

Liquid Nitrogen Generator Instruction Manual

UMP-40W

Export Control Policy

When applying a refrigerator to a cryocooler for optical sensors, the cryocooler falls under row 6.A.2.d.2 of the control list established by The Wassenaar Arrangement, which is equal to row 10(2) of appended table 1 of Japan's Export Trade Control Order.

Customers must follow all related rules and regulations such as Foreign Exchange and Foreign Trade Act and take appropriate procedures when exporting or re-exporting our refrigerators.

INTRODUCTION

Thank you for choosing our products. This instruction manual provides information and precautions on handling, installation, operation, and maintenance of the product.

This product is intended for use by qualified personnel who recognize shock hazards and are familiar with the safety precautions required to avoid possible injury. To ensure proper use of this product, read this instruction manual carefully and keep this manual close at hand so that you can use for reference during operation. If you purchased our other products and/or optional devices with this product, read relevant instruction manuals carefully.

Note that the UMP-40W is designed for the use outside of Japan and cannot be installed nor used in Japan.

<General Precautions>

- (1) The information included in this manual cannot be used for redistribution or reproduction, nor be disclosed or transferred to a third party without written permission from ULVAC CRYOGENICS.
- (2) Information provided within this document is subject to change without notice, due to the change of specifications or product update.
- (3) Although the information in this document is believed to be accurate, we would welcome feedback from our customers. Please contact us.

Safety Conventions

Our products have been designed to provide extremely safe and dependable operation when properly used. Following safety precautions must be observed during normal operation and when servicing them.



WARNING

A warning describes safety hazards or unsafe practices which could result in severe injury or loss of life.



CAUTION

A caution describes safety hazards or unsafe practices which could result in personal injury or equipment damage.



Toxic gas or chemicals used.

There is a risk of severe injury upon contact.



Corrosive chemicals used.

There is a risk of severe injury upon contact.



Flammable gas used.

There is a danger of fire or burn injury.



Explosive gas used.

There is a risk of fire or explosion.



Electrical hazard.

High voltage can cause severe injury or death.



Hot heating part present.

There is a risk of burn injury.



Caution low temperature.

There is a risk of low temperature burn injury.

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1. Safety Instructions

1. Danger of electric shock: Do not touch the live part.



To this unit, voltage that would cause electrocution or serious injuries is applied. It is extremely dangerous to touch the live part inside the unit. Make sure to turn OFF the main power source before performing installation, maintenance or repair. Contacting the internal parts that are not insulated may damage human body or equipment.

Connect the earth wire to D type grounding.

2. Danger of oxygen deficiency: Ventilate well.



Nitrogen gas itself is not toxic to human bodies but it reduces the oxygen level in the atmosphere (the oxygen concentration of 18% or below is defined as an oxygen-depleted state). Install the equipment on a well-ventilated place, and add a ventilating fan with a capacity of at least 2000 m³/hr airflow. Do not stay together with a dewar containing liquid nitrogen in a sealed space, such as an elevator or a car.

3. Danger of explosion: Do not seal LN₂.



The volume of nitrogen gas is 700 times of liquid nitrogen. Sealing liquid nitrogen in an airtight space produces high-pressure gas of 700 atm and may result in explosion. Use liquid nitrogen in the condition constantly open to the air.

4. Danger of burns or frostbites: Never touch high or ultra-low temperature parts.



Liquid nitrogen provides temperature as low as -196°C . If liquid nitrogen is directly handled, frostbites, loss of sight, and others are foreseen. Always wear leather gloves, goggles, trousers without turnips, etc. to handle liquid nitrogen. In addition, use cautions to liquid nitrogen transport lines, too. In this unit, there is a part with danger of burns if touched directly. Perform work such as maintenance or repair at least 30 minutes after the unit is shutdown.





5. Danger of explosion: Do not expose to corrosive gases.



High-pressure helium gas is filled in this unit. When disassembling or disposing of the unit or parts, be sure to discharge helium (no need to discharge helium for regular maintenance). In addition, never attempt to install the apparatus under the atmosphere of hydrochloric acid-based, chlorine gas-based, and other corrosive gases.

2. Disposal Considerations

Disposal of industrial waste is regulated by national or local governments. Follow all applicable local or national laws, regulations or guidelines when disposing our products.

			 WARNING
When the refrigerator unit may have pumped toxic or dangerous gases, you must contact your safety supervisor at the time of disposal, and follow the instructions to remove hazardous substances before disposing.			

We provide Safety Data Sheet (SDS) of our products upon your request.
Please contact us when necessary.

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3. General Description of the System

3.1 Liquid nitrogen generator (UMP-40W)

UMP-40W Liquid Nitrogen Generator provides liquid nitrogen by cooling down, condensing and liquefying nitrogen gas with the cold head (RMS150T).

Liquid nitrogen is stored inside dewar, and can be transferred to another container with easy operation. With the optional automatic transfer system, liquid nitrogen can be automatically transferred to the dewars of the customer's system.

Nitrogen gas source can be selected from PSA nitrogen generator, and membrane nitrogen generator.

Liquid nitrogen generator is hereafter referred to as "UMP-40W" in this book.

3.2 Helium gas compressor (C30PMVRT)

This unit is in the right side of UMP-40W, compress Helium gas to supply to the cold head to provide cryogenic temperatures. It is automatically turned on and off by the control circuit of UMP-40W.

Helium gas compressor is hereafter referred to as "C30PMVRT" in this manual.

For details of this equipment, please refer to the operation manual for "C30PMVRT".

3.3 PSA (Pressure Swing Adsorption) Nitrogen Generator (type GN-30i)

PSA Nitrogen Generator GN-30i generates highly concentrated nitrogen from the air using adsorber and supply the gas to UMP-40W. The nitrogen generated here is used as the material for liquid nitrogen and is also used to take out liquid nitrogen.

PSA nitrogen generator is hereafter called "GN-30i" in this book. When we describe things that are in common with membrane nitrogen generators, they are collectively referred to as "nitrogen generators".

Please refer to the operation manual of GN-30i for details.

4. Component Description

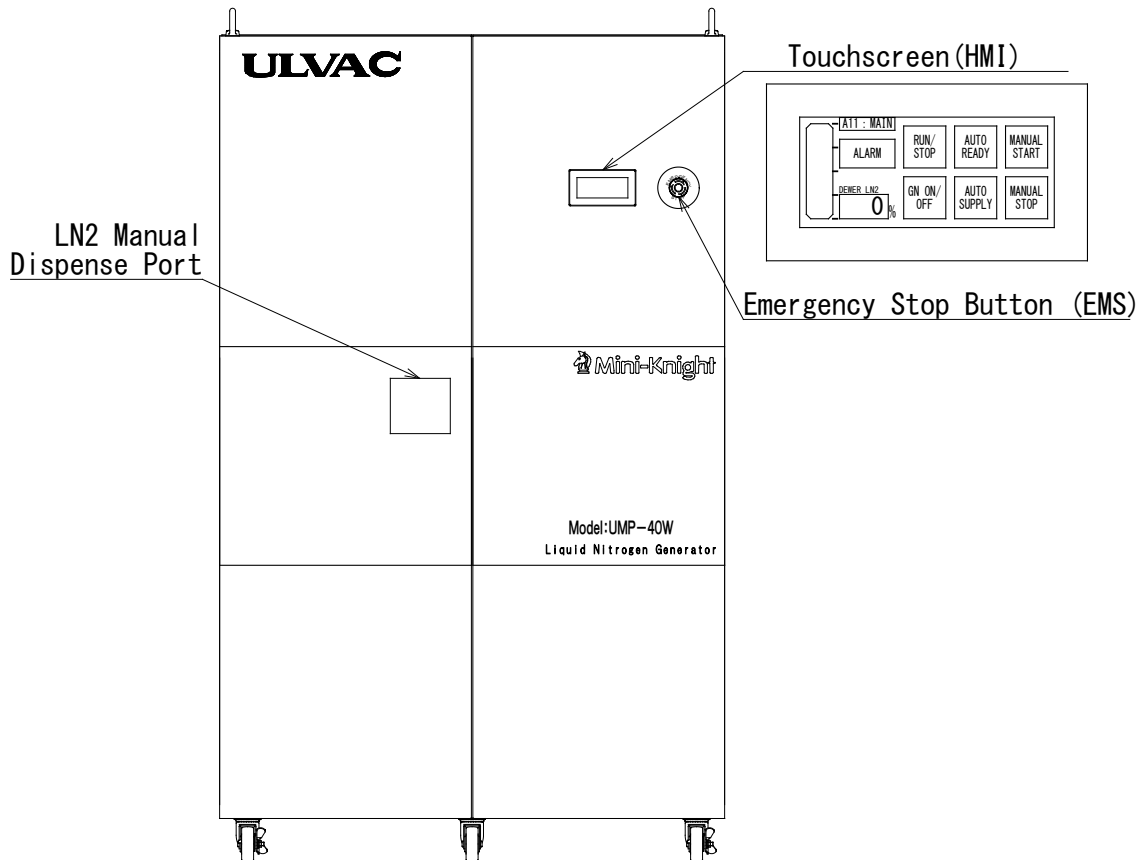


Figure 4-1 Front view of UMP-40W

4.1 Front view of UMP-40W (Figure 4-1)

- | | |
|----------------------------|--|
| Emergency stop button(EMS) | :Press this button to shut down the control circuit to stop as dispensing liquid nitrogen or liquefaction. Do not use the emergency stop button except for emergency. |
| Front left door | :Remove two screws to open this door. Inside the door, there is a liquid nitrogen dewar, a cold head or open this door only for periodic inspection, maintenance and repair services. |
| Front right door | :Remove two screws to open the front right door. Inside the door, there are C30PMVRT and electric circuits. Open this door when you adjust helium gas pressure.
※Ensure that main power is disconnected before opening this door. |

LN₂ manual dispense port

:Press the panel to open. Inside the panel, there is a coupling to connect liquid nitrogen supply flexible hose. Since the port may reach extremely low temperature, do not touch it with bare hands during or right after dispensing liquid nitrogen.

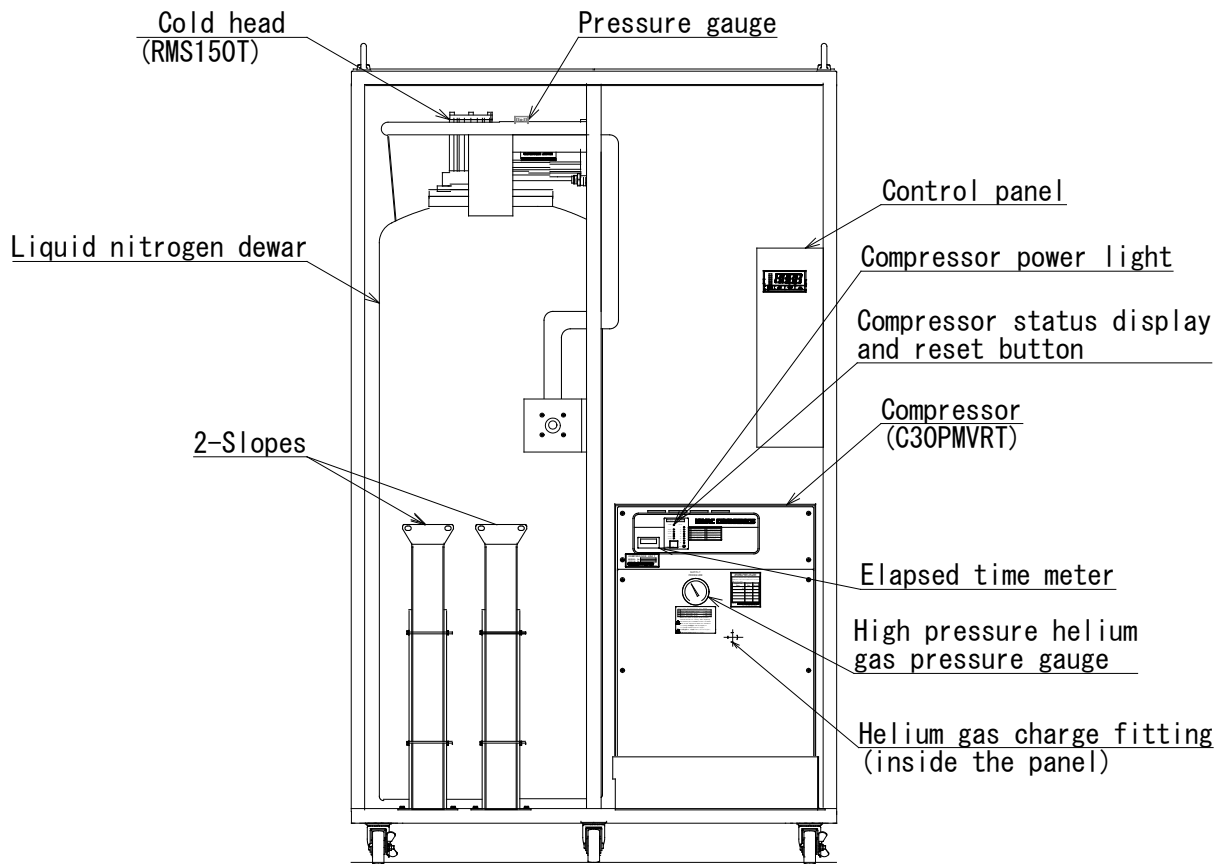


Figure 4-2 Inside view of UMP-40W front door and lower panel

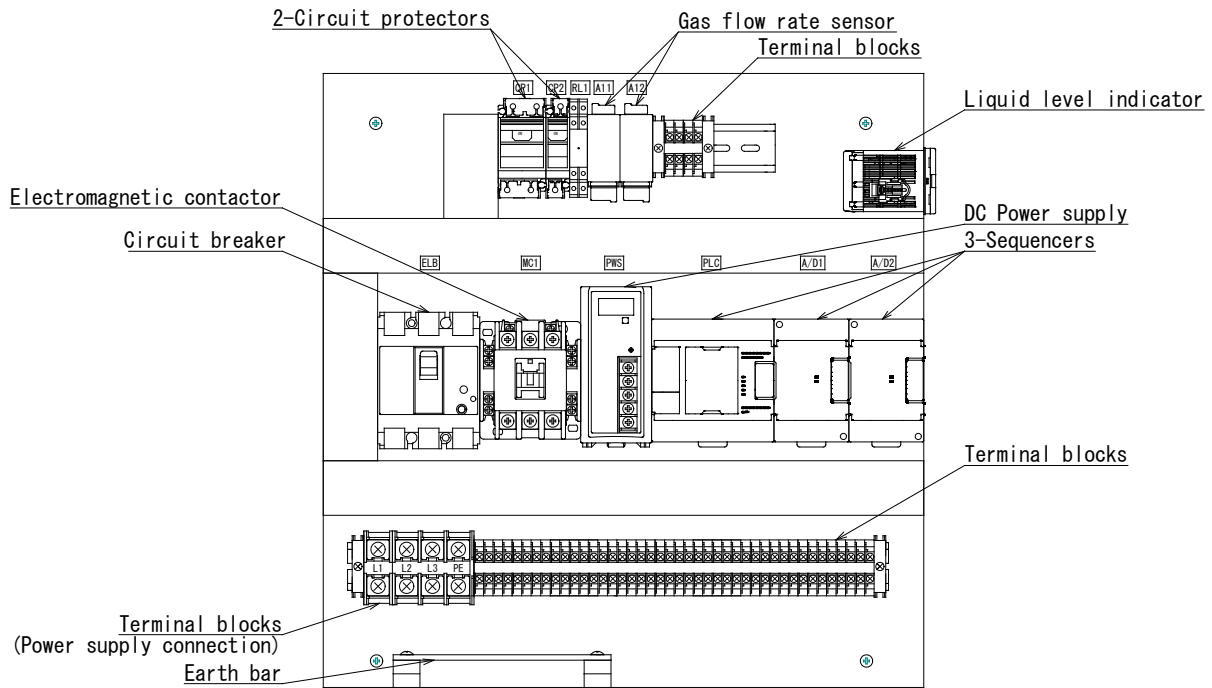


Figure 4-3 Electrical circuit

4.2 Inside view of UMP-40W front door and lower panel (**Figure 4-2**)

- Liquid nitrogen dewar : Container that stores liquid nitrogen up to 100 liters.
- Cold head (RMS150T) :The cold head works in conjunction with the compressor to generate ultra-low temperature and produce liquid nitrogen. The cold head needs maintenance services according to the time in operation.
- Pressure gauge :Displays the pressure inside the dewar.
- He Pressure Meter :Displays the pressure of Helium gas filled in C30PMVRT.
 - When suspended: 1.26 – 1.34 MPa
 - When in operation: 1.70 – 2.20 MPa
- He gas charge fitting :This port is inside the front panel of C30PMVRT. Connect the charging hose to this port to charge Helium gas. Do not touch this port except when needed, as it may result in helium leakage.

Compressor status display and RESET button	:Refer to the instruction manual of the compressor unit.
POWER light	The POWER light button lights when C30PMVRT is in operation.
Elapsed time meter	:The elapsed time meter displays the total operation time of C30PMVRT. Use this information to conduct maintenance work properly.

4.3 UMP-40W Electrical circuit (Figure 4-3)

Circuit breaker	:The Circuit Breaker is the protective breaker for control circuit of the UMP-40W. It is tripped when an electric leak or short-circuit occurs.
Sequencer	:The Sequencer is a controller used to control the operation of UMP-40W system. This functions to operate necessary units upon reception of signal from the sensors. In the event of an error, please inform us of the status of input or output lights of the sequencer when contacting us.
Level sensor converter	:The level sensor converter is the electric component for detecting liquid nitrogen level in the UMP-40W. Since it is adjusted precisely, please do not touch any button.
Terminal blocks	:The Terminal blocks connect the wiring of signal reception of the electric appliances and containers of automatic supply destination.

5. Flow Diagram

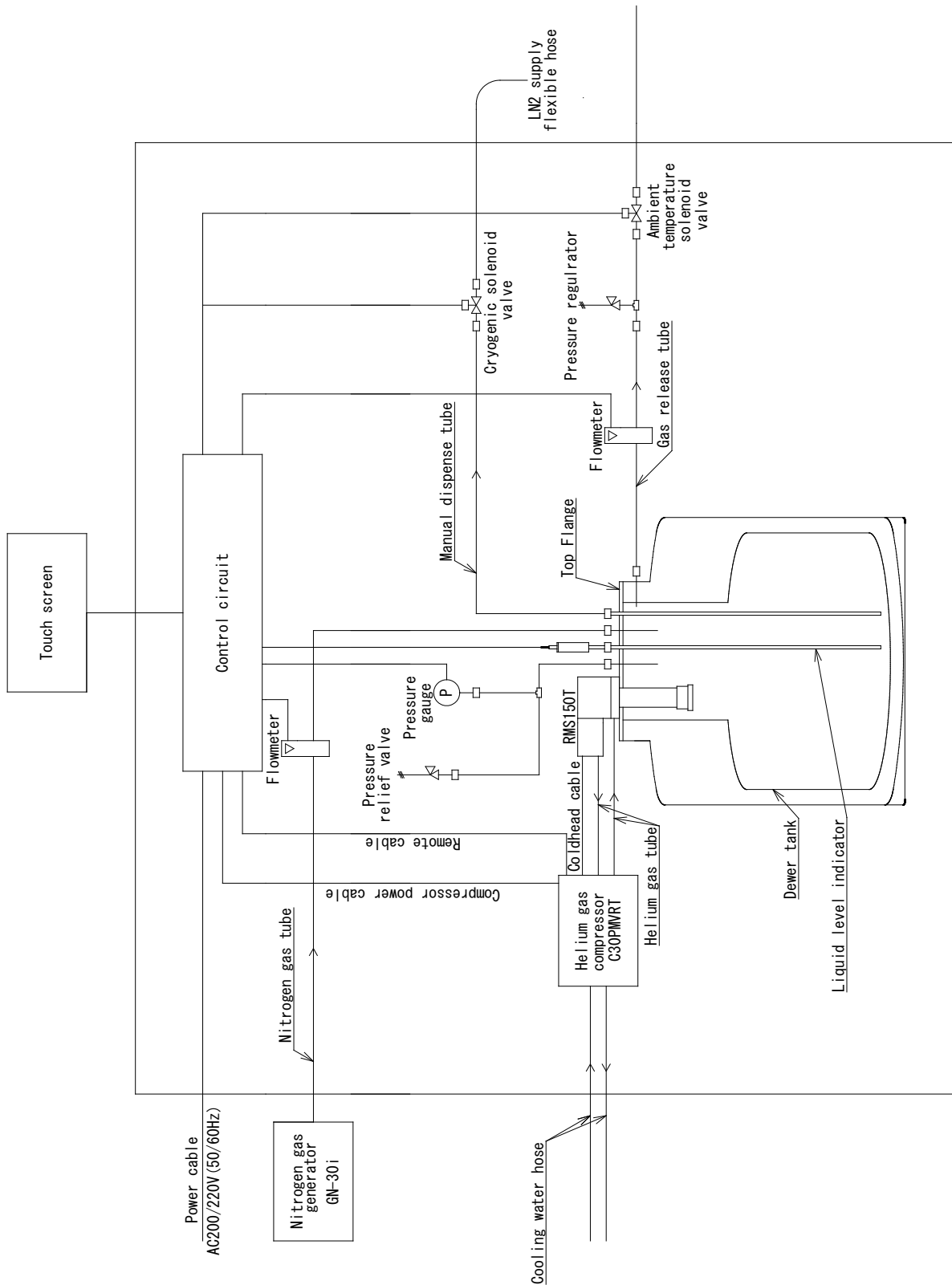


Figure 5-1 UMP-40W Flow Diagram

6. Specifications

6.1 Liquid nitrogen generator

Type	: UMP-40W
Liquid nitrogen production	: 40L/day (60Hz)
Dimensions	: 1095[W] x 750 [D] x 1793 [H]
Weight	: Approx. 430 kg
Cold head type	: RMS150T
Compressor type	: C30PMVRT
Cooling method	: Water-cooled
Ambient conditions	: Ambient temperature: 10 – 35°C Relative humidity: 80% or less (Non-condensation other than LN ₂ dispense port)

- UMP-40W must be installed indoors.
- UMP-40W must not be used in the atmosphere with organic solvents or corrosive gases.

6.2 PSA (Pressure Swing Adsorption) nitrogen gas generator

Type	: GN-30i
Dimensions	: 600[W] × 650[D] × 1200[H]
Weight	: Approx.120kg
Cooling method	: Air-cooled (Intake from front, exhaust from back)

- GN-30i must be installed indoors.
- GN-30i must not be used in the atmosphere with organic solvents or corrosive gases.
- Air inhaled from the front is discharged to the backside. Do not block these areas.

6.3 Power source (for UMP-40W)

Rated working voltage	: 50Hz 190 - 220VAC, 60Hz 200 - 230VAC three-phase
Power capacity	: 30 A or above
Power consumption	: 7.5kW
Connection	: Round type crimping terminal for M5



CAUTION

Use D-type earth ground for safety.

6.4 Cooling water (for UMP-40W)

Flow rate : 300 – 900L/hour (recommended: 330L/h)

Pressure : 0.02 – 0.17 MPa (recommended: 0.1MPa)

Temperature : 10 – 32°C (recommended: 20°C)

Water quality : Tap water equivalent

* Check the water quality on a regular basis.



CAUTION

The flow rate of cooling water should be within the following allowable range. When the flow rate or pressure is too low, it may result in abnormal suspension, failure, or damaging cooling water pipes due to the temperature rise.

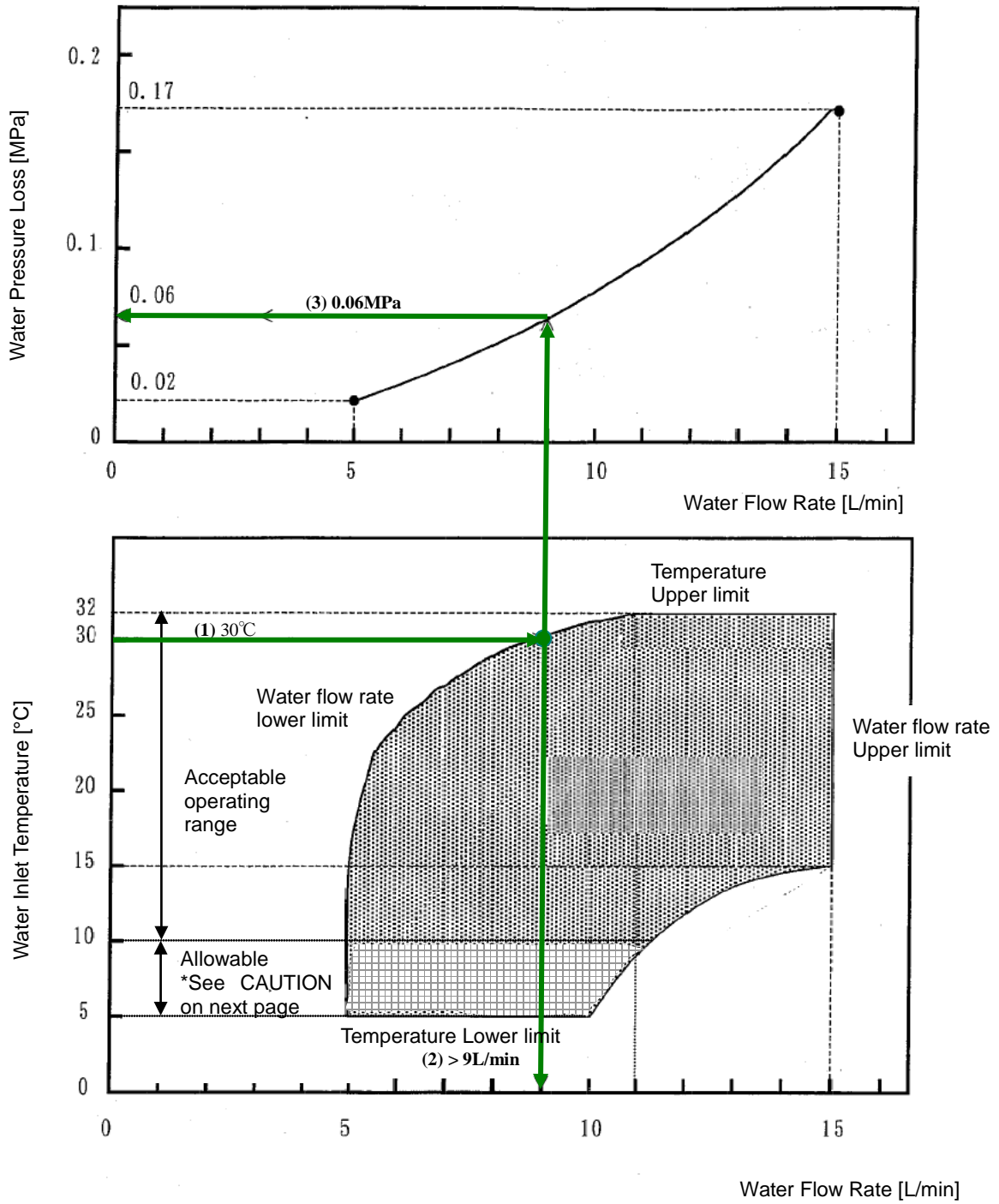


Figure 6-1 Allowable range of cooling water for UMP-40W



CAUTION

If cooling water temperature is lower than 10°C, stop the water flow when the compressor is suspended. If cooling water of below 10°C is kept flowing, it may raise viscosity of lubricant oil and the compressor may fail to startup when turned on.

6.5 Power source for GN-30i (when using GN-30i)

Voltage	: 200 VAC \pm 10% (50/60Hz) , single-phase
Power capacity	: 15 A or above
Power consumption	: 1.2 kW (50/60Hz)
Connection	: Round type crimping terminal for M4



CAUTION

Use D-type earth ground for safety.

7. Installation

7.1 Environmental Requirements

- (1) Install the equipment at a level and stable indoor place. Power supply or other utilities should be located nearby.
- (2) Install the equipment at a well-ventilated place where the ambient temperature is 10 – 35°C and humidity is 80% or lower (without condensation except for LN₂ dispense port).
- (3) Secure the following space for maintenance.

<NOTE> The area other than the back are required only at the time of maintenance and check, and do not always need to be cleared.

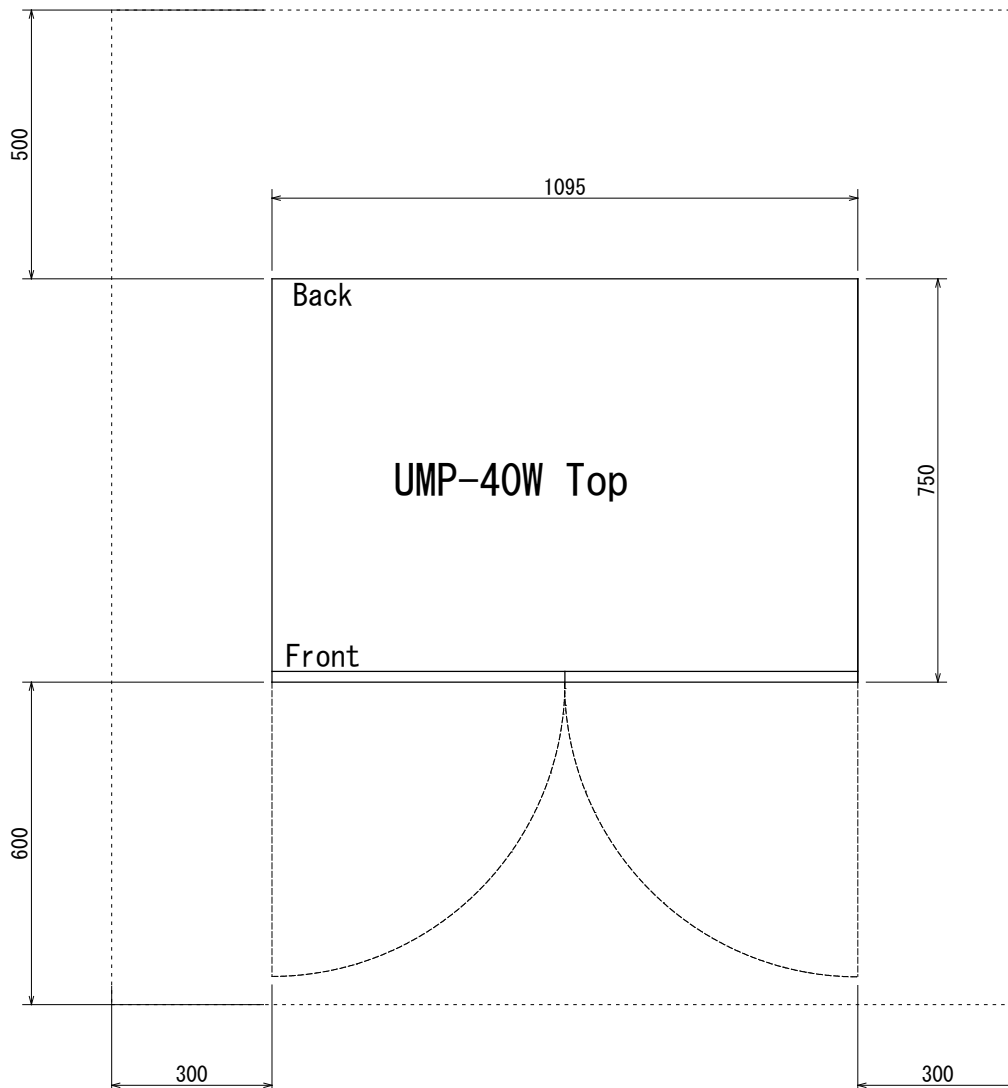


Figure 7-1 Maintenance space for the UMP-40W

- (4) Lock the wheels to fix the equipment.

7.2 GN-30i power connection

		WARNING
Ensure that main power source is disconnected before making the connection to power-supply.		

Refer to Chapter 6.5 Power source for GN-30i (when using GN-30i) for supply voltage, power capacity and power consumption.

- (1) Use a device such as circuit tester to confirm that the supply voltage is within the appropriate scope.
- (2) Connect the power-supply.
- (3) Turn ON the power breaker inside the GN-30i.

7.3 UMP-40W utility connection

Remove the back panel of UMP-40W and locate the hole for utility connection on the bottom. Connect cables through this hole including power-supply, Nitrogen tube and remote cables of Nitrogen generation system, signal cables for automatic supply destination.

7.3.1 UMP-40W power connection

		WARNING
Ensure that main power source is disconnected before making the connection to power-supply.		

Refer to Chapter 6.3 Power source (for UMP-40W) for supply voltage, power capacity, or power consumption

- (1) Use a circuit tester or others to confirm that the supply voltage is within the scope.
- (2) Connect the crimping terminal side of power cables to UMP-40W through the holes on the bottom. Make sure that the numbers on the terminal block (R, S, T, E) correspond to the numbers of power cables and connect them to the terminal block. If the connection is inadequate, it may result in damage by a fire while UMP-40W is in operation.
- (3) Once the connection to the terminal board is made, attach the power cable to the circuit breaker and supply electricity by turning on the breaker in the electric circuit part of UMP-40W. Be sure to confirm that the power is supplied to the sequencers or other parts in the electric circuit of UMP-40W.



WARNING

Do not connect the earth ground wire to power lines. It may result in electric shock or electric leakage.



CAUTION

When you operate multiple devices with one power source, be aware of the total capacity. Lack of capacity invites overcurrent (voltage drop) and may result in damaging the equipment.



CAUTION

Only the personnel who have sufficient knowledge and skill on electric connections or cables can perform the work to extend power cables.

7.3.2 UMP-40W Cooling Water Connections



CAUTION

Depending on water quality, scale might accumulate inside the cooling water tube, or the tube might be corroded. It is recommended to use water circulation system when there is such concern.

- 1) Connect the cooling water joint included in the same package to the cooling water IN and OUT connectors.
The screw size of the connector is Rc3/8. Place seal tape on the screw part.
- 2) Connect the cooling water joint to the cooling water supply side.
- 3) Connect the cooling water hose to the water supply side and the UMP-40W water IN connector, and water discharge side and UMP-40W water OUT connector.
- 4) Once the connections are made, open the main valve of cooling water supply to check that the water flows in correct direction and no leakage is seen from the coupling or hoses.
- 5) When you use cooling water circulation system, set the water temperature at 20°C.



CAUTION

Water may leak if the connection between cooling water joint and hose is loose



CAUTION

Be sure to connect the hose to the correct port. Wrong connection may result in damaging cooling water tube and invites water leakage.

(*)Refer to “6.4 Cooling water (for UMP-40W)” for the allowable range of cooling water.

7.3.3 Nitrogen Gas Tube Connections

Place Nitrogen gas tube from the bottom hole and connect it to the gas connector of Dewar along Helium gas pipe. Connect the other side to the Nitrogen gas supply port of a Nitrogen gas generator.

7.3.4 “Nitrogen gas generator” remote cable connections

Connect a remote cable to the remote connector inside UMP-40W and the signal connector from the back of GN-30i.

8. Electric Wiring

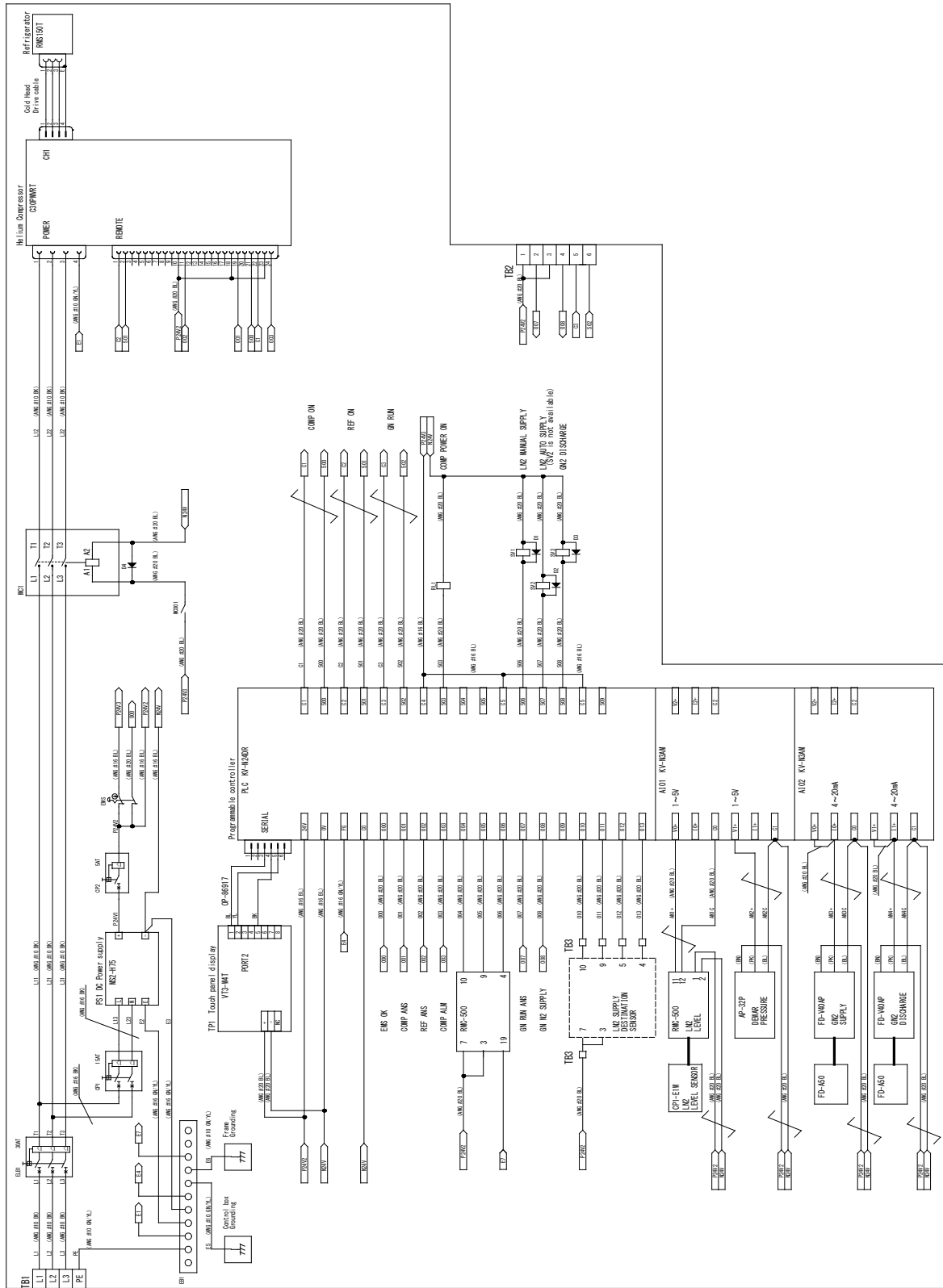


Figure 8-1 Electric wiring UMP-40W

9. Touchscreen Operation

9.1 MAIN screen

Figure 9-1 shows the MAIN screen.

This screen provides the interface such as turning ON or OFF the system, checking the volume of produced LN₂, or manually dispensing LN₂. Refer to **Table 9-1 MAIN screen descriptions** for the information on the icons.

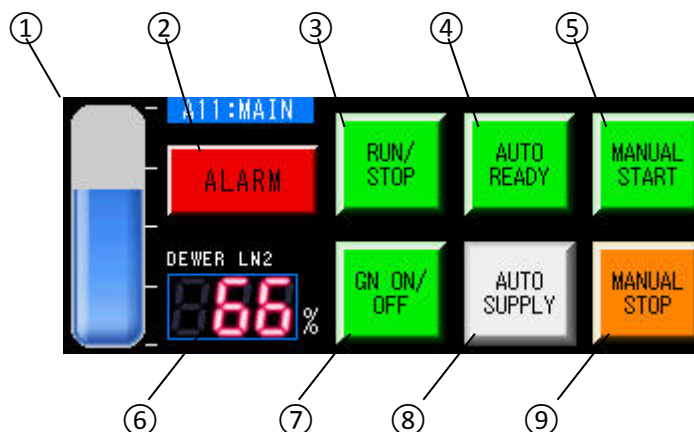


Figure 9-1 MAIN screen

Table 9-1 MAIN screen descriptions

Icon	Description	Reference
① DEWER	Touch the dewar icon on the left of the screen to show the LN ₂ level. Touch this button to switch to the system monitor to show the state of the system.	9.2 DEWER TANK
② ALARM	This icon flashes when the system is in alarm state. Touch this button to turn to ALARM MENU and confirm the cause of alarm.	9.3 ALARM
③ RUN/STOP	Use this button to start or stop the UMP-40W. Normally, this button is in ON state.	—
④ AUTO READY	Use this button when you transfer LN ₂ (press and hold the button).	—
⑤ MANUAL START	Use this button when you dispense LN ₂ manually. (Manual dispense)	—
⑥ DEWER LN2	Displays the volume of LN ₂ produced and stored in the dewar. Press and hold this button to turn to ALARM MENU.	9.5 MENU

⑦	GN ON/OFF	Touch this button to turn ON or OFF the nitrogen gas generator. (press and hold) The flashlight displays as follows; Blinks every second: No nitrogen gas supply (in preparation) Blink every 0.5 second: nitrogen gas being supplied Illuminates: Purge completed	—
⑧	AUTO SUPPLY	Indicates LN ₂ is being supplied automatically.	—
⑨	MANUAL STOP	Interrupts dispensing LN ₂ .	—

9.2 DEWER TANK

In MAIN screen, touch DEWAR (dewar icon on the left) to switch the screen to the system monitor shown in Figure 9-2.

This screen allows you to check the state of the system. The items of this screen are described in Table 9-2.

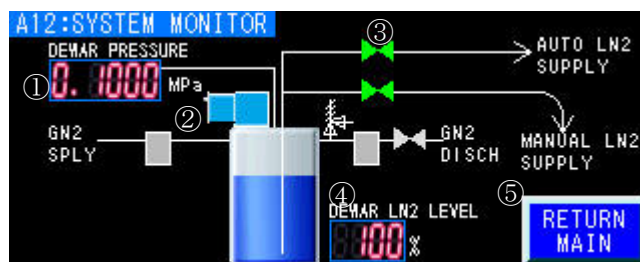


Figure 9-2 SYSTEM MONITOR

Table 9-2 SYSTEM MONITOR descriptions

Icon	Description
① DEWAR PRESSURE	Shows the pressure inside the dewar.
② REFRIGERATOR	Shows the state of the refrigerator. In operation: Blue Suspended: Black and white
③ VALVE	Shows the state of the valve. Open: Green Closed: Black and white
④ DEWAR LN ₂ LEVEL	Shows the volume of LN ₂ in the dewar by percentage
⑤ RETURN MAIN	Return to the MAIN screen

9.3 ALARM MENU

When an error condition is encountered, ALARM button flashes. Touch the ALARM button to confirm where the error is taking place. Figure 9-3 shows the ALARM MENU screen.



Figure 9-3 ALARM MENU

Table 9-3 ALARM MENU descriptions

	Icon	Description	Reference
①	COMP ALARM	Compressor is in alarm state.	9.3.1 COMP ALARM
②	N2 ALARM	Nitrogen supply is in alarm state.	9.3.2 N2 ALARM
③	GN ALARM	Nitrogen gas generator is in alarm state.	9.3.3 GN ALARM
④	MENU	Move to MENU screen.	9.5 MENU
⑤	SUPPLY DESTN ALARM	LN2 transfer destination is in alarm state.	9.4 SUPPLY DESTN ALARM
⑥	MAINTENANCE ALARM	Maintenance interval is reached.	9.4.1 MAINTENANCE ALARM
⑦	ALARM HISTORY	Displays alarm history.	9.4.2 ALARM HISTORY
⑧	MAIN	Move to MAIN screen.	9.1 MAIN screen

9.3.1 COMP ALARM

Touch COMP ALARM button and the screen in Figure 9-4 is displayed.

When COMP ANS TIME OUT is red and blinking, there is a fault in the compressor.

When REF ANS TIME OUT is red and blinking, refrigerator circuit of the compressor is in an error state.

Refer to the corresponding instruction manuals for the way to clear the alarms.

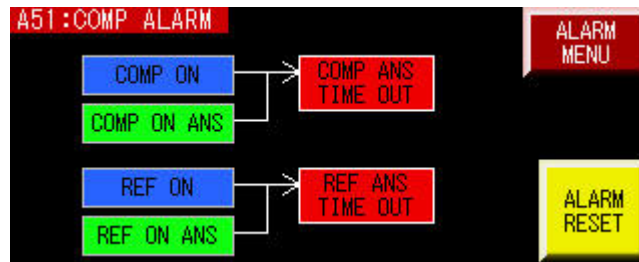


Figure 9-4 COMP ALARM

9.3.2 N2 ALARM

Touch N2 ALARM in ALARM MENU to display the screen in Figure 9-5.

The descriptions on the alarms are shown in Table 9-4.

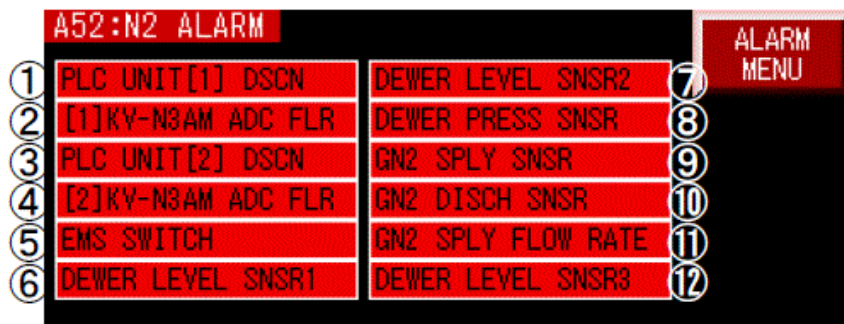


Figure 9-5 N2 ALARM

Table 9-4 N2 ALARM

Icon	Description	Corrective Action
① PLC UNIT [1] DSCN	Inappropriate connection with extended unit 1	Please contact us.
② [1] KV-N3AM ADC FLR	[1] KV-N3AM A/D conversion error	
③ PLC UNIT [2] DSCN	Inappropriate connection with extended unit 2	
④ [2] KV-N3AM ADC FLR	[2] KV-N3AM A/D conversion error	

	Icon	Description	Corrective Action
⑤	EMS SWITCH	Emergency stop button is pressed	Return the Emergency stop button to the original position.
⑥	DEWER LEVEL SNSR1	Broken wire detected in LN ₂ level gauge	Please contact us.
⑦	DEWER LEVEL SNSR2	Broken wire detected in LN ₂ level gauge	
⑧	DEWER PRESS SNSR	Broken wire detected in dewar pressure gauge	
⑨	GN2 SPLY SNSR	Broken wire detected in nitrogen gas supply flow meter	
⑩	GN2 DISCH SNSR	Broken wire detected in nitrogen gas discharge flow meter	
⑪	GN2 SPLY FLOW RATE	Inappropriate supply volume of nitrogen gas	Check that the N ₂ gas generator flow rate is within the range of 26 – 30L/min. Refer to the instruction manual of N ₂ gas generator for the detail.
⑫	DEWER LEVEL SNSR3	Broken wire detected in LN ₂ level gauge	Please contact us.

9.3.3 GN ALARM

Touch GN ALARM in ALARM MENU to turn to the screen in Figure 9-6.

When GN ANS TIME OUT is red and blinking, there is an error in the operation signal of nitrogen gas generator

When N2 SUPPLY TIME OUT is red and blinking, there is an error in the LN₂ supply signal.

Refer to the instruction manual of the nitrogen gas generator for how to clear the alarm state.

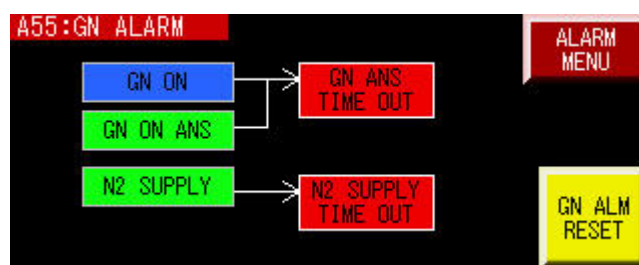


Figure 9-6 GN ALARM

9.4 SUPPLY DESTN ALARM

Touch SUPPLY DESTN ALARM in ALARM MENU, and LN2 SUPPLY DESTINATION screen is displayed as in Figure 9-7.

When SENSOR DISCONNECT is red and blinking, supply destination is not connected properly.

When SENSOR ERROR is red and blinking, an error is detected in the level gauge of the transfer destination.

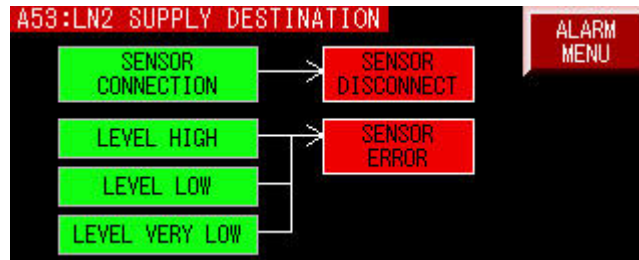


Figure 9-7 LN2 SUPPLY DESTINATION

9.4.1 MAINTENANCE ALARM

Touch MAINTENANCE ALARM in ALARM MENU to turn to the screen in Figure 9-8.

This alarm is activated when the maintenance interval of corresponding component is reached.

These alarms can be cleared by pressing CONFIRM button. However, if the necessary maintenance is not performed, the same alarm will be activated in 120 hours.

Refer to the corresponding instruction manual for the maintenance intervals of the devices.



Figure 9-8 MAINTENANCE ALARM

9.4.2 ALARM HISTORY

Touch ALARM HISTORY in ALARM MENU to display ALARM HISTORY screen in Figure 9-9. This screen provides information on types and timing of alarms that have taken place.



Figure 9-9 ALARM HISTORY

9.5 MENU

Touch MENU in ALARM MENU to display the screen in Figure 9-10.

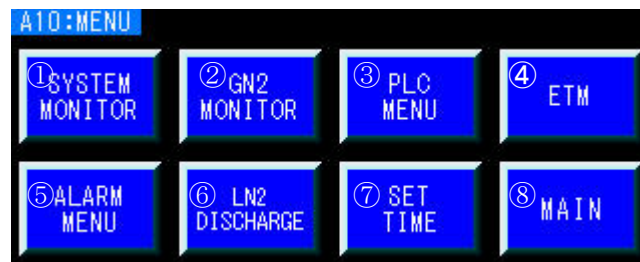


Figure 9-10 MENU

Table 9-5 Descriptions on MENU

Icon	Description	Reference
①	SYSTEM MONITOR Turn to SYSTEM MONITOR screen.	9.2 DEWER TANK
②	GN2 MONITOR Information such as nitrogen gas flow rate, pressure inside the dewar, LN ₂ level, or rate of LN ₂ production is available.	9.3.8 GN2 MONITOR
③	PLC MENU This menu is for our service personnel when a trouble arises.	9.3.11 PLC MENU
④	ETM This screen shows the total operation time for each device.	9.3.9 ETM
⑤	ALARM MENU Displays ALARM MENU screen	9.3 ALARM MENU
⑥	LN2 DISCHARGE This screen is used at the time of maintenance.	9.3.10 LN2 DISCHARGE
⑦	SET TIME Date and time can be set from this screen.	9.3.12 SET TIME
⑧	MAIN Return to MAIN screen.	9.1 MAIN MENU

9.5.1 GN2 MONITOR

Press GN2 MONITOR to switch to the screen shown in Figure 9-11.

This screen provides information on nitrogen gas flow rate or pressure inside the dewar.

The descriptions of the items are in Table 9-6 N2 MONITOR descriptions.

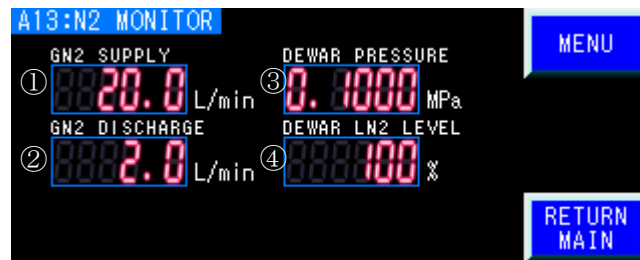


Figure 9-11 N2 MONITOR

Table 9-6 N2 MONITOR descriptions

	Item	Description
①	GN2 SUPPLY	Displays supply flow rate of nitrogen gas
②	GN2 DISCHARGE	Displays discharge flow rate of nitrogen gas
③	DEWAR PRESSURE	Displays pressure inside the dewar
④	DEWAR LN2 LEVEL	Displays the volume of liquid nitrogen inside the dewar

9.5.2 ETM

Touch ETM in MENU to display the screen in Figure 9-12.

The elapsed time of operation is displayed for nitrogen generator, compressor, and refrigerator.

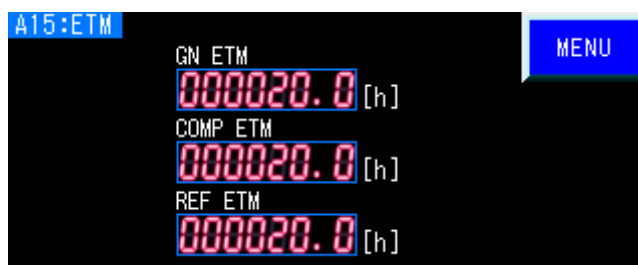


Figure 9-12 ETM

9.5.3 LN2 DISCHARGE

Touch LN2 DISCHARGE in MENU to display the screen in Figure 9-13.

This menu is for the maintenance work.

Press DISCHARGE START to discharge LN₂ in the dewar.

DISCHARGE STOP stops discharging LN₂.

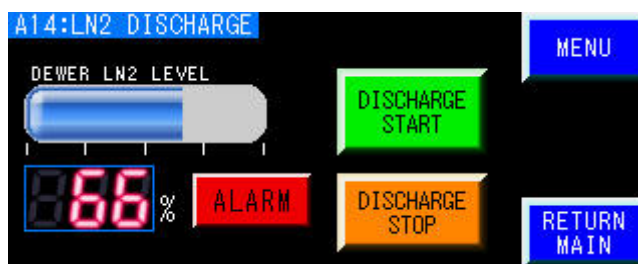


Figure 9-13 LN2 DISCHARGE

9.5.4 PLC MENU

Touch PLC MENU in MENU to display the screen in Figure 9-14.

This menu is for our service personnel to check the status when a trouble arises.



Figure 9-14 PLC MENU

DIO MONITOR, [1] AIO MONITOR, [2] AIO MONITOR are shown in Figure 9-15, Figure 9-16, and Figure 9-17.

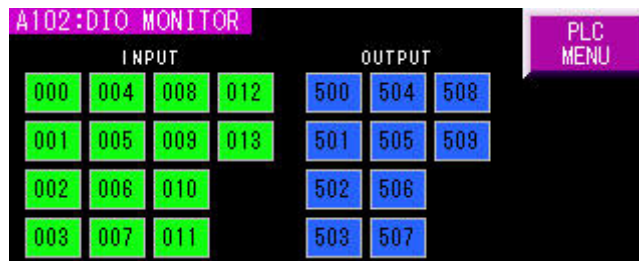


Figure 9-15 DIO MONITOR

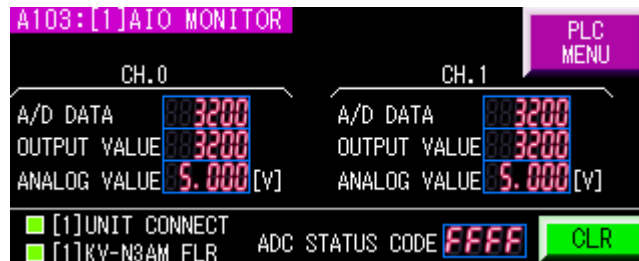


Figure 9-16 [1] AIO MONITOR

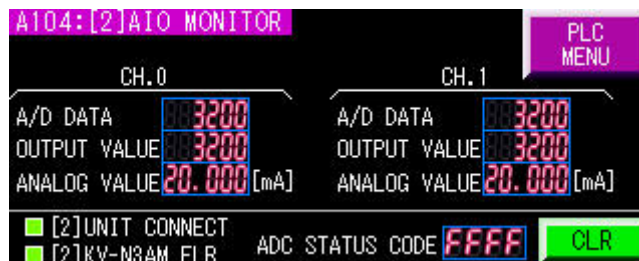


Figure 9-17 [2] AIO MONITOR

9.5.5 SET TIME

Touch SET TIME to display screen in Figure 9-18.

From this screen you can set the date and time. Touch the numeric figures circled white, and the numeric numbers are displayed on the upper left as in Figure 9-19. Correct the date or time as desired and press ENTER, and then SET to complete the change.

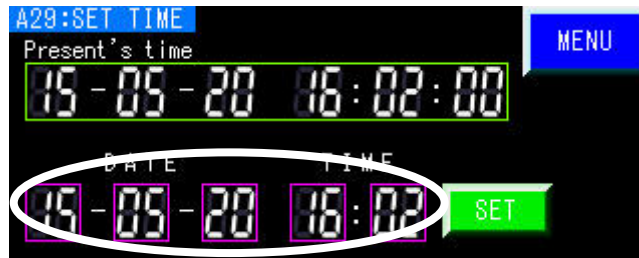


Figure 9-18 SET TIME①

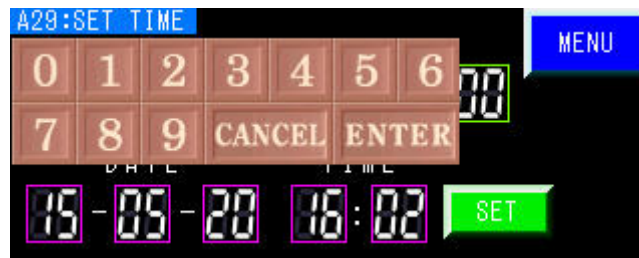


Figure 9-19 SET TIME

10. Operation

10.1 Checks prior to operation

Check the following items before starting the operation.

- (1) The power source of the UMP-40W and GN-30i are connected correctly.
- (2) The air inlet and outlet opening of GN-30i is cleared.
- (3) Cooling water hose is connected correctly between UMP-40W and cooling water supply.
- (4) The nitrogen gas tube is connected correctly between UMP-40W and the nitrogen generators.
- (5) The touchscreen of UMP-40W is turned OFF (lights off).
- (6) The main power source of UMP-40W and GN-30i are ON.
- (7) Nitrogen generator remote cables are properly connected between UMP-40W and the nitrogen generator.

10.2 Operation preparation

10.2.1 Start nitrogen gas supply with GN-30i

- (1) Press RUN/STOP and GN ON/OFF of UMP-40W touchscreen (not of GN-30i) to start up GN-30i. When it starts operation normally, the GN ON/OFF on UMP-40W touchscreen flashes of 1 second each.

Note: Once operation starts, RUN/STOP switch does not work for the following 6 minutes. If you wish to stop, press the emergency stop button of the UMP-40W.

- (2) Nitrogen gas is started to be supplied 6 minutes later than the start-up of the GN-30i.

Check that the GN2 monitor indicates the N₂ gas flow rate of 26-30 L/min. When shifted, please refer to the operation manual of GN-30i and adjust the flow rate by control valve.

When it starts operation normally, the GN ON/OFF on UMP-40W operation display flashes of 0.5 second each



CAUTION

Use nitrogen gas with recommended flow rate and pressure. Otherwise, liquid nitrogen generation may be hindered.

10.2.2 Start-up

- (1) When nitrogen gas is supplied to UMP-40W, C30PMVRT starts up and starts to liquefy nitrogen. If liquefaction does not start and the ALARM lights up, refer to alarm menu of touchscreen in the Chapter 9.

- (2) Purity of nitrogen in the dewar must be improved at the time of initial start-up.

Since inside of liquid nitrogen dewar is at room temperature at the initial start-up, it is necessary to take the time to cool inside of the dewar. (It normally requires about half a day.)

When the temperature of the dewar goes down, liquid nitrogen begins to be accumulated. The liquefaction continues until liquid nitrogen in the dewar reaches 100 liters (100%). After that, liquefaction starts when the amount of remaining liquid nitrogen is below 75L (75%), and stops when it reaches to 100L (100%). This cycle goes on repeatedly.

10.3 Shutdown

When the UMP-40W is turned OFF with the RUN/STOP, RUN/STOP lights off and all the operations stop including LN₂ production, supplying nitrogen gas, or dispensing LN₂.

Due to the residual heat of C30PMVRT, stop cooling water supply at least ten minutes after turning OFF the RUN/STOP of UMP-40W

10.4 When suspending for long time (for 1 to 2 weeks) and resuming UMP-40W








CAUTION

When the system is suspended operation for a long time, liquid nitrogen in the dewar will be replaced by the air. If the device is resumed in such a condition, the liquefaction efficiency deteriorates due to the moisture in the air. Follow the procedure below when resuming.

- (1) Disconnect the remote cable from GN-30i before pressing the RUN/STOP switch of UMP-40W and open the front panel of GN-30i.
- (2) Turn the GN-30i to local operation. (Refer to the operation manual for GN-30i.)
- (3) Press the button on the front of GN-30i to startup and keep supplying nitrogen gas to UMP-40W for at least one hour.
- (4) Stop GN-30i, switch the GN-30i to remote operation, and connect the remote cables for nitrogen generators.
- (5) Press RUN/STOP button of UMP-40W to reboot the entire system.

NOTE: Inform us in advance when the system is to be suspended for longer than two weeks.

11. Dispense Liquid Nitrogen Manually

					WARNING
<ul style="list-style-type: none"> • When dispensing liquid nitrogen, make sure to keep the room well ventilated in order to prevent oxygen shortage. • Never attempt to seal liquid nitrogen. • When dispensing liquid nitrogen, be sure to put on protective fittings such as leather gloves. Also, use caution with handling liquid nitrogen supply flexible hose as it is in extremely low temperature right after dispensing. 					

11.1 Connecting liquid nitrogen supply flexible hose

Connect the joint (coupler joint) of attached flexible hose to LN₂ manual dispense port located at the front of UMP-40W. When connecting to the coupler joint, do so while pushing the outer ring part of the UMP-40W side.

11.2 Dispense liquid nitrogen

To manually dispense liquid nitrogen, insert the head end of flexible hose in liquid nitrogen container, and keep pressing the MANUAL START button for 3 seconds. With the above steps, the MANUAL START button lights green, and liquid nitrogen flows out of head end of flexible hose.

The dispense operation stops automatically 10 minutes later from the start-up of supply. The MANUAL START flickers 30 seconds in advance of the automatic termination. When more liquid nitrogen is needed, press MANUAL START button again to extend the operation for another 10 minutes. Press MANUAL STOP button to stop dispensing.



CAUTION

The pressure relief valve might be activated when the system is resumed after completing LN₂ manual dispense. This does not give any damage to the system.



CAUTION

Never leave the place while manually dispensing liquid nitrogen. Keep the place well ventilated for prevention of lack of oxygen.

- ◇ Liquefying operation stops during the manual dispense operation.
- ◇ When nitrogen-gas supply stops, liquid nitrogen cannot be supplied.

11.3 Disconnection of flexible hose



CAUTION

When disconnecting flexible hoses, make sure that they return to room temperature. Note that disconnecting hoses right after dispensing liquid nitrogen may result in damaging the O-ring inside the coupler joint.

Disconnect flexible hoses in the opposite way of connecting. Push down the outer ring of the UMP-40W side joint and pull out the flexible hose to disconnect.

12. Maintenance and Inspection

12.1 Daily inspection

Check for the following items for daily inspection.

- (1) The operation sound generated from each unit is normal.
- (2) The pressure and flow rate of nitrogen gas are 0.2 MPa and 26 ~30NL/min. respectively.
- (3) The He gas pressure of C30PMVRT is within the proper range.

When suspended: 1.26 – 1.34 MPa

When in operation: 1.70 – 2.20 MPa

- (4) The alarm light of UMP-40W is not lit.

12.2 Periodical maintenance/inspection

(1) C30PMVRT

Parts	Per 12,000hr	Per 24,000hr
Coldhead *1	✓	-
Oil adsorber	-	✓

(2) GN-30i



Parts	Per 8,000hr or 2 years (Shorter)	Per 20,000hr
GN-30i Air Compressor	✓	-
GN-30i Filter *2	✓	-
GN-30i Solenoid valve	-	✓



- ◇ 1. Check the total operation time of UMP-40W with the hour meter on operation display.
- ◇ 2. The total operation time of GN-30i is shown in the sequencer display in the electric circuit of UMP-40W. The operation light of GN-30i blinks when the maintenance time approaches.

*1... Maintenance parts are normally to be replaced “Once every 12,000 hours of operation”, however, even if 12,000 hours is not reached, replace them with new ones once every 5 years as the internal parts may become deteriorated.

*2... In addition to the table above, clean the filter of the air opening of GN-30i once a month.

NOTE: For coldhead and oil absorber, it is requested to return a complete set of parts (after replacement) to us. Please return the set of parts after the replacements.


	 WARNING
<p>Be sure to turn off the main power source before performing the maintenance work.</p>	

	 WARNING
<p>Since helium is filled in this equipment as well as in the maintenance parts (cold head, oil adsorber), do not disassemble these parts. When you have to disassemble or dispose such parts, discharge helium using the optional charging adapter kit.</p>	

13. Troubleshooting

When any failure or unusual phenomenon occurs in the equipment, execute at first the fault diagnosis shown in the following table. When making contact with or making an inquiry to us, please check the PLC menu of the touchscreen or lighting status of PLC lamp arranged to the electrical circuit in advance.

When the alarm lamp blinks, please refer to Section8 of the touchscreen instruction manual.

	<h2 style="margin: 0;">WARNING</h2>
<p>Ensure that main power is disconnected before inspecting the power source or inside of the equipment. Some parts of the equipment may remain in high temperature right after stopping operation. Use caution to avoid burn injury.</p>	

Problem	Possible Cause	Corrective Action
(1) The operation display lamp fails to come on.	Power is not supplied	Please supply the power
	The power cord is not connected.	Connect the power cord correctly.
	The circuit breaker of UMP-40W is turned OFF.	Turn ON the circuit breaker.
(2) Power breaker is tripped.	Short-circuit or electric leakages occur.	Please contact us.
(3) Liquid Nitrogen cannot be dispensed.	No liquid nitrogen such as at the time of initial start-up. (LN ₂ amount is displayed as 0 %)	Please wait until liquid nitrogen is accumulated.
	Level sensor malfunctions due to ice or frost in the dewar.	Please contact us..
	Electromagnetic valve breaks down (Electromagnetic valve does not sound operating.)	Please contact us.
	The equipment is in initial start-up.	Wait for about 12 hours until the dewar temperature is lowered enough to store liquid nitrogen.
(4) Liquid Nitrogen does not increase.	The helium gas piping and refrigerator cables are not connected correctly.	Connect the helium gas lines and refrigerator cables correctly.
	The level sensor fails to detect correctly.	Please contact us.

Problem	Possible Cause	Corrective Action
	Cold head and oil adsorber exceed the recommended maintenance interval.	Conduct the maintenance according to the operation time.
(5) The rate of Liquid Nitrogen production is lowered.	Helium charge pressure of C30PMVRT is lowered.	Add helium to the specified pressure. Please contact us when this trouble occurs frequently.
	Amount of evaporation from dewar increased.	Please contact us.
	EMP absorbs special gas such as helium.	Please contact us.
	Ice or frost adheres to inside the dewar or around the cold head.	Please contact us.
	The purity of Nitrogen gas is not sufficient.	Check the purity of nitrogen gas supplied.
(6) Other failures		Please contact us.

14. Accessories

The accessories below are delivered along with the equipment.

UMP-40W

Flexible Hose for Dispensing LN ₂	1 (0.8m)
Cooling Water Hose	2 (5m)
Cooling Water Joint	2 (Screw size Rc3/8)
Nitrogen Gas Tube	1 (5m)
Single Head Wrench	1 set
Instruction Manual	1 (This book)

C30PMVRT

Instruction Manual	1
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GN-30i

Remote Cable for Nitrogen Generator	1
Instruction Manual	1

- The above accessories may vary depending on the customer's specifications.

15. Warranty

1. Gratis warranty period and warranty coverage

Gratis warranty period

Gratis warranty period is one year starting from the date of delivery.

Coverage

(1) Failure diagnosis

As a general rule, diagnosis of failure should be done on site by customer.

However, ULVAC CRYOGENICS or our service network can perform this service for an agreed fee upon the customer's request. There will be no charge if the cause of the breakdown is found to be a fault of ULVAC CRYOGENICS.

(2) Damage during transportation

When damage by delivery/transportation is admitted, the product will be repaired free of charge within the range of the guarantee expressed in the sales contract.

(3) Breakdown repairs

There will be a charge for breakdown repairs, replacements and on-site visits for the following seven conditions. In those cases the cost shall be your own expense even though the product is within the warranty period.

- 1) Breakdowns due to improper storage or handling, careless accident, software or hardware design by the customer.
- 2) Breakdowns due to modifications of the product without consent of the manufacturer.
- 3) Breakdowns due to maintenance of the product without authentic parts or breakdowns resulting from using the product outside the specified specifications of the product.
- 4) Breakdowns due to contamination or corrosion caused by user's use conditions.
- 5) Breakdowns due to natural disasters (such as fire, earthquake, flood, lightning, salt damage, and so on), environmental pollution, irregular voltage, and /or usage of undesignated power source.
- 6) Breakdowns that are outside the terms of warranty.
- 7) Consumables and/or replacement service.

Since the above services are limited to within Japan, diagnosis of failures, etc are not performed abroad. If you desire the after service abroad, please contact ULVAC CRYOGENICS and consult us for details in advance.

2. Exclusion of opportunity loss from warranty liability

Regardless of the gratis warranty term, compensation to opportunity losses incurred to your company or your customers by failures of ULVAC CRYOGENICS products and compensation for damages to products other than ULVAC CRYOGENICS products and other services are not covered under warranty.

3. Repair period after production is discontinued

ULVAC CRYOGENICS shall accept product repairs for seven years after production of the product is discontinued.

Manufacturer: ULVAC CRYOGENICS INCORPORATED

For our contact information, refer to “SERVICE NETWORK” on the back of this book.

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SERVICE NETWORK

- For technical support, servicing or additional contact information, visit us at www.ulvac-cryo.com.

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Revision History

Date	Revision No.	Contents
2016 / 08 / 08	2016.08	First edition
2016 / 09 / 13	2016SR01	“Disposal Considerations” has been added.
2017 / 09 / 27	2017SR02	6.3.2 N2 ALARM Figure 6-5 and Table 6-4 have been modified.
2019 / 09 / 24	2019SR03	Full-fledged revision
2022 / 01 / 18	2022JA04	12. Maintenance and Inspection has been modified.

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