be done without risk. Use self-contained breathing apparatus, cool fire exposed areas and equipment (standard procedure for chemical fire).			
UNUSUAL FIRE AND EXPLOSION HAZARDS	Decomposition at flame temperatures may form toxic fluorine compounds.			

SECTION V - REACTIVITY DATA

STABILITY	UNSTABLE	CONDITION TO AVOID: Temperatures above 280°C without adequate vent.
	STABLE ☐	
INCOMPATIBILITY (materials to avoid)	Strong oxidizing materials, such pure oxygen.	
HAZARDOUS DECOMPOSITION PRODUCTS	At temperature above 280°C, the product decomposes thermally and can release toxic fumes. Corrosive contact materials (e.g. Aluminium, Titanium and their alloys) may cause lower decomposition Temperature.	
HAZARDOUS POLYMERIZATION	MAY OCCUR	CONDITION TO AVOID: Temperatures above 280°C without adequate vent.
	WILL NOT OCCUR ☐	

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SECTION VI - HEALTH HAZARD DATA

EFFECT OF OVEREXPOSURE - Condition to avoid Eyes : mild irritation Skin : mild irritation, may cause dermatitis, oil acne or follicle with repeated contact. Ingestion : harmful if swallowed. Inhalation : no data	
OTHER LIMIT LD ₅₀ ≥ 37.4 g/kg (Perfluoropolyether, rat : on the analogy of similar article)	
PRIMARY ROUTES ON ENTRY ☐ Inhalation ☐ Skin contact ☒ Other (specify) In case of swallowing it intentionally	
EMERGENCY AND FIRST AID PROCEDURES Eyes : Flush with large amount of water Skin : Remove contaminated clothing, wash skin with soap and water, launder clothing prior to reuse Ingestion : Contact doctor for directions. Never give anything by mouth to an unconscious person.	

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURES

STEP TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED In case of accidental release or spill, eliminate all source of ignition, stop leak and absorb the liquid with sand or other absorbent and dispose of in accordance with the local, state, federal law and regulation.
WASTE DISPOSAL METHOD Dispose of in accordance with the local, state, federal law and regulations, or destroy using a hightemperature incinerator designed to burn fluorine containing materials.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) It's unnecessary when used under normal condition.	
VENTILATION Do not breathe vapors during processing. Use with adequate ventilation when handled at temperatures above 200°C.	
PROTECTIVE GLOVE (Specify type) Glove of oil-resisting	EYE PROTECTION (Specify type) Chemical goggles
OTHER PROTECTIVE EQUIPMENT It's unnecessary when used under normal condition.	

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING Minimize skin contact, wash with soap and water, prior eating, drinking, smoking or using sanitary facilities.
OTHER PRECAUTIONS Do not store near flammable or explosive materials, keep away from fire, heat sources or hot surfaces, do not smoke in working areas and avoid contamination of smoking products.

SECTION X - REGURATION

TRANSPORT	: -
HAZARD SYMBOLS	: -
OTHER INFORMATION	: -

MSDS No. 1784

This information corresponds with the state of our knowledge at time of printing and is intended to give information of possible applications to a reader with technical experience.

The assurance of properties, product responsibility or guarantee are impossible without our clarification as to the specific application of use and service conditions.

a-3 YL-VAC25/6, YL-VAC14/6 (SOLVAY SOLEXIS)

製品安全データシート

Material Safety Data Sheet

FOMBLIN® YLVAC

日本語版整理番号: 2002-01

Page 1 of 9

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製造元

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Emergency Calls	
電話番号:	
Telephone Number:	02-3835-1

1) 物質の特定

COMPOUND IDENTIFICATION

製品名:	
Trade Name:	FOMBLIN® Y
グレード:	
Grades:	VAC06/6; VAC14/6; VAC16/6; VAC25/6
化学分類:	パーフルオロポリエーテル
Chemical Family:	Perfluoropolyethers

2) 組成 / 成分情報

COMPOSITION / INFORMATION ON INGREDIENTS

製品の性質

Composition of the preparation

EC 指示規則 88/379(3 項セクション 6) で報告された濃度以上において、暴露値のある物質や EC 指示規則 67/548 によって危険と分類された物質

Substances with established exposure limits or classifiable as dangerous according to EC Directive 67/548 and following amendments, in concentration equal or higher than that reported in EC Directive 88/379 (item 3, sect. 6):

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名前 <u>Name</u>	濃度 <u>Conc.</u>	CAS 番号 <u>CAS N°</u>	化学記号 <u>Symbol</u>	危険区分 <u>Risk Phrases</u>
なし none				

3) 危険有害性

HAZARDS IDENTIFICATION

人体に対する有害性 <u>Adverse human health effects</u>	適切な作業衛生環境基準に従って、適正な取り扱いをする場合、本製品には人体への危険性は認められない。 The product, when properly handled, according to the good working and hygienic practices, is not dangerous for the human health.
環境に対する影響 <u>Environmental effects</u>	適切な作業衛生環境基準に従って、適正な取り扱いをする場合、本製品には環境への危険性は認められない。 The product, when properly handled, according to the good working and hygienic practices, is not dangerous for the environment.
物理的・化学的危険性 <u>Physical and chemical hazards</u>	本製品は、加熱または火災により熱分解して有毒腐食ガスが発生する場合、人体および環境に対して危険性がありうる。 Harmful effects for health and environment in case of thermal decomposition, due to heating or fire, for the emission of toxic and corrosive gases.

4) 応急措置

FIRST-AID MEASURES

暴露による下記症状

Symptomatology following exposure

眼球接触 <u>Eye contact</u>	充血 Redness
皮膚接触 <u>Skin contact</u>	皮膚の赤変 Redness
摂取 <u>Ingestion</u>	腹痛、吐き気、嘔吐 Abdominal pain, nausea, vomit.

応急措置

First Aid Measures

眼球接触 <u>Eye contact</u>	ふんだんな水で少なくとも 15 分、目を洗い流す。 Wash with plenty of water for at least 15 minutes.
皮膚接触 <u>Skin contact</u>	水と石鹸で皮膚をよく洗う。 Wash with water and soap.
摂取 <u>Ingestion</u>	コップ数杯の水を飲ませる。 Give some glasses of water to drink. 嘔吐させる。 Induce vomiting. 痛みが継続する場合には、医師に相談する。 Seek medical advice in case of persistent pain.

5) 火災時の措置

FIRE FIGHTING MEASURES

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特別危険性

Specific hazards

本製品は、不燃性および不爆発性である。

The product is not flammable and not explosive.

本製品の加熱により、毒性で腐食性のガスを伴って、分解する可能性がある。

The heating of the product may cause decomposition with emission of toxic and corrosive vapors.

特別事項

Specific methods

炎と安全な距離を保ち、風上にいる。

Stay upwind and at safety distance from flames.

製品が火に包まれた場合、安全な状態にすることが可能であれば、容器を移動させること。

In case of surrounding fire, remove the containers, when possible to do so in safe conditions.

引火した場合、散水して容器を冷やし続けること。

In case of fire keep containers cool by spraying with water.

消火剤

Extinguishing media

消火時の保護具

Protection of fire-fighters

水、粉末、泡、化学消火剤、炭酸ガス

Water, powders, foams, chemicals, CO₂.

自給式呼吸器具

Self-contained breathing apparatus.

腐食性蒸気より皮膚や目を保護する防護服

Protective clothing for skin and eyes against corrosive vapors.

⑥漏出時の措置

ACCIDENTAL RELEASE MEASURES

注意事項

Personal precautions

早急に漏出を止めて、安全な状態にする。

Stop the release as soon as possible, in safe conditions.

漏出した製品は、火災源や炎との接触を避けること

Avoid the contact of the released product with glowing surfaces and flames.

漏出した製品が熱分解を起こす場合に限り、危険性がある。

Possible risk only in case of thermal decomposition of the released product.

環境対策

Environmental precautions

漏出した製品の下水路、地上水、地下水、土壌への放出を避ける。

Avoid the discharge of the released product in sewage systems, in surface and underground waters, in the soil.

洗浄方法

Methods for cleaning up

漏出した製品を土壌、砂、おが屑などで吸い取り、適当な容器に回収して廃棄する。

Absorb the released liquid with earth, sand or sawdust and collect it in suitable containers for disposal.

⑦取扱い及び保管

HANDLING AND STORAGE

取扱い

HANDLING

注意

Precautions

技術上の措置

Technical measures

製品を分解温度以上に加熱しない。(290°C)

Avoid heating the product above its decomposition temperature (290°C).

作業所の換気を良くし、また、洗眼浴や非常シャワーなどの水道設備を完備する。

Provide working areas with adequate ventilation systems and with water-wash facilities(eye bath and emergency showers).

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保管

STORAGE

保管条件

Storage conditions

熱源より遠ざける。

Keep away from heat sources.

可燃物、爆発物より遠ざける。

Keep away from combustible and explosive materials.

相溶性のない物質(10)を参照)より遠ざける。

Keep away from incompatible substances(se sect. 10).

本製品は通常ポリエチレン製容器で保管される。

Product usually storage in polyethylene containers.

包装

Packaging

包装材料として適するもの

Recommended materials

包装材料として適さないもの

Non suitable materials

金属、プラスチック、ガラス

Metal, Plastic, glass.

内面処理されていない金属容器は、徐々に腐食されるため適さない。

Not lined metals are unsuitable because of slow corrosion.

8) 暴露防止措置 / 保護具

EXPOSURE CONTROLS / PERSONAL PROTECTION

暴露限界値

Exposure limits

熱分解で発生する副生成物の許容濃度限界値のみ得られている。
(ACGIH 1995/96):

Only threshold limits of by-products from thermal decomposition are available(ACGIH 1995/96):

フッ化水素

HF

TLV/TWA

2.6 mg/mc

3 ppm

カルボニルフロライド

COF₂

TLV/STEL

13.5 mg/mc

5 ppm

個人用保護具

PERSONAL PROTECTIVE EQUIPMENT

呼吸保護

Respiratory protection

火災の場合に自給式呼吸器具を使用し、通常使用時には必要ない。

Not necessary in normal use, self-contained breathing apparatus in case of fire.

目の保護

Eye protection

安全眼鏡

Safety goggles.

手の保護

Hand protection

ゴム製手袋

Rubber gloves.

皮膚と体の保護

Skin and body protection

作業着あるいはゴム製エプロン

Worksuit or rubber apron.

衛生上の措置

Hygiene measures

取り扱い中には、飲食や喫煙をしない。

Do not drink, eat and smoke during handling.

9) 物理的・化学的性質

PHYSICAL AND CHEMICAL PROPERTIES

物理的状態

Physical state

液体

liquid

色:

Color:

無色

colorless

臭い:

Odor:

無臭

odourless

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融点:	なし
Melting point:	not applicable
沸点:	
Boiling point:	>270°C @760mmHg
燃焼性:	不燃性
Flashpoint:	not flammable
爆発性:	不爆発性
Explosion properties:	not explosive
酸化性:	酸化性なし
Oxidising properties:	not oxidiser
蒸気圧:	
Vapor pressure:	$10^{-5} \sim 10^{-7}$ mmHg(20°C)
動粘度:	
Kinematic viscosity:	50~300 cst
密度(20°C):	
Density(20°C.):	1.88~1.90 g/ml
水への溶解性:	不溶
Solubility in water:	not soluble
有機溶剤への溶解性:	フッ素系溶剤に可溶
Solubility in organic solvents:	soluble in fluorinated solvents

10) 安定性 / 反応性

STABILITY AND REACTIVITY

安定性:	通常の使用条件、保管状態において安定である。
Stability:	The product is stable in normal conditions of use and storage.
回避事項:	製品を 290°C 以上に加熱しない。
Conditions to avoid:	Avoid heating the product above 290°C. 裸火または加熱表面に当てない。 Avoid contact with flames.
回避物質	強アルカリ化学物質（アルカリ水酸化物、アンモニア、無水アルカリ）。
Materials to avoid:	Strong alkaline compounds(alkaline hydroxides, ammonia, non aqueous alkalis). 100°C 以上で製品をルイス酸 (AlCl ₃ , SbF ₅ , CoF ₃) と接触させない。 Lewis acids(AlCl ₃ , SbF ₅ , CoF ₃) above 100°C. 100°C 以上で製品を粉末状のマグネシウム、アルミニウム、およびそれらの合金と 100°C 以上で接触させない。 Powdered magnesium, aluminium and their alloys above 100°C.
危険な分解生成物:	製品は 290°C 以上の温度で分解し、有毒腐食性のガス HF、COF ₂ などを発生することがある。 ; この分解は、金属によって促進される。
Hazardous decomposition products:	The product may decompose at temperature above 290°C with emission of HF and COF ₂ , which are toxic and corrosive gases; metals promote the decomposition.

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11) 毒性情報

TOXICOLOGICAL INFORMATION

侵入経路

Penetration routes

液体製品の接触または摂取。

Contact or ingestion of the liquid product.

熱分解によって発生するガスの吸入。

Inhalation of gases from thermal decomposition.

人体に対する有害性

Adverse effects for the Human Health

短期または長期におよぶ暴露後の遅延性および急性効果

Delayed and/or immediate effects after short and/or prolonged exposure:

急性毒性:

知見なし

Acute toxicity:

no known effect

局所作用 / 刺激性:

刺激性なし; 分解生成物は皮膚や目や粘膜に強い刺激を与えることがある。

Local effects / irritating power:

not irritant; decomposition products may cause severe irritation to skin, eyes and mucosae.

感作性:

知見なし

Sensitization:

no known effect

慢性毒性:

知見なし

Chronic toxicity:

“ “ “

癌原性

知見なし

Carcinogenicity:

“ “ “

変異原性

知見なし

Mutagenicity:

“ “ “

生殖毒性

知見なし

Reproduction toxicity:

“ “ “

毒性実験データ

Experimental toxicological data

経口毒性

LD₅₀-oral

>2000 mg/Kg

Species: ラット
rat

NOEL-oral

>1000 mg/kg/day(28d)

Species: ラット
ratLD₅₀-dermal

>2000 mg/Kg

Species: ラット
rat

皮膚炎

なし

Species: ウサギ

Irritation(skin)

non irritant

Species: rabbit

目の炎症

なし

Species: ウサギ

(eye)

non irritant

Species: rabbit

皮膚感作性

なし

Species: モルモット

Sensitization(skin)

non sensitizing

Species: Guinea pig

変異原性(エイムス試験)

なし

Mutagenicity(Ames test)

negative(in vitro and in vivo)

Species:

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12) 環境情報 ECOLOGICAL INFORMATION

環境への影響

Environmental effects

- | | |
|--------------------------------|-------------------|
| － 拡散性: | データなし |
| － Mobility: | no available data |
| － 残存性 / 分解性: | データなし |
| － Persistence / degradability: | no available data |
| － 生物蓄積: | データなし |
| － Bioaccumulation: | no available data |
| 生態安定性データ | データなし |
| Ecostability data | no available data |

生態毒性データ

Ecotoxicity data

- | | | | |
|-------------------------------|---|----------|---------------|
| 魚 | 水に対する製品の最大溶解度以上 | Species: | ニジマス |
| LC ₅₀ -fish | >max. solubility of product in water | | Rainbow trout |
| 甲殻類 | 水に対する製品の最大溶解度以上 | Species: | ミジンコ |
| EC ₅₀ -crustaceans | >max. solubility of product in water | | daphnia |
| バクテリア類 | 水に対する製品の最大溶解度以上 | Species: | |
| EC ₅₀ -bacteria | >max. solubility of product in water | | |
| 注意事項 | 作業管理基準にのっとり、環境を汚染しないように使用する。 | | |
| EVALUATION | Use the product according to the good working practice, avoiding polluting the environment. | | |

13) 廃棄上の注意 DISPOSAL CONSIDERATIONS

廃棄物の処理

Waste treatment

フッ素系化合物用に設計された高温ゴミ焼却炉を用いた熱分解設備へ廃製品を送る。

Send the waste product to thermal destruction, using high-temperature incinerators designed to burn fluorine compounds.

包装時の取扱い

Packaging treatment

可能な場合は、容器をよく洗って再使用する。

Reuse, when possible, the containers, after thorough washing. 使用済容器を各地方自治の法規により認められた埋立業者に送る。

Send the waste containers to authorized landfills, according to local laws and regulations.

14) 輸送情報 TRANSPORT INFORMATION

危険性

Specific hazards

製品は輸送上危険性はない。

Product not dangerous for transportation.

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容器情報

Packaging informations

製品は、通常各種容量のポリエチレン容器で出荷される。(ドラム、ガロン缶、タンク)

Product usually shipped in polyethylene containers of different capacities(drums, jerricans, tanks).

国際輸送分類

INTERNATIONAL TRANSPORT CLASSIFICATION

U.N.番号:	指定なし。
U.N. Number:	not assigned
容器等級:	指定なし。
Packaging group:	not assigned
陸上、鉄道、海上、航空輸送	該当せず。
Road, rail, sea, air-Transportation	not classified

15)取締規制情報

REGULATORY INFORMATION

CEE 規則(指示 67/548 とその修正条項)

CEE Regulations(Directive 67/548 and following amendments)

分類

Classification

分類:	なし
Classification type:	not required
危険等級:	なし
Hazard class:	none

ラベル情報

Labeling

製品名:

Trade Name:

FOMBLIN® Y

グレード:

Grades:

VAC06/6; VAC14/6; VAC16/6; VAC25/6

危険マーク:

Hazard Symbol:

なし

none

危険区分:

Risk phrases (R)

なし

none

安全区分:

Safety phrases (S)

なし

none

16)その他の情報

OTHER INFORMATION

参考文献

BIBLIOGRAPHY

ソルベイ ソレクシス社内部データ

—Solvay Solexis internal data

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この安全データシートは、EC指示規則 93/112 に準拠し、作成したものである。

Safety Data Sheet according to EC Directive 93/112

この MSDS は、ソルベイ ソレクシス社（イタリア）の安全データシートを翻訳したものです。
This MSDS is translated the MSDS of SOLVAY SOLEXIS S.p.A.

本製品安全データシートに記載する情報は、安全のみを目的、対象としているものであり、公表の時点で、当社が知り、経験したすべての知見に基づき、誠実に提供されていますが、当社は、意図されている本来の用途以外に本製品を使用することにより発生する損害、その他、その支配の及ばない実際の使用条件などについては、如何なる責任をも有するものではない。

The information given in this safety data sheet is for safety purpose only. It is given in good faith and based on the best knowledge and experience of the company at the date of issuing.

The Company is not responsible for damages caused by the use of the product in applications for which it was not intended or for conditions of use outside its control.

この安全データシートの英日両文に違いがある場合は、英文を優先適用する。

The English version of the Agreement shall be controlling in all respects.

b. Control system supplementation
b-1 Interlock List

ULVAC, Inc. Components Div.

Interlock List

Model: Dry Vacuum Pump: ER sires

Kinds of Interlocks				Detection method		Equipment		Controller LED Blink (red)		Controller LED Blink (orange)		LCD Message		Warning Buzzer		Remote Control Warning Signal feed back		DRP Main Power Off (MGC1 Off)		DRP Motor Power Off (INV1 Stop)		MBP Main Power Off (MGB2 Off)		MBP Main Power Off (MGC2 Off)	
EMO and EMS				CA	CL	PM																			
Emergency stop				H	H	S	The type button of the mushroom is knocked down.																		
Emergency terminal off				H	H	S	Remote connector 1-2 cut off																		
Emergency power off (stand-alone)				H	H	H	The type button of the mushroom is knocked down.																		
Emergency power off (Built in device)				H	H	H	The type button of the mushroom is knocked down.																		
External interlock off				H	H	S	Remote connector 4-20 cut off																		
Purge gas (N2)																									
Low flow rate of purge gas				E	H	S	N2 flow sensor + software (Alarm level)																		
Low flow rate of purge gas				E	H	S	N2 flow sensor + software (Warning level)																		
Cooling water																									
Low flow rate of water				E	H	S	Water flow sensor + software (Alarm level)																		
Low flow rate of water				E	H	S	Water flow sensor + software (Warning level)																		
Low flow rate of water				E	H	H	Water flow switch																		
Water leakage				E	H	H	Sensing of water leak detection belt + Sensor																		
Gas pressure of exhaust pipe																									
The gas pressure is high.				E	H	S	Pressure sensor + software (Alarm level)																		
The gas pressure is high.				E	H	S	Pressure sensor + software (Warning level)																		
The gas pressure is high.				E	H	H/C	Pressure switch																		
Over load																									
DRP motor over load				E	H	H	Motor Breaker (Limit level)																		
DRP motor over load				E	H	S	Current sensor + software (Alarm level)																		
DRP motor over load				E	H	S	Current sensor + software (Warning level)																		
MBP motor over load				E	H	H	Motor Breaker (Limit level)																		
MBP motor over load				E	H	S	Current sensor + software (Alarm level)																		
MBP motor over load				E	H	S	Current sensor + software (Warning level)																		
Control unit over load				E	H	H	Fuse (Limit level)																		
Over temperature																									
DRP over heat				E	H	S	Thermo sensor + software (Alarm level)																		
DRP over heat				E	H	S	Thermo sensor + software (Warning level)																		
DRP over heat				E	H	H	Thermo switch (Limit level)																		
MBP over heat				E	H	S	Thermo sensor + software (Alarm level)																		
MBP over heat				E	H	S	Thermo sensor + software (Warning level)																		
MBP over heat				E	H	H	Thermo switch (Limit level)																		
Disconnection of thermo couple				E	H	H	An electric signal does not come back from the thermo couple.																		
Control power output low				E	H	S	An enough voltage is not supplied.																		
Remote start																									
When a local mode is selected, the remote start operation is invalidated.				H	S	S	Remote control is selected as a controller.																		

b-2 Electrical Parts List

List of the main electric parts
Model : Dry Vacuum Pump : LR/HR series

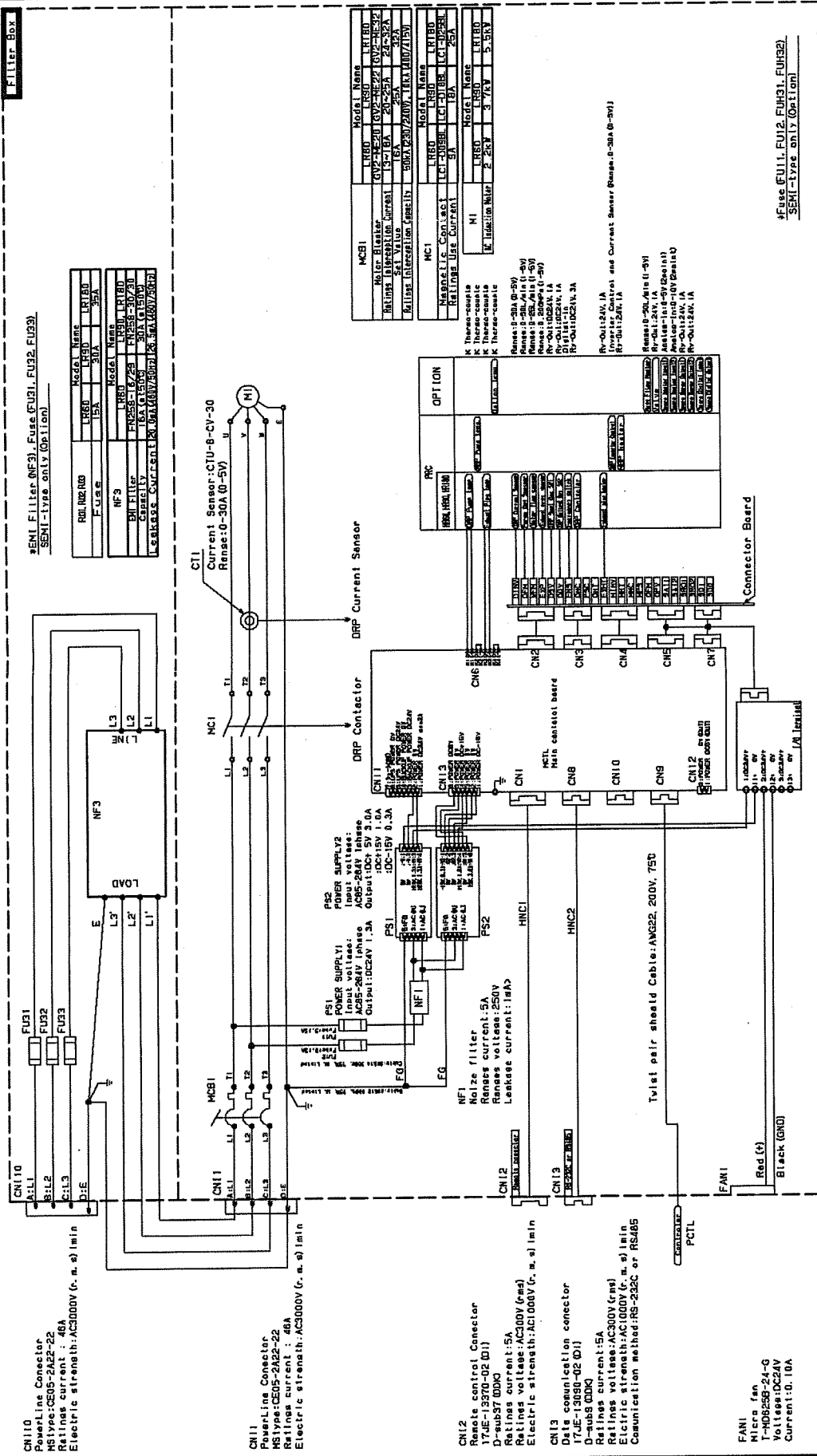
ULVAC, Inc. Components Div.
Date : April 14, 2004

Sheet(1/2)

Sign	Mark	Name	Model	Specification	Maker	Listed
CNI1		Power line connector	CE05-2A22-22PD-B CE05-6A22-22SD-B-BBS Han 100A Module-LR420	Max 45A AWG8 MAX 100A AWG 6	DDK HARTING	UL (E67741), CE VDE 0627/VDE 0110 UL/CSA
HNP1	L1 L2 L3 PE	Power Line 1	81-559-0039	RO-FLEX1100T AWG10*4	DDK	UL(E194236), TUV, IEC, CE, S, FI, D, N
HNP1		Power Line 1	AWG6-LR420	UL1015 : 600V 105C	YOSHIDA-DENSEN	UL(E62190), CSA(U37907)
HNP2	T1 T2 T3 PE	Power Line 2	81-559-0040	RO-FLEX1100T AWG12*4 CE05-6A18-10SD-B-BBS	DDK	UL(E194236), TUV, IEC, CE, S, FI, D, N
HNP2		Power Line 2	AWG6-LR420	UL1015 : 600V 105C	YOSHIDA-DENSEN	UL(E62190), CSA(U37907)
CNI2		Remote Connector	17DE-13370-G 17JE-23370-02(D8A)	AC300V 5A	DDK	UL
HNC1		Control Line 1	81-518-0061	UL2651 FLEX-S 40(AWG28)	DDK	UL
CNI3		Communication connector	17DE-13090-G 17JE-23090-02(D8A)	AC300V 5A	DDK	UL
HNC2		Control Line 2	81-518-0062	UL2651 FLEX-S 10(AWG28)	DDK	UL
33		CNI1-MCB1 L1				
43		CNI1-MCB1 L2				
34		MCB1 L1-FS11		UL1015 : 600V 105C	YOSHIDA-DENSEN	UL(E62190), CSA(U37907)
44		MCB1 L2-FS12				
35		FS11-NF1				
45		FS12-NF1	MAW-1205-22 LEAD	Lead line of NF1	DENSEI-LUMDA	UL(E141509), CSA, FI
36		NF1-TB1				
46		NF1-TB1				
37		TB1-PS1 1				
47		TB1-PS1 3				
38		TB1-PS2 1		UL1015 : 600V 105C	YOSHIDA-DENSEN	UL(E62190), CSA(U37907)
48		TB1-PS2 3				
1		PS1-TB2				
2		PS1-TB2				
MCB1		Primary pump Motor breaker	GV2-ME20 LR/HR60 GV2-ME22 LR/HR90 GV2-ME32 LR/HR180 GV3-ME63 LR420	AC200V 13-18A AC200V 20-25A AC200V 24-32A AC200V 40-63A	TOSHIBA	UL, CE, IEC,
MC1		Primary pump Contactor	LC1-D09 LR/HR60 LC1-D18 LR/HR90 LC1-D25 LR/HR180	AC200V 2.2kW AC200V 4.0kW AC200V 5.5kW	YASKAWA	CE
DINV		Booster pump Motor Driver	UVC110-200 LR420	AC200V 11kW	Core Drive	
M1		Primary pump Motor	WELQ-ST1-A32634 LR/HR60 WELQ-ST1-A32635 LR/HR90 WELQ-ST1-A32636 LR/HR180 UGBTWH-TT2 LR420	AC200V 2.2kW AC200V 3.7kW AC200V 5.5kW AC200V 11kW	nidec	JIS Conforming
FU11		Fuse terminal	M 4/8SF	3.15A	KIMUDEN	UL, CSA, FI
FU12		Fuse terminal	M 4/8SF	3.15A	KIMUDEN	UL, CSA, FI
NF1		Noise filter	MAW-1205-22	AC220V, 5A	DENSEI-LUMDA	UL(E141509), CSA, FI
PS1		Power supply	LDA30F-24-SN	AC85-264V 0.8A / DC24V 1.3A	COSEL	UL, CE
PS2		Power supply	LDC30F-SN	AC85-264V 1.3A / DC+5V 3.0A, DC+15V 1.0A, DC-15V 0.3A	COSEL	UL, CE
CT1		Current Sensor	CTU-8-CV-30	Output 0-5V, 30A	U.R.D	
TB1		Terminal block	M10/10	AC800V 65A 6AWG	KIMDEN	UL, TUV, IEC
TE2		I/O terminal	EX1D-T20A	125V 1A	idec	UL
TB3		Terminal board	81-999-0567	Earth Board (iron)	ULVAC	UL, TUV recognition parts used
MCTL		Main control board	YU-1022A	UL File No. E80148	YUSHIN DENKI	UL recognition material
PCTL		Controller	YU-1023	UL File No. E80148	YUSHIN DENKI	UL recognition material
FAN1		Cooling fan	T-MD625B-24-G	DC24V 0.09A	ORIX	UL
DFM		Purge gas flow sensor	CMS0200 LR/HR180, 1800 CME0501 Other models	DC24V / 0-5Vdc analog 0-200SLM DC24V / 0-5Vdc analog 0-50SLM	YAMATAKE	UL recognition material
WFM		Water flow sensor	PP-25L-24V-1	DC24V / 0-5Vdc analog	REGAL JOINT	UL recognition material
EMS		Emergency stop switch	ZA2-B554+ZA2-B2104	AC800V 1.2A, DC600V 0.1A	TOSHIBA	UL, TUV, IEC
DSV		Seal gas valve	USB3-6-1-W (DC24V)	DC24V 0.03A	CKD	UL recognition material
DGV		Ballast gas valve	USB3-6-3-W (DC24V)	DC24V 0.03A	CKD	UL recognition material
DGV		Ballast gas valve	VX2130-02-5G	DC24V 0.03A	SMC	CE, CSA
HT3		Exhaust pipe Heater	FC-1-25-R-1-2-2-L	AC200V, 160W	Fuji Chemical	CE
SSR3		Exhaust pipe solid-state relay	RG3NA-210B DC5-24	AC200V 30A	OMRON	UL, CSA
HNP3		PS1-MCTL CNI1				
		PS2-MCTL CNI3		UL1015 : 600V 105C	YOSHIDA-DENSEN	UL(E62190), CSA(U37907)
HNP4	19 20	FAN1-TB2 FAN1-TB2	T-MD625B-24-G	Lead line of FAN1	ORIX	UL(E58377)
HNC7		Connector Board assy MCTL CN2/3/4/5/6/7 - TB3	81-999-0567	UL1007 AWG22	DDK	UL(E62190), CSA(LL37908)
HNC4	DSV	Cable for seal gas solenoid valve	81-999-0564	2464 AWG22*2C	DDK	UL(E65955)
HNC5	DGV	Cable for ballast gas solenoid valve	81-999-0565	2464 AWG22*2C	DDK	UL(E65955)
HNC6	EMS	Cable for manual stop switch	81-999-0566	2464 AWG22*2C	DDK	UL(E65955)
HNC3	DINV	Cable for Primary pump driver		2464 AWG22*2C	DDK	UL(E65955)
DFM		Cable for Purge gas flow sensor		2464 AWG22*5C	TAIYO-DENSEN	UL(E65955)
HNS1	WFM	Cable for Water flow sensor	PP-25L-24V-1	Lead line of WFM	REGAL JOINT	UL(E42933), UL(E59661)

Sign	Mark	Name	Model	Specification	Maker	Listed				
MOB2		Booster pump Motor breaker	GV2-ME16	1R/HR300	AC200V 9-14A	TOSHIBA	UL, CE, IEC,			
			GV2-ME20	1R/HR600	AC200V 13-18A					
			GV2-ME22	1R/HR1200	AC200V 20-25A					
			GV2-ME32	1R/HR1800	AC200V 24-32A					
MINV		Booster pump Motor Inverter	GV3-ME63	1R3600	AC200V 40-63A	YASUKAWA	UL, CE			
			CIMR-J7AA20P70	1R/HR300	AC200V 0.75kW					
			CIMR-J7AA22P20	1R/HR600	AC200V 2.2kW					
			CIMR-J7AA23P70	1R/HR1200	AC200V 3.7kW					
M2		Booster pump Motor	CIMR-V7AA25P50	1R/HR1800	AC200V 5.5kW	Nidec	JIS Conforming			
			UV0110-200	1R3600	AC200V 11kW					
			WELQ-5T1_A32632	1R/HR300	AC200V 0.75kW					
			WELQ-5T1_A32634	1R/HR600	AC200V 2.2kW					
FAN2		Cooling fan	WELQ-5T1_A32635	1R/HR1200	AC200V 3.7kW	Nidec	JIS Conforming			
			WELQ-5T1_A32636	1R/HR1800	AC200V 5.5kW					
			UGBTWH-7T2	1R3600	AC200V 11kW					
			T-MD625B-24-G		DC24V 0.09A					
CN110		Power line connector	CE05-2A32-17PD-B		Max 80A AWG4	DDK	UL (E67741), CE			
			CE05-6A32-17SD-B-BBS		1R/HR1800, LR/HR2400					
			CE05-2A22-22PD-B		Max 45A AWG8					
			CE05-6A22-22SD-B-BBS		1R/HR300, LR/HR600, LR/HR1200					
FU21		Fuse terminal	Han 100A Module		MAX 100A AWG 6: LR3600	HARTING	VDE 0627/VDE 0110 UL/CSA			
			L60030M-1 C 1R/HR60,90,180		AC600V 30A 6AWG					
			Fuse	KLK30 1R/HR90,180	30A			Littelfuse	UL, CSA, GL	
			Fuse terminal	L60030M-1 CLR/HR60,90,180	AC600V 30A 6AWG			Littelfuse	UL, CSA, GL	
FU22		Fuse	KLK30 1R/HR60,90,180	30A		Littelfuse	UL No. E10480			
			Fuse terminal	L60030M-1 CLR/HR60,90,180	AC600V 30A 6AWG			Littelfuse	UL, CSA, GL	
			Fuse	KLK30 LR/HR60,90,180	30A			Littelfuse	UL No. E10480	
			Fuse terminal	L60030M-1 CLR/HR60,90,180	AC600V 30A 6AWG			Littelfuse	UL, CSA, GL	
FU23		Fuse	KLK30 LR/HR90,180	30A		Littelfuse	UL No. E10480			
			Current Sensor	CTU-8-CV-30	Output 0-5V, 30A			URD		
	HNP11		L11	CNI10-TB21 or FU31				UL1015 : 600V 105C	YOSHIDA-DENSEN	UL(E62190), CSA(Q37907)
			L21	CNI10-TB21 or FU32						
L31		CNI10-TB21 or FU33								
PE		CNI10-PE								
HNP14	L14	TB21-MCB2 L1		UL1015 : 600V 105C	YOSHIDA-DENSEN	UL(E62190), CSA(Q37907)				
	L24	TB21-MCB2 L2								
	L34	TB21-MCB2 L3								
	T11									
HNP15	T21	MCB2-MBP motor driver			KOEI	UL, CE				
	T31									
	PE									
				UE/STO-SB(105°C)XN/TC, AWG10*4						
HNC11	DINV	Cable for MBP driver		2464-1061/V2A-SB7P*24AWG	KOEI	UL(E65955)				
HNC12	FAN2	Cable for FAN2		2464 AWG22*2C	KOEI	UL(E65955)				
HT2		MBP Heater	FZ-225	HR300	AC200V 210W	Fuji Chemical				
			FZ-197	HR600	AC200V 390W					
			PMB012C-Mantol heater	HR1200	AC200V 1.0kW					
			FZ-278	HR1800	AC200V 1.0kW					
SSR2		MBP solid-state relay	形G3NA-210B DC5-24		AC200V 10A	OMRON	UL, CSA			
			HR300,HR600							
			形G3PA-210B-VD DC5-24		AC200V 10A					
			HR1200,HR1800							
BS2		MBP Bimetal switch	05-PNA120		AC200V 15A	MATSUO				
NF2		EMI noise filter	FN258-16/29		AC200V 15A (50C)	SCHAFFNER	UL, CSA recognition material			
			1R/HR60							
			FN258-30/33		AC200V 30A (50C)					
			1R/HR90,180							
NF3		EMI noise filter	FS5559-35-33		AC200V 35A (50C)	SCHAFFNER	UL			
			1R/HR300							
			FS5559-60-34		AC200V 60A (50C)					
			1R/HR600,1200,1800							
FU31		Fuse terminal	L60030M-1 C		AC600V 30A 6AWG	Littelfuse	UL, CSA, GL			
			1R/HR60,90,180,300							
			L60060C-1 C		AC600V 60A 6AWG					
			1R/HR600,1200,1800							
FU32		Fuse	KLK15		15A	Littelfuse	UL No. E10480			
			1R/HR60							
			KLK30		30A					
			1R/HR90,180,300							
FU33		Fuse terminal	OCMR060		60A	Littelfuse	UL, CSA, GL			
			1R/HR600,1200,1800							
			L60030M-1 C		AC600V 30A 6AWG					
			1R/HR60,90,180,300							
HNP12	L12	CNI10-TB21 or FU31		AC600V 60A 6AWG	Littelfuse	UL, CSA, GL				
	L22	CNI10-TB21 or FU32								
	L32	CNI10-TB21 or FU33								
	PE	CNI10-PE								
HNP13	L13	TB21-MCB2 L1		UL1015 : 600V 105C	YOSHIDA-DENSEN	UL(E62190), CSA(Q37907)				
	L23	TB21-MCB2 L2								
	L33	TB21-MCB2 L3								

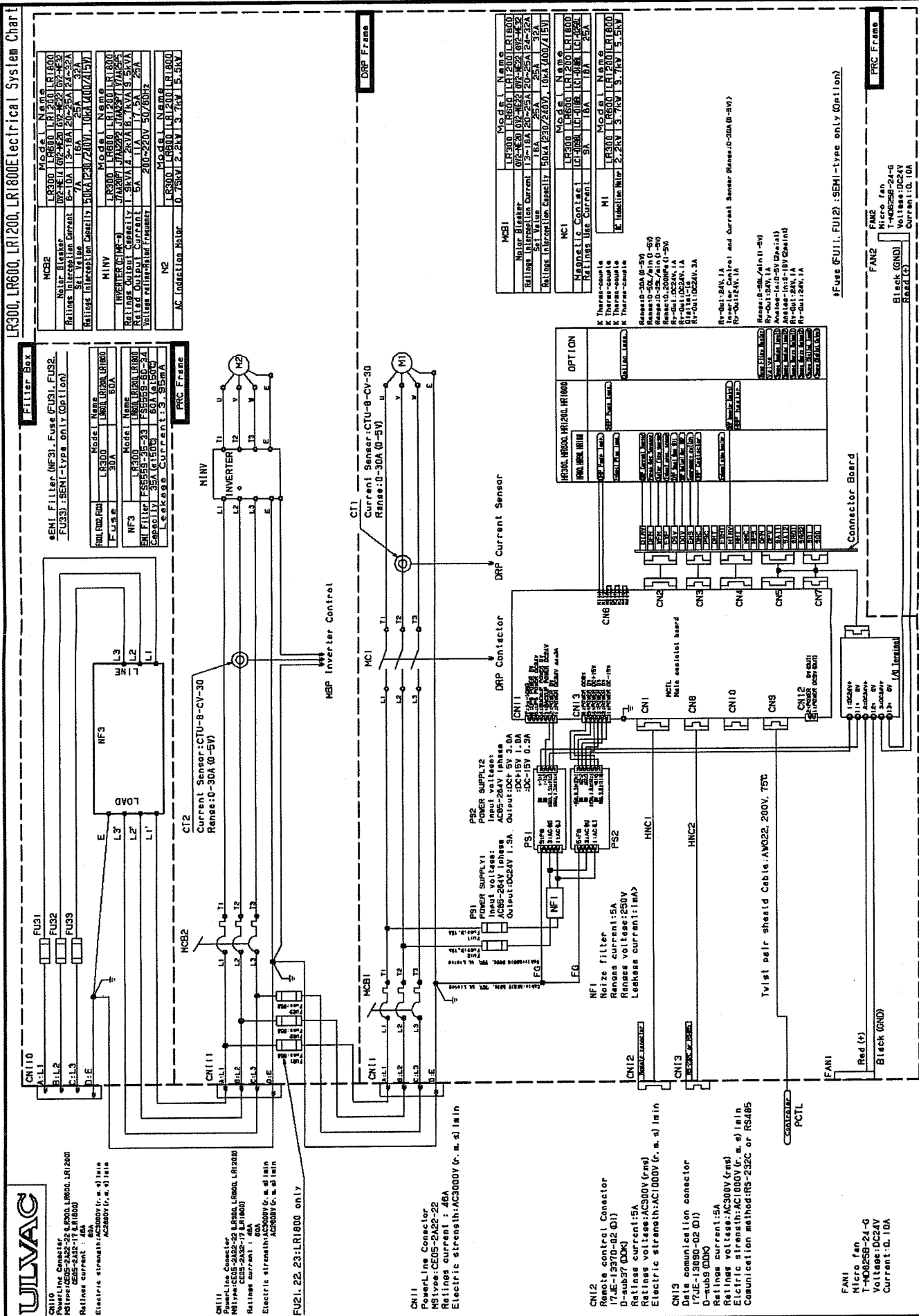
LR60, LR90, LR180 Electrical System Chart



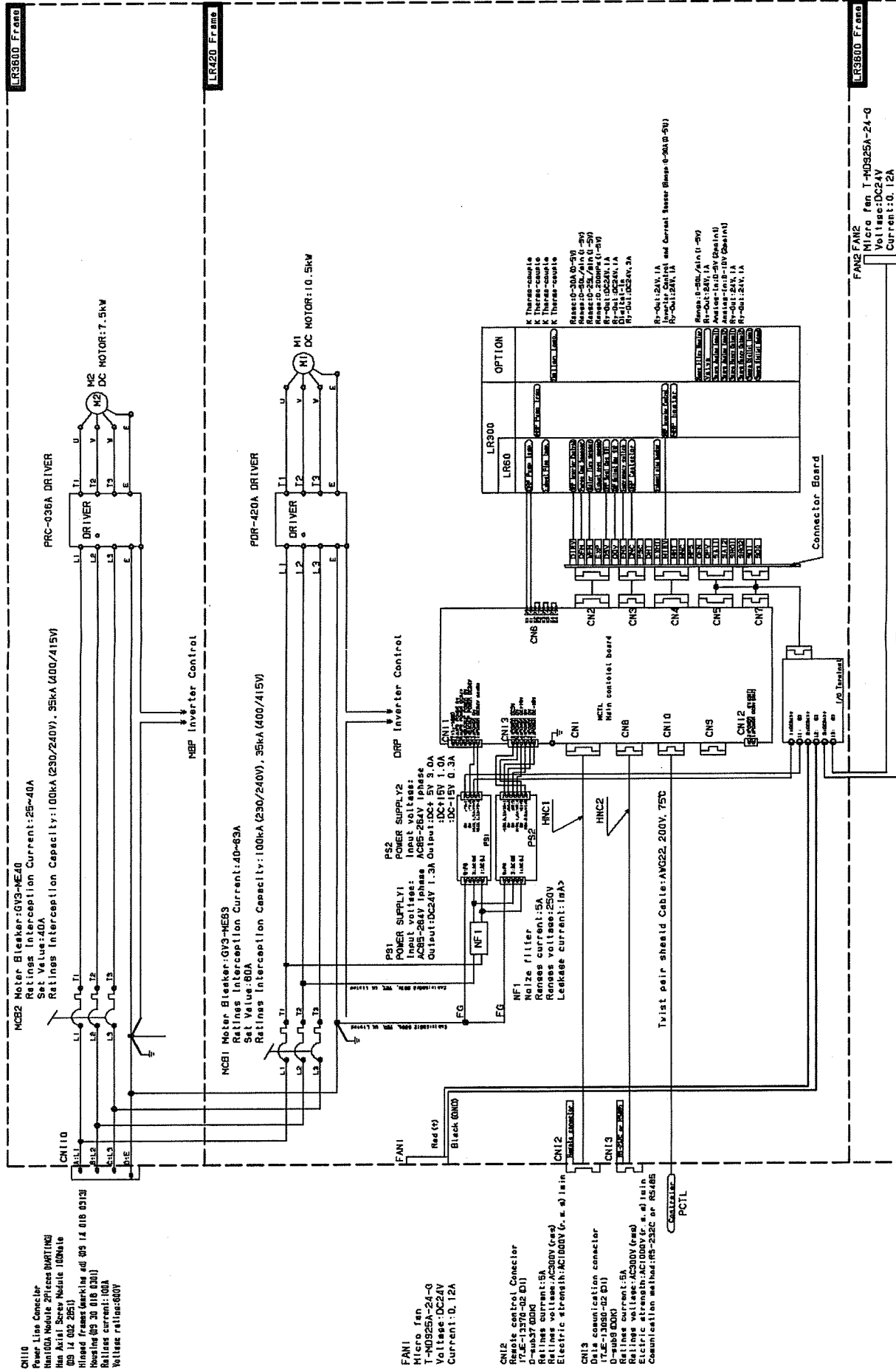
iii



ULVAC



CN110
 Power Line Connector
 Ham100A Module 2-Pieces BARTINGJ
 Hun Axial Screw Module 100Mate
 Q9 14 002 28511
 Hinged frames (marking ad) Q9 14 018 03120
 Housing Q9 30 018 03011
 Rollers current: 100A
 Rollers rating: 660V



bout the exchange of FU31/32/33

These fuses are set up for the protection of EMI filter (NF31, NF32). The necessity for changing this fuse is not caused usually. Controller's LCD disappears when this fuse cuts, and the pump stops.

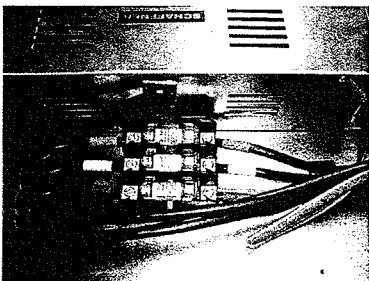
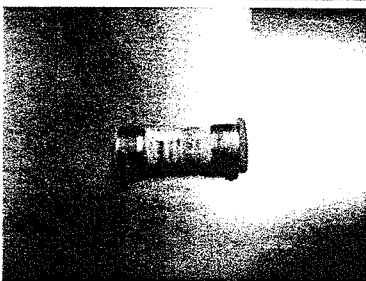
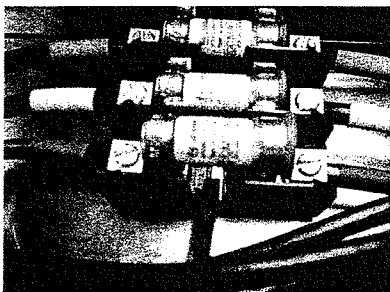
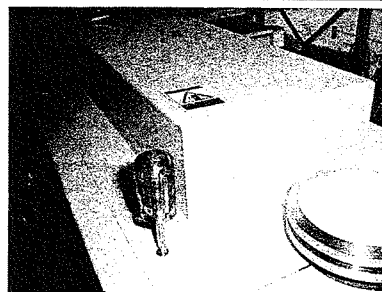
The replacement procedure of the fuse has been described based on the demand item in UL3101. Please never do the clearing work independently. Please contact the nearby service station when the exchange is necessary.



<< Electric shock is possible >>

Never exchange it.

0. Please sever the pump from the power supply surely. Reference"4.2 maintenance: Power Wiring

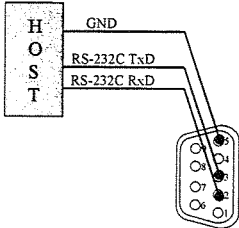
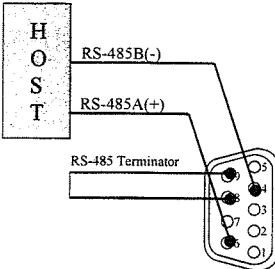
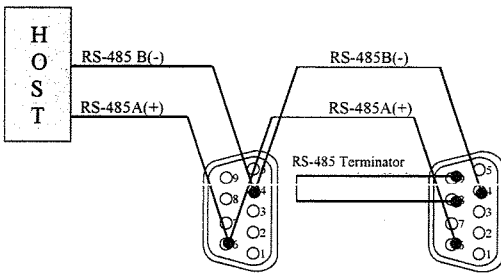
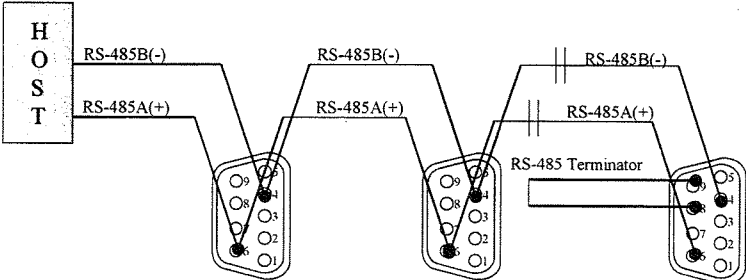
	
1. An upper panel is removed.	3. Please exchange all (three pieces) fuse sat the same time.
	
2. The fuse is changed.	4. An upper panel is set up.

PUMP	Use Fuse			
Model	Capacity of fuse	Number	Maker	Model
LR/HR60	15	3	Little Fuse	CCMR 015.
LR/HR90	30	3	Little Fuse	CCMR 030.
LR/HR180	35	3	Little Fuse	CCMR 035.
LR/HR300	30	3	Little Fuse	CCMR 030.
LR/HR600	50	3	Little Fuse	CCMR 050.
LR/HR1200	50	3	Little Fuse	CCMR 050.
LR/HR1800	60	3	Little Fuse	CCMR 060.

* There is no SEMI specification of LR420, LR3600 now.

c. Communication system supplementation.

c-1 Communication connector connection chart.

When communicating by RS-232C. Pin assignment <table><tr><td>Pin No</td><td>Item</td></tr><tr><td>2:</td><td>RS-232C RxD</td></tr><tr><td>3:</td><td>RS-232C TxD</td></tr><tr><td>5:</td><td>GND</td></tr></table>	Pin No	Item	2:	RS-232C RxD	3:	RS-232C TxD	5:	GND			
Pin No	Item										
2:	RS-232C RxD										
3:	RS-232C TxD										
5:	GND										
When communicating by RS-485. Pin assignment <table><tr><td>Pin No</td><td>Item</td></tr><tr><td>4:</td><td>RS-485 B(-)</td></tr><tr><td>6:</td><td>RS-485 A(+)</td></tr><tr><td>8:</td><td>RS-485 Terminator</td></tr><tr><td>9:</td><td>RS-485 Terminator</td></tr></table>	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]
Pin No	Item										
4:	RS-485 B(-)										
6:	RS-485 A(+)										
8:	RS-485 Terminator										
9:	RS-485 Terminator										
At tow connection.	 Pump address [:01] [:02]										
At nn connection.	 Pump address [:01] [:02] [:nn]										



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 station when it is not set.
- Please input the 3 digits of “ : n n ” 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

c-2 Communication command.

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

[illegible]

Pump side
(Response)
x = 0 : At stop
x = 1 : Reverse rotation
x = 2 : Interlocked
x = 3 : Alarm generating
x = 4 : At start
x = 5 : Running
x = 6 : Stop-operation beginning
x = 7 : Clear ESD
x = 8 : Undefined
x = 9 : RAM clear END

Command name: Stop

[illegible]

Command name: Start

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
Host side																																													
OK																																													
Pump side																																													
OK																																													
NG																																													
CAUTION: Does not start when alarm is activated.																																													

Command name: 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	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
A3[31:0]																																													

Pump 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
A3[x:0]																																													

The bit x represents the following status:

Response

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

	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
Host side	A4xDP																																													
Pump side	A4xDP																																													

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

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
A53C																																													
lost side																																													

Pump side

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

Command name : Local/remote selection.

Host side

ABR

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

Pump side

OKR

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

Pump side

Response/LOCAL/REMOTE is changed over each time a signal is sent.

Command name: Alarm reset.

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
A/B/C																																												
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
D/E/F																																												
pump side																																												

Response/CAUTION: Do not send it when pump is running.

Communication specifications.

```

Signal format      : RS-232C
Transfer system    : Start-stop synchronous system
Baud rate          : 9600 bps
- Bit configuration : Start      1 bit
                   : Data       8 bit
                   : Parity     EVN
                   : Stop       1 bit
Data configuration : J1S code
                   : Terminator

```

SP : Space code

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

承 認 検 査 図 說 計 製 図		ULVAC		TITLE New PDR-C commands	
		SCALE			
		DATE			
MFG No.				DWG No.	

Command name: Display data read-out at start.

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
 B1 h n h p k
 Pump 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
 B1 h n h x x x x x k
 (Response)
 n n : Sensor number. x x x x : Instruction value of sensor.

Sensor number table.

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

Command name: SV1 reversing instruction

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
 C1 k
 Pump 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
 C1 k
 (Response)
 OK or NG

Command name: SV reversing instruction

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
 C2 k
 Pump 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
 C2 k
 (Response)
 OK or NG

Command name: Alarm log clearness

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
 C4 k
 Pump 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
 C4 k
 (Response)

Command name: Baud rate setting.

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
 C5 B A U D x k
 Pump 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
 D k k
 (Response)
 x=0:9600bps x=1:19200bps
 x=2:38400bps x=3:4800bps

Command name: RS-485 address setting.

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
 C6 A S S h h k
 Pump 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
 D k k
 (Response)
 n n : 00~99

Command name: Reset at running time.

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
 C7 R s t k
 Pump 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
 D k k
 (Response)

承認	検図	設計	製図	ULVAC	TITLE	
					New PDR-C commands - Part 2 -	
MFG	No.	No.	No.	No.	No.	SCALE
						DATE
DWG				No.		

Command name: Alarm log read-out.

[illegible]

Pump side

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.). Δ

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. Δ

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	MEP 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 deflection

Command name: Warning read-out.

Host side	B3nnp
1	22
2	23
3	24
4	25
5	26
6	27
7	28
8	29
9	30
10	31
11	32
12	33
13	34
14	35
15	36
16	37
17	38
18	39
19	40
20	41
21	42
22	43
23	44
24	45
25	46
26	47
27	48
28	49
29	50
30	51
31	52
32	53
33	54
34	55
35	56
36	57
37	58
38	59
39	60
40	61
41	62
42	63
43	64
44	65
45	66
46	67
47	68
48	69
49	70
50	71
51	72
52	73
53	74
54	75
55	76
56	77
57	78
58	79
59	80
60	81
61	82
62	83
63	84
64	85
65	86
66	87
67	88
68	89
69	90
70	91
71	92
72	93
73	94
74	95
75	96

	Pump side																																																																																																		
B3mksxeekkkuuu06																																																																																																			
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	97	98	99	00

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

xx/ee/kk/uuu 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

B3h100

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

Pump side

B3nnxxeeekkkuuuR

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

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

xx/ee/kk/uuu 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

承 認	検 査	図 說	製 図		TITL E	
					New PDR-C commands - Part 4 - 	
MFG					SCALE	DWG
					DATE	

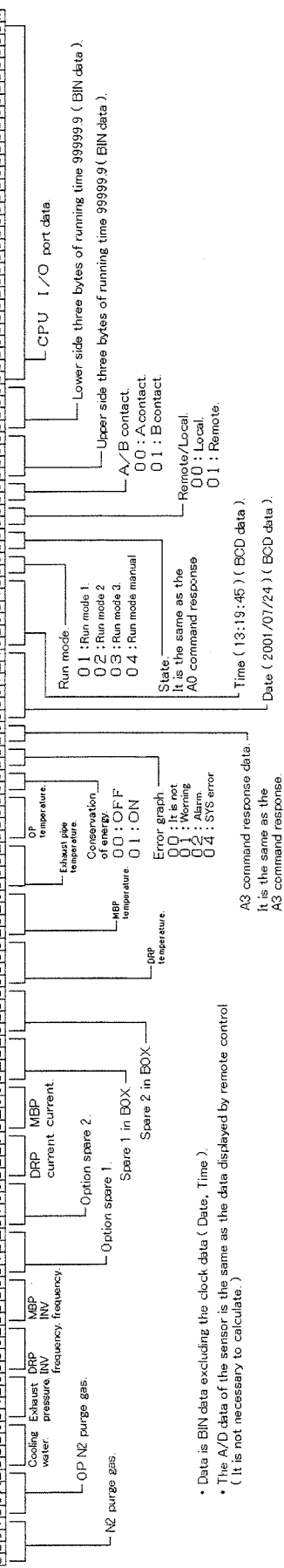
Command name: Run log read-out

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	97	98	99	100																																																	
06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	91	92	93	94	95	96	97	98	99	100

Pump side (Response)

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	97	98	99	100																																																	
06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	91	92	93	94	95	96	97	98	99	100



Command name: Current status read-out

Host side

Host side	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F	30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F	70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F	80	81	82	83	84	85	86	87	88	89	8A	8B	8C	8D	8E	8F	90	91	92	93	94	95	96	97	98	99	100
-----------	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----

Response is the same as run log read-out

承認	検	図	設計	型	図	TITLE	
						New PDR-C commands	
						SCALE	:
						DATE	:
MFG No.						DWG No.	

ULVAC overseas address

最終確認 2002/4/18

country	company	address	tel	fax
Singapore	ULVAC, Inc. Singapore Customer Service Center	30 Loyang Way, #07-10, JTC Building Singapore 508769	(+65)-65422700	(+65)-65422755
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	※ Lip Chee Hardware & Engineering Pte. Ltd.	No.3 Kian Teck Road, Singapore 628764	(+65)-68617533	(+65)-68610113
	※ INABATA SINGAPORE(PTE) Ltd.	78 Shenton Way, #18-00, Singapore 079120	(+65)-62200796	(+65)-62227972
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	※ INABATA MALAYSIA SDN. BHD. Headquarters	Letter Box No.83, 25th Floor, UBN Tower, 10 Jalan P. Pantele, 50250 Kuala Lumpur, Malaysia	(60)2-388588	(60)2-388051
	※ INABATA MALAYSIA SDN. BHD. Penang Branch	Unit 2, Lower Level 5, Hotel Equatorial Penang, No.1, Jalan Bukit Jambul, 11900 Penang, Malaysia	(60)4-643-4700 (4 Lines)	(60)4-644-3755
India	ULVAC, Inc. India Office	1003, Babukhan Estate, Basheerbagh, Hyderabad 500 001, India	(91)40-3242396	(91)40-3242395
Australia	※ Dynavac Engineering Pty., Ltd.	30 Bearing Road Seven Hills NSW 2147, Australia	(61)3-9801-6011	(61)3-9800-3371

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筑波CSセンター	TEL 0297-52-0944	〒300-2206	茨城県筑波郡谷和原村福岡 2455-2
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㈱昭和真空

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大阪支店	TEL 06-6390-2127	〒532-0011	大阪府淀川区西中島 5-13-12 谷ビル 5F

アルバックファイ㈱

本社	TEL 0467-85-6522	〒253-0084	神奈川県茅ヶ崎市円造 370
大阪営業所	TEL 06-6397-2741	〒532-0003	大阪府淀川区宮原 3-3-31 上村ニッセイビル

アルバック東北㈱

TEL 0178-28-7733	〒039-2280	青森県八戸市北インター工業団地
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(株)タナカ

本社	TEL 011-731-0291	〒060-0906	札幌市東区北六条東2丁目 札幌総合卸センター内
石狩事業所	TEL 0133-73-0662	〒061-3241	石狩市新港西 1-727-1
苫小牧営業所	TEL 0144-72-9551	〒053-0815	苫小牧市永福町 1-4-16
釧路営業所	TEL 0154-51-3141	〒084-0912	釧路市星が浦大通 5-6-28
函館営業所	TEL 0138-49-5031	〒049-0111	上磯郡上磯町七重浜 4-23-25
室蘭営業所	TEL 0143-44-3713	〒050-0081	室蘭市日の出町 1-12-30
旭川営業所	TEL 0166-48-8102	〒079-8414	旭川市永山八条 3-3-18
北見営業所	TEL 0157-31-5410	〒090-0001	北見市小泉 438-11

東北化学薬品(株)

本社	TEL 0172-33-8131	〒036-8061	青森県弘前市大字神田 1-3-1
青森支店	TEL 0177-38-4451	〒030-0131	青森市間屋町 1-13-10
八戸支店	TEL 0178-43-9236	〒031-0071	青森県八戸市沼館 1-15-3

(株)アヅマテクノス

本社	TEL 025-247-8386	〒950-0912	新潟市南笹口 1-9-10
秋田支店	TEL 0188-62-6311	〒010-0954	秋田市山王沼田町 6-32
仁賀保営業所	TEL 0184-36-3211	〒018-0402	秋田県由利郡仁賀保町平沢字前谷値 116-37
長岡支店	TEL 0258-47-1515	〒940-2127	新潟県長岡市新産 3-2-4

三益半導体工業(株)

本社	TEL 0273-73-1622	〒370-0801	群馬郡群馬町足門 762
産商事業部	TEL 0273-61-7511	〒370-0801	高崎市上並榎町 397-1
北関東営業所	TEL 0284-73-3911	〒326-0836	足利市南大町 1-5

アルバックES(株)

1グループ	TEL 03-5218-6011	〒104-0028	中央区八重洲2-3-1
3グループ	TEL 042-945-2061	〒359-0021	所沢市東所沢 1-3-11
4グループ	TEL 0298-23-2651	〒300-0048	土浦市田中 3-8-32 土浦学園通りビル 4F
5グループ	TEL 03-5218-6011	〒104-0028	中央区八重洲2-3-1
6グループ	TEL 0263-51-0888	〒399-0702	長野県塩尻市広丘字金塚 967-1

稲畑産業(株)	TEL 03-3639-6549	〒103-8448	中央区日本橋本町 2-8-2
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遠藤科学(株)

本社	TEL 054-283-6222	〒422-8567	静岡市西脇 1294
静岡営業所	TEL 054-283-5222	〒422-8567	静岡市西脇 1294
三島営業所	TEL 0559-73-3211	〒411-0000	三島市外長泉町竹原 370
富士営業所	TEL 0545-51-5311	〒417-0035	富士市津田町 30-2
袋井営業所	TEL 0538-43-5151	〒437-0062	袋井市泉町 2-9
浜松営業所	TEL 053-464-3400	〒435-0028	浜松市飯田町 1082
御殿場営業所	TEL 0550-84-1411	〒412-0043	御殿場市新橋 436
島田営業所	TEL 0547-38-3900	〒427-0104	島田市井口 1355
湖西営業所	TEL 053-577-4111	〒431-0425	静岡県湖西市梅田 1024
平塚営業所	TEL 0463-54-1121	〒254-0014	平塚市四之宮1558
横浜営業所	TEL 045-471-5422	〒222-0033	横浜市長北区新横浜2-14-26

三ツワ理化学工業(株)

千葉営業所	TEL 043-206-1071	〒260-0044	千葉市中央区松波 1-11-3 石橋松波ビル 2F
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稲畑産業㈱

大阪本社 TEL 06-6267-6327 〒542-8558 大阪市中央区南船場 1-15-14 堺筋稲畑ビル

㈱勝木太郎助商店

本社 TEL 0761-22-6288 〒923-0937 石川県小松市本町 3-1-3
金沢営業所 TEL 0762-68-2880 〒920-0059 石川県金沢市示野西 67
富山営業所 TEL 0764-31-8676 〒930-0897 富山県富山市田刈屋町 28

三弘アルバック㈱

本社 TEL 052-702-6811 〒465-0081 名古屋市名東区高間町 544
三重営業所 TEL 0593-86-4857 〒510-0235 三重県鈴鹿市南江島町 13-25
岐阜営業所 TEL 0583-84-7701 〒509-0145 岐阜県各務原市鵜沼南兆 3-20 川村ビル 2-5

㈱京都タカオシン

本社 TEL 075-751-7755 〒606-8395 京都市左京区丸太町通川端東入東丸太町 18-1
滋賀営業所 TEL 0748-36-6682 〒523-0056 滋賀県近江八幡市古川町 1173-68

三ツワ理化学工業㈱

本社 TEL 06-6351-9631 〒530-0041 大阪市北区天神橋 3-6-24
配送センター TEL 06-6351-6101 〒530-0043 大阪市北区天満 1-11-1
奈良営業所 TEL 0742-33-1921 〒630-8114 奈良市芝辻町 4-6-15 宝来ビル
滋賀営業所 TEL 0775-53-0143 〒520-3032 栗太郡栗東町刈原 47-1 ギンケイ
岡山営業所 TEL 086-464-6366 〒710-0011 倉敷市徳芳 154-2
広島営業所 TEL 082-271-2181 〒733-0821 広島市西区庚午北 2-17-4 船本ビル
宇部支店 TEL 0836-21-4146 〒755-0053 山口県宇部市西中町 4-28
周南営業所 TEL 0833-44-2779 〒744-0002 山口県下松市東海岸通り 1-11

㈱友田大洋堂

本社 TEL 0852-24-3456 〒690-0047 島根県松江市嫁島町 13-34 松江卸団地内
鳥取営業所 TEL 0857-22-4156 〒680-0862 鳥取市雲山 147-4

はじめ科学㈱

本社 TEL 0899-22-2151 〒791-8018 愛媛県松山市問屋町 3-7 松山卸商センター内
新居浜支店 TEL 0897-33-4177 〒792-0811 愛媛県新居浜市庄内町 2-5-19

㈱大熊

本社 TEL 0862-93-2171 〒701-0165 岡山県岡山市大内田 756-3
津山営業所 TEL 0868-26-8701 〒708-0842 岡山県津山市河辺 1073-1
倉敷支店 TEL 086-455-8895 〒712-8044 倉敷市東塚 6-4-51

㈱大一器械

TEL 0886-56-8122 〒771-0185 徳島県徳島市川内町平石若宮 340

増田薬品㈱

TEL 0878-51-0631 〒760-0020 香川県高松市錦町 1-13-21