

**EYELA**

Environmental Chamber

KCL-2000W

**Instruction Manual****Important**

This manual is designed to use this unit safely with the best performance.

**Be sure to read “Safety precautions carefully before use.**




Please keep this manual in a place easily accessible to every user.

# Safety precautions

## 1. Signal word for warning

Any flammable material such as organic solvent cannot be contained in this unit. Also, due to its functions and characteristics, some parts of this unit subject to high temperature. If you touch them carelessly, you may get burned unexpectedly. This manual shows precautions for your safety to prevent careless injuries.

They are classified and defined according to their risk, and indicated with an alert mark and a signal word. Please follow these instructions.

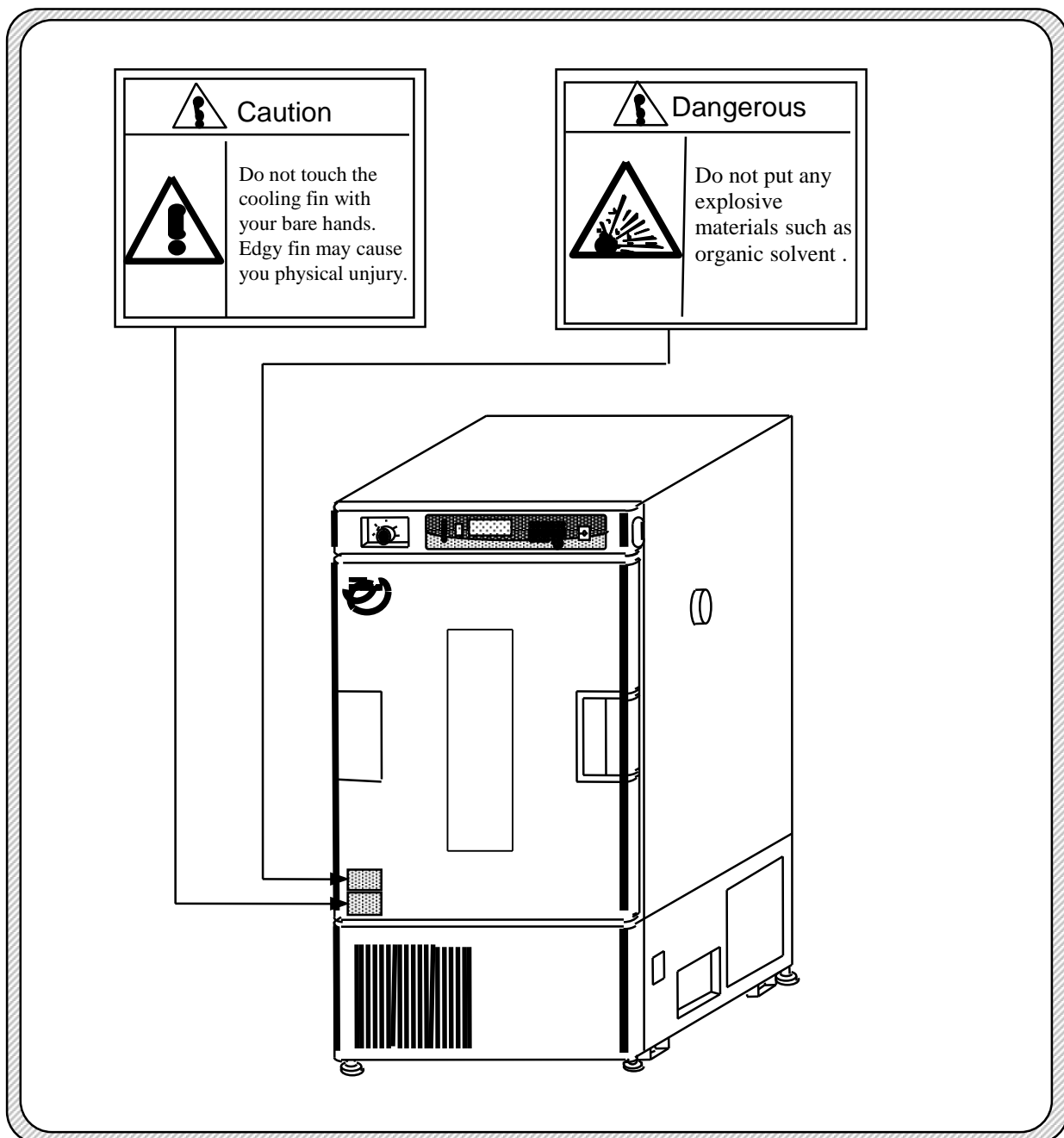
Alert Mark Signal word	Definition
 Dangerous	Mishandling the product will cause users serious personal injury or loss of life.
 Warning	Mishandling the product may cause users serious personal injury or loss of life.
 Caution	Mishandling the product may injure users or cause property damage.

Though we are trying to look into conceivable risk of using the product, it is very difficult for us to expect all. It means that all the instructions in this manual do not cover all the potential risks that may be caused by the product. However, if you follow the instructions, you surely can handle and operate the products safely. Please use extreme care when handling this product and try to prevent all the potential accidents and mechanical failures.

## 2. Warning display on the product

For highly priority danger, warning label is attached on the machine body. The position of the label is as below. Please read the instructions carefully whenever using the machine.

\* If you have any trouble reading the label because of damage and etc., please replace with new one.  
Please contact us if you require new label.



## Introduction

This instruction manual describes the procedure of installation, operation, troubleshooting, maintenance / check-up, and disposal for Environmental chamber KCL-2000W.  
Please read this manual carefully before use.

Besides this instruction manual, we have enclosed the leaflet on panel key operation, which explains the procedure for making operation program with panel key.  
Please refer to it if needed.

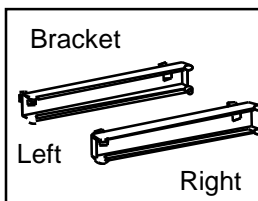
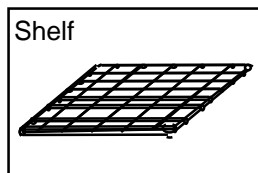
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## Items contained in your packing

Check the type and quantity of each part.

Model		KCL-2000W	Model		KCL-2000W
Contents			Contents		
1	Main unit	1	12	Silicon stopper	1
2	Shelf	2	13	Alarm output connector	1
3	Bracket Right	2	14	Dropper	1
	Left	2	15	Washing brush	1
4	External water tank	1	16	Instruction manual	1
5	Rack for external water tank	1	17	Key operation manual	1
6	Plate for fixing rack for external water tank	1	18	CD-ROM Communication software	1
7	Screw	2	19	RS-232C communication cable	1
8	Water-supply hose set	1			
9	Water-supply hose	1			
10	Wet-bulb wick	5			
11	Drain hose	1			



• Shelves and brackets are fixed to the chamber with adhesive tape

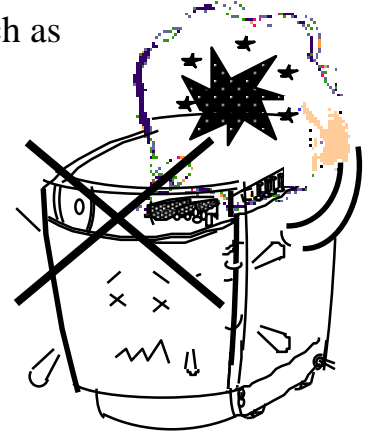
# 1 For safety use

This unit is not designed with explosion-proof structure.  
Use extreme care when handling it.



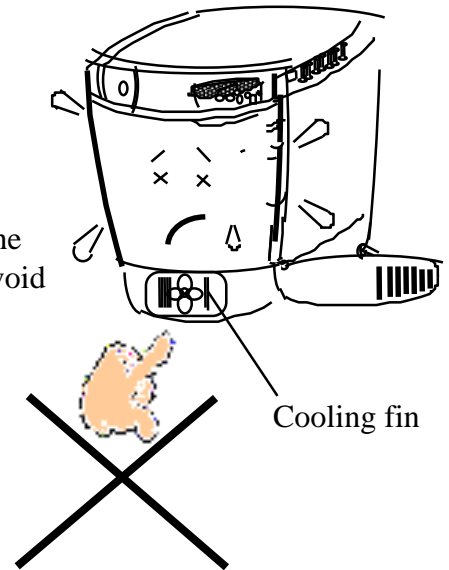
Do not put any inflammable materials such as organic solvent into the chamber.

While operating the unit in high temperature, sample in the chamber may vaporize, catch fire and explode. Inflammable materials are nitrates, nitro compounds, etc. and explosive materials are chloride peroxides, inorganic peroxides, salt nitrates, organic solvents etc. This unit is not designed with explosion-proof structure.



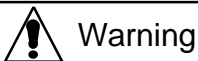
Do not touch the cooling fin with your bare hands.

The cooling fin is very sharp.  
Do not touch it with your bare hand on the occasion of maintenance of the unit to avoid injury of your hand.



## 2 Outline of the product

### 2-1 Use application



**Do not remodel the product.**  
**Do not use it out of specified applications.**

Remodeling or using the product out of specified applications may cause electric shock or malfunction.

This unit is an environmental chamber used for various tests such as humidity test and insulation performance test of electric parts, corrosion test of metal parts or drugs and medicines field etc under controlled temperature and humidity.

## 2-2 Specifications

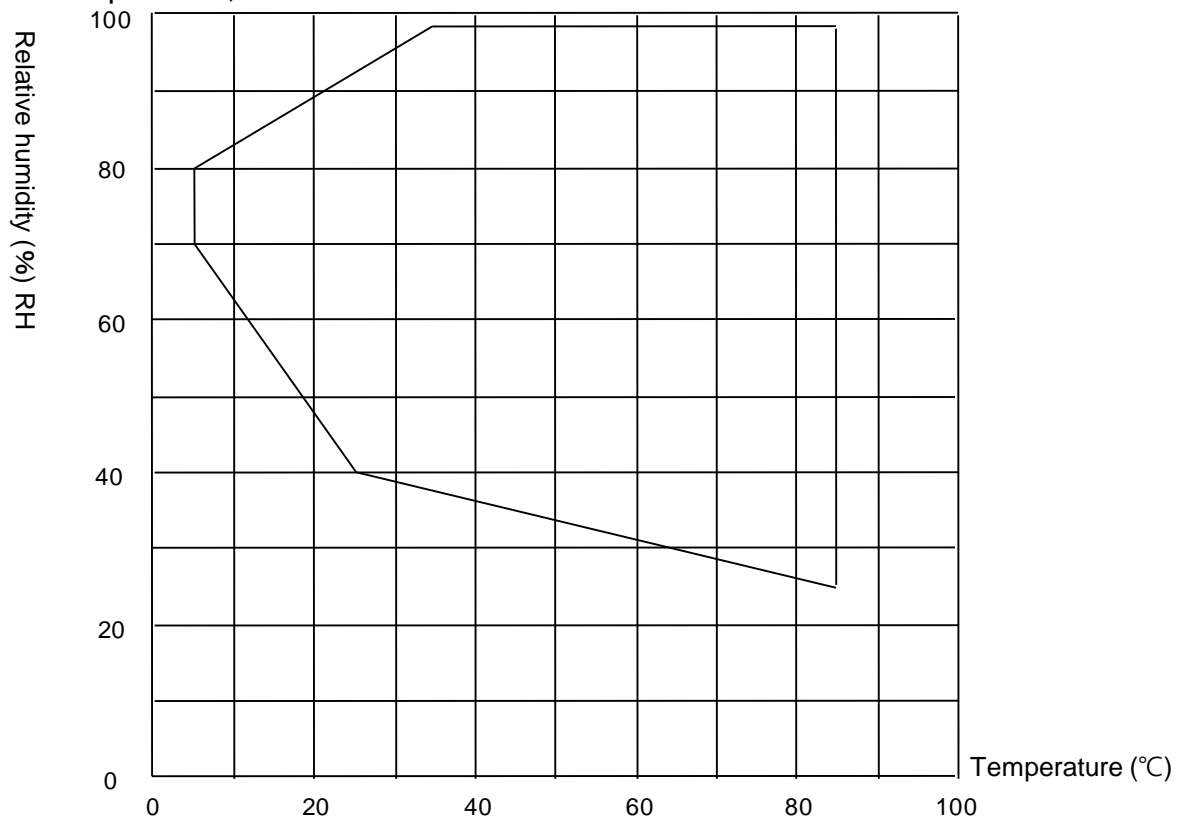
Product	Environmental chamber
Model	KCL-2000W
Air flow system	Forced air flow
Temp./Humidity control range *1	-15~+85°C/25~98%RH Minimum unit 0.1°C/0.1%RH
Temp./Humidity control accuracy *1	Within $\pm 0.5^\circ\text{C}/\pm 3\%\text{RH}$ *2
Temp./Humidity uniformity *1	Within 4°C/12%RH *2
Temp./Humidity control	P.I.D. control by a microprocessor
Temp./Humidity setting	Digital setting through the membrane switch
Temp./Humidity indication	Digital readout Minimum unit 0.1°C/0.1%RH <ul style="list-style-type: none"> <li>• Set/Measured temperature, Set/Measured relative humidity, Total time (1 min.~999 days 23 hrs. and 59 min.)</li> <li>• Graphic display (Switch-over)</li> </ul>
Defrosting system *2	<ul style="list-style-type: none"> <li>• Normal mode : Automatic control by microprocessor (Interval defrosting mode)</li> <li>• Manual mode (Manual start, Automatic stop/Manual stop)</li> </ul>
Program	<ol style="list-style-type: none"> <li>1.Auto-start program (1 min.~99 days 23hr. 59min.)</li> <li>2.Auto-stop program (1 min.~99 days 23hr. 59min.)</li> <li>3.User's program (7 patterns) <ul style="list-style-type: none"> <li>• 1 pattern : contains Max. 10 segments, 1 min.~99 days 23hr. 59min./1 segment</li> <li>• Repetition time of program : 1~999 times or endless</li> <li>• Program type : Target precedence control of temperature and humidity, Step control, Gradient control</li> </ul> </li> </ol>
Other functions	<ul style="list-style-type: none"> <li>• RS-232C interface</li> <li>• Recorder output terminal for temperature and humidity</li> <li>• Alarm output terminal (Contact voltage type)</li> <li>• Calibration of temperature indication • Maintenance mode</li> <li>• External water supply • Forced draining • Input terminal for drain tank alarm</li> </ul>
Safety features	Residual current device and excess current breaker, Door switch Stand-alone over heat protector (Variable type +30~+93°C) Stand-alone over heat protector for boil-dry protection Self-diagnosis system of temperature controller (Dry-bulb temperature sensor failure, Wet-bulb temperature sensor failure, Heater fault, Refrigeration unit fault (High pressure, Overload), Temperature curve failure, Power failure, Overheat, Overcool, Cooling failure, Level sensor fault, Humidity control failure, Humidity upper limit fault, Water supply failure, Low level of water supply tank, Door open, Watch dog, SSR fault, Full drain tank (when using an optional drain tank)) Overload relay holding circuit, Protection timer for ref. unit, High pressure switch for ref. unit.
Temperature controller	P.I.D. control by microprocessor, Noncontact zero cross
Dry-bulb temperature sensor	Platinum temperature measuring resistor Pt100Ω
Wet-bulb temperature sensor	Platinum temperature measuring resistor Pt100Ω
Heater	Stainless steel sheath heater 650W (SUS304)
Heater for humidifying	Stainless steel sheath heater 200W × 2 (SUS316)
Refrigeration unit, Coolant	Air-cooled type 200W Coolant : R-134a
Interior	Antibacterial stainless steel sheet Others: SUS304
Chamber dimensions *3	500W × 400D × 700H (mm)
Chamber capacity	Approx. 140 L
Shelf	Max.15kg/shelf under uniform loading Supplied shelves : 2 pcs. as standard with 2 brackets
Shelf size	468W × 375D (mm)
Pitch of bracket holder / No. of columns	40mm pitch 5 levels/2 columns
Door	With observation window (without inner door) • Quadplex glass • Equipped with heater for reducing dew condensation, no double door
Cable port	2 ports at both sides of unit ID40mm
Supplying water	Distilled water or ion-exchange water through a polyethylene tank or a cartridge water purifier Electric conductivity : 10μs/cm or less
Tank capacity	Inside : Approx. 10L (Removable) Outside : Approx. 20L (connected by one-touch socket)

Model	KCL-2000W
Recorder output	Measured temperature : DC1mV/ °C Measured humidity : DC1mV1%RH
Alarm output	Contact capacity AC250V 5A Normal : OFF Abnormal : ON
Drain port	Nozzle OD 11 × ID7 mm
Range of available temperature	5 ~35°C
Overall dimensions *3	635W × 755D × 1695H mm
Net weight *4	153kg
Power input	7A 1.5kVA
Rated power source	AC220V 50Hz

- \*1 The above performance has been obtained under conditions of 20°C of room temperature, rated power source voltage, and without load.  
The performance is indicated in conformity with JTM KO1-1998 (Testing method and indication form for constant temperature and humidity bath by Japan Testing Machinery Association).
- \*2 If the unit is operated at 30~40°C or lower temperature for a long time (one day~one week or longer), please set "interval defrosting operation" for the operation.  
The chamber temperature will go up by about 3°C, and the chamber humidity increase by about 20%RH, when the defrosting mode works under room temperature 20°C.  
Actual changes of such temperature and humidity differ depend on actual operating conditions.
- \*3 The chamber dimensions and overall dimensions without external tank do not include any projections.
- \*4 The net weight includes external tank part and rack frame.  
If the rack is not used, the net weight is about 127kg.
- \* The required time to heat and cool, and to humidify, temperature and humidity control accuracy, and temperature and humidity uniformity differ depend on the environmental temperature, power source voltage, with load or without load.

# Humidification control range

(1) 20°C room temperature, unloaded condition



- \*1 The accuracy of temperature control differs depends on the environmental conditions such as load condition.
- \*2 If the unit is operated at 30~40°C or lower temperature for a long time (one day~one week or longer), interval defrosting operation must work. The temperature in the chamber is raised about 3°C, and the humidity in the chamber is raised about 20%RH, when the defrosting mode works under 20°C of room temperature. These variation differs depends on actual operating conditions.

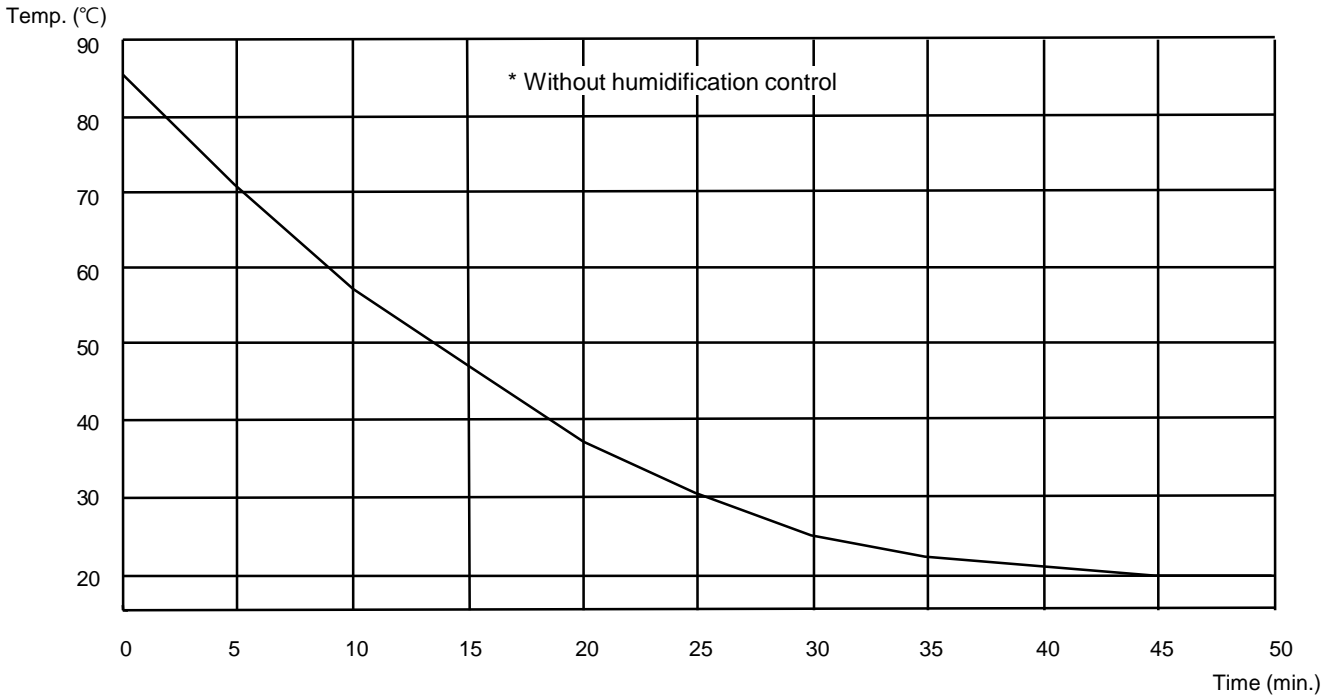


## 2-3 Heating and cooling data

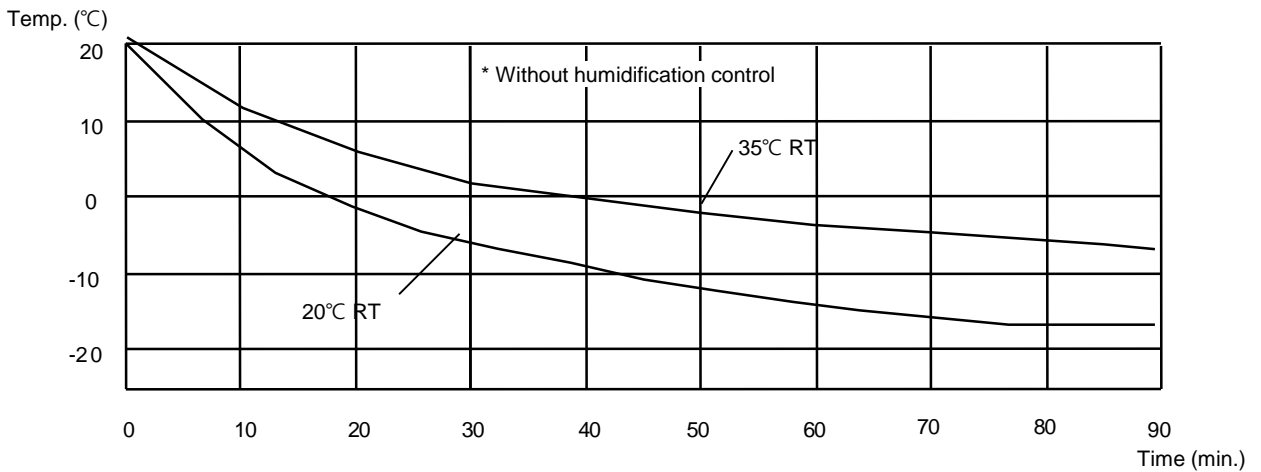
- AC-100V 50Hz
- Unloaded condition

Note; The maximum temperature and required time to heating differs depend on the environmental temperature, power source voltage, with load or without load.

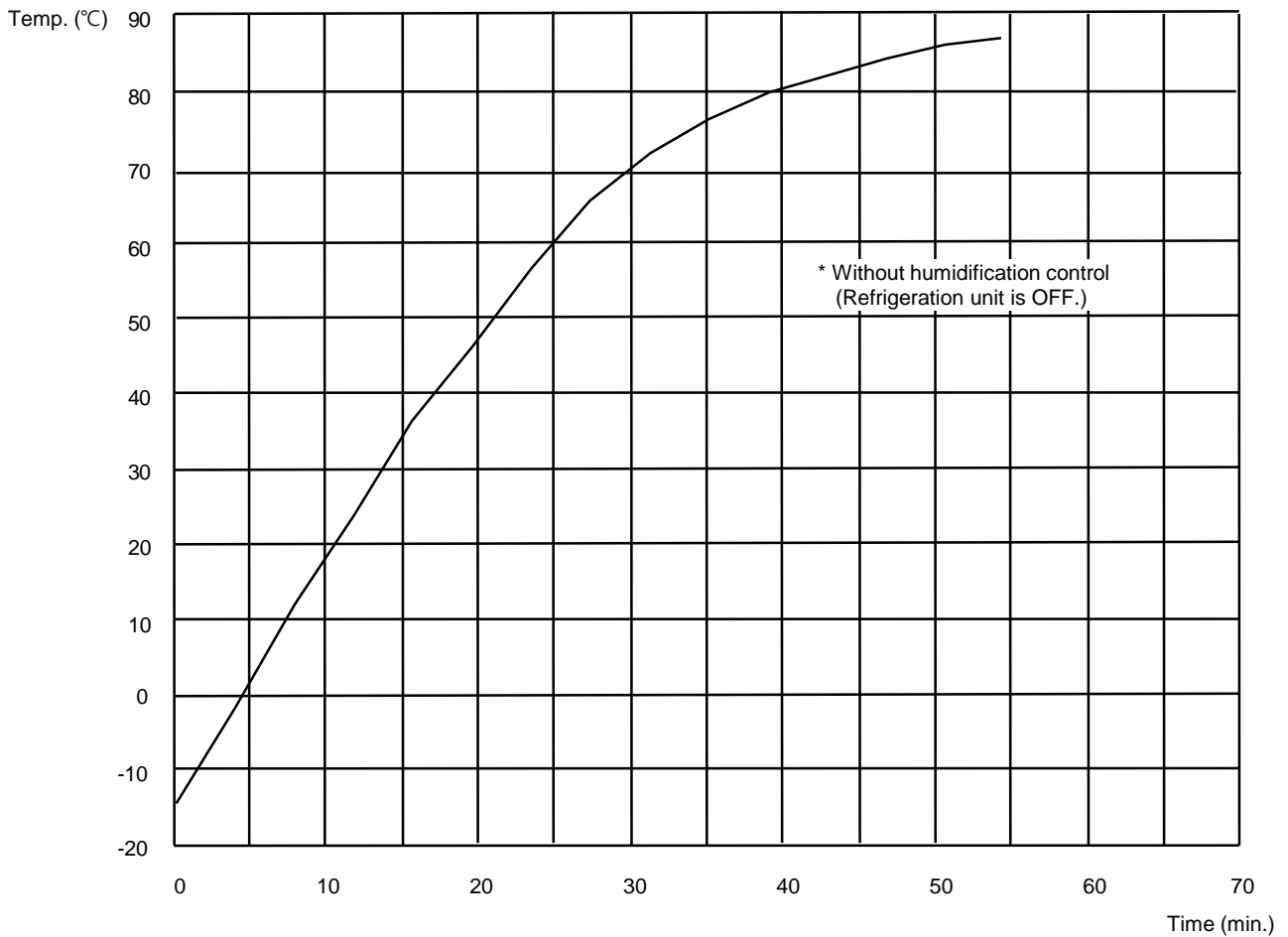
### (1) 20°C room temperature, Cooling curve (85→20°C)



### (2) 20/35°C room temperature, Cooling curve



### (3) 20°C room temperature



## 2-4 Optional accessories

### ● Drain tank

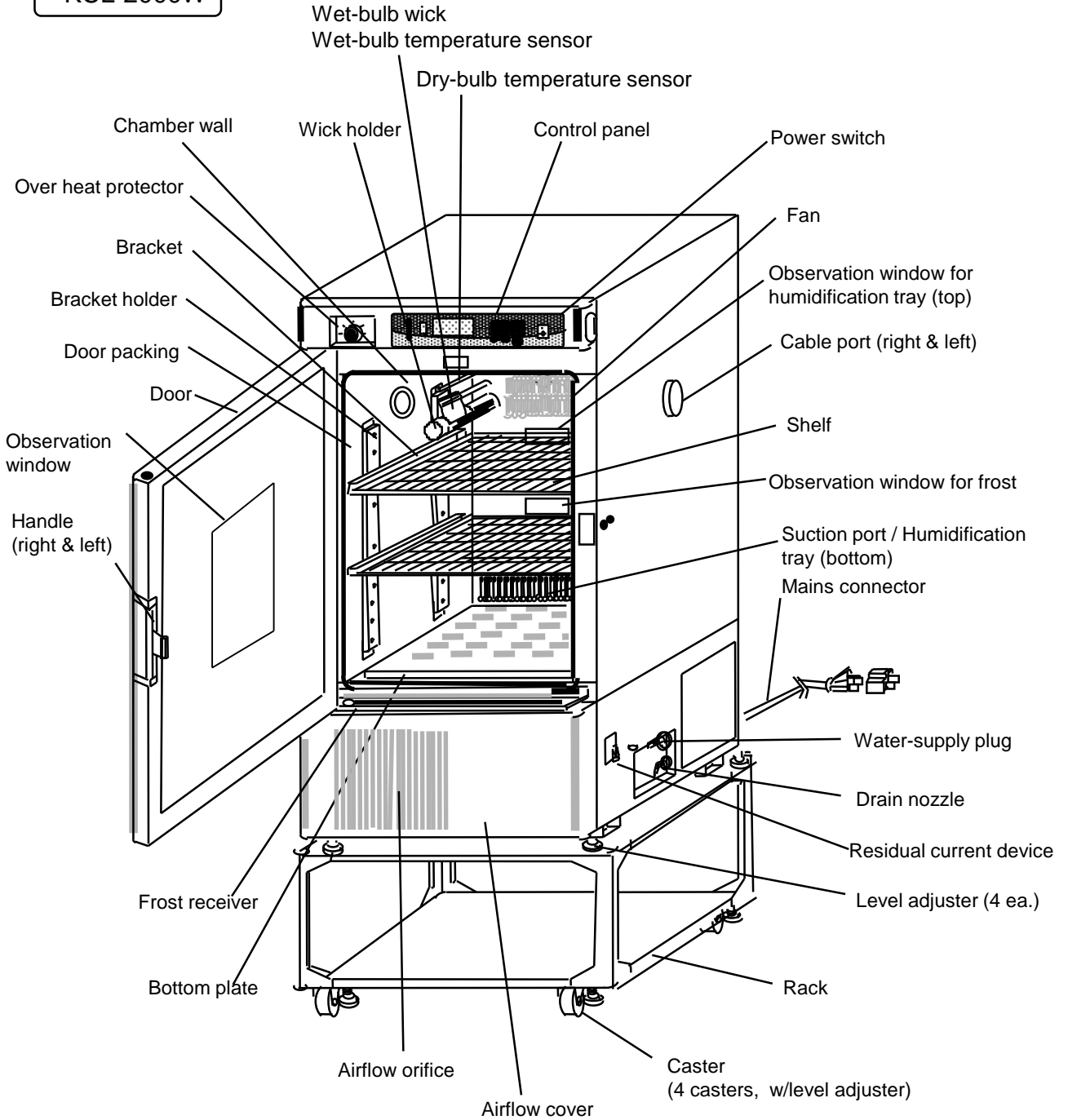
If 10L capacity drain tank is full (option), the unit indicates alarm message and stops temperature and humidity control.

Description	Drain tank
Cat. NO.	204960

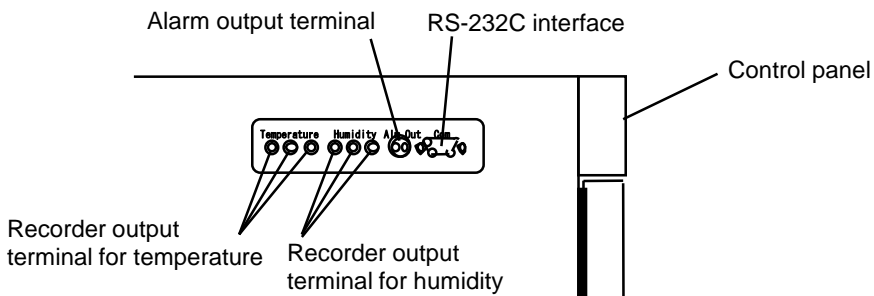
The tank cannot be used when the unit is placed on the floor without using a rack.  
Use the drain tank in a place where is 310mm lower than the unit.

## 2-5 Name of each part

KCL-2000W



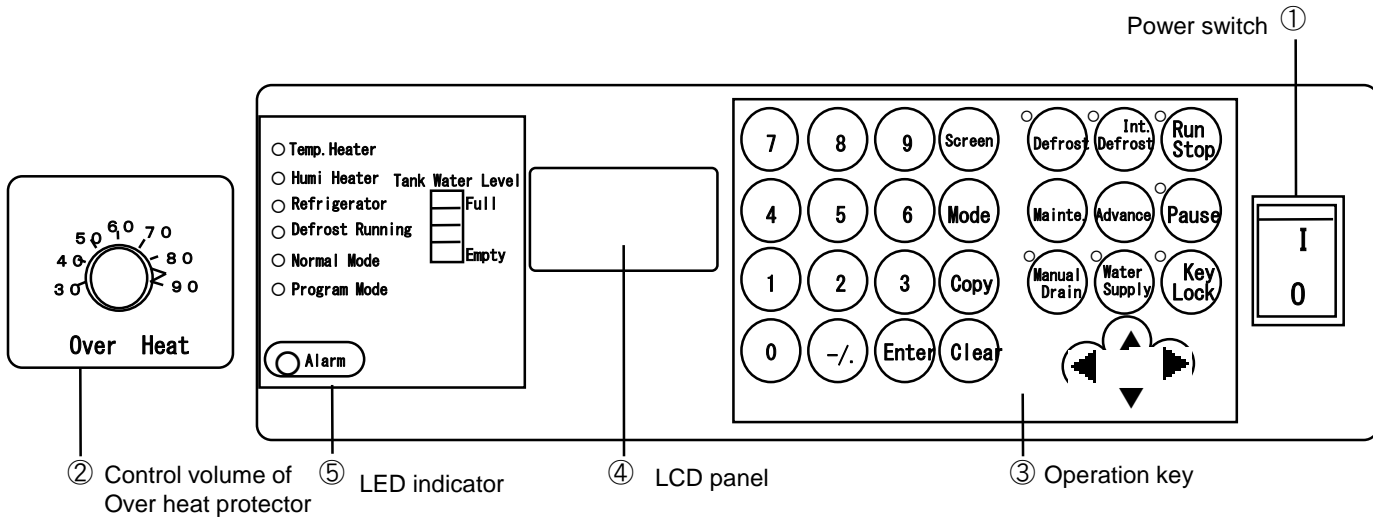
Left side view



# 3

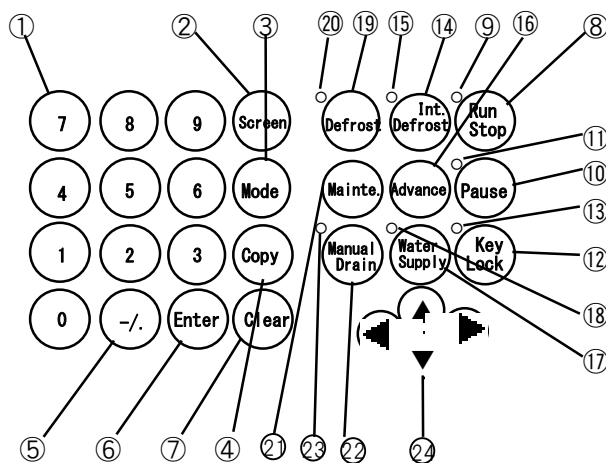
## Descriptions and function of control panel

### 3-1 Control panel




No.	Description	Function
①	Power switch	Turns on and off the unit.
②	Over heat protector	<p>You can set any value for over heat protector within the range from 30 to 90°C through this volume switch.</p> <p>Set the over heat protection value 10°C higher than the set up value when the temperature is between the setup value and 80°C. If the setup temperature is higher than 80°C, turn the control volume clockwise fully (93°C) to be the maxim.</p> <p>* When the chamber temperature reaches to the protection value, the alarm message [TH] is indicated on the LCD panel and the control operation stops.</p>

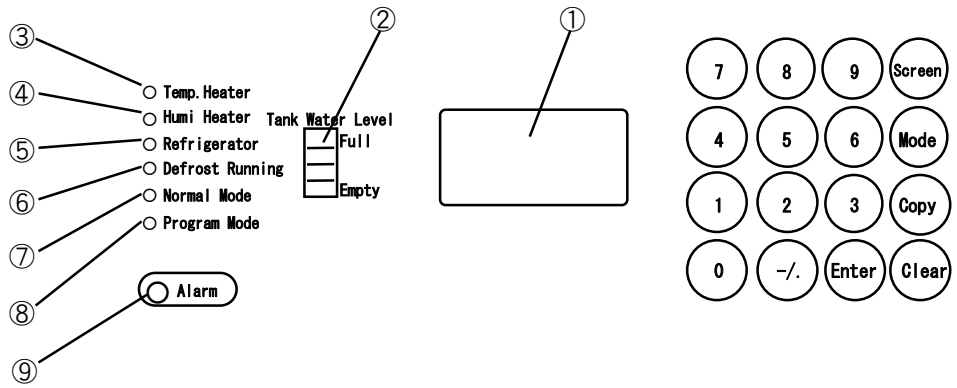
## 3-2 Operation keys and key lamps



No.	Description	Function
①	Numeric keypad [0]~[9] key	Used for entering a value.
②	[Screen] key (Graphic indication key)	The display is changed from [Set/Measured value indication]→[Temperature graphic indication]→[Humidity graphic indication] in order in user's program No.3~11.
③	[Mode] key (Program selection key)	Selects [Normal mode] or [Program mode].
④	[Copy] key (Copy function key)	When setting user's program No. 3~11, previous segment of setup temperature and humidity can be copied. (The time cannot be copied. In the segment 0 this function does not work.
⑤	[-./] key	If you press this key before inputting the value, [- (minus sign)] is entered, and if you press in the middle of the value, [. (decimal point)] is entered.
⑥	[Enter] key	Inputs and enters each setting data and selects input mode.
⑦	[Clear] key (Clear key)	Clears the input data and releases alarms. * Some alarms cannot be released by this key. (Refer to the chapter [Releasing alarm] on P.17.) Also you can clear all the data of the selected programs if you select one program displayed by [Mode] key.
⑧	[Run/Stop] key	Holding down this key for more than 1 second (for preventing wrong operation) can start and stop the control.
⑨	[Run/Stop] key lamp	Lights up while controlling.
⑩	[Pause] key (Pause key)	If you press this key while operating the temperature, humidity and gradient control in constant temperature control of user's program No.3~11., the measured temperature and humidity at that time are maintained. If you press the key once again, [Pause] function is released and re-starts the control from the segment that was interrupted by pause function.
⑪	[Pause] key lamp	Lights up while the pause function is active.
⑫	[Key Lock] key (Operation key lock function)	Holding down this key for more than 3 seconds (for preventing wrong operation) can lock all the keys, which makes all of the key operations unusable. If you press the key once again for more than 3 seconds, the [Key Lock] function is released.
⑬	[Key Lock] key lamp	Lights up while operation keys are locked.

No.	Description	Function
⑭	[Int.Defrost] key (Automatic defrosting )	Turns ON/OFF the defrosting operation. (If you turn on the function, the intermittent automatic defrosting operation is executed when the set temperature is 40°C or lower. While operating, Defrost Running lamp illuminates.
⑮	[Int.Defrost] key lamp	Lights up when the Automatic defrosting mode is selected.
⑯	[Advance] key (Forced advance of segment)	If you press this key while operating any user's program No.3~11, the operation is proceeded to the next segment by compulsion.
⑰	[Water Supply] key (External water supply)	Water is supplied to the inner tank from the outer tank by this key. When the inner tank level reaches to the level 1 (low level), water is supplied automatically from the outer tank, and when the level reaches to 3, water supply stops. * This key function does not work while draining by [Manual Drain] key.
⑱	[Water Supply] key lamp	Lights up when the water supply is active.
⑲	[Defrost] key (Forced defrosting)	Turns ON/OFF the forced defrosting operation. If you press this key while the control operation stops or runs, forced defrosting operation starts to work (Defrost Running lamp illuminates). When the defrosting operation is completed, it stops automatically or re-starts control operation that was interrupted (Defrost Running lamp turns off a light).
⑳	[Defrost] key lamp	Lights up when the forced defrosting operation is active.
㉑	[Meinte.] key (Maintenance mode)	Changes the operation to the maintenance mode. Sets temperature and humidity adjustment function, and measures and displays the time for humidification tray, wet-bulb wick, and condenser filter, which are required maintenance.
㉒	[Manual Drain] key (Forced draining)	Used for forced drainage for humidification tray (top and bottom) and wet-bulb wick tray. While executing forced draining, the humidification control and water supply are stopped.
㉓	[Manual Drain] key lamp	Lights up when the forced draining operation is active.
㉔	Cursor key [▲][▼][◀][▶]	Pressing the key can move the cursor [  ] from right to left or up and down.

### 3-3 LCD panel and LED indicator



No.	Description	Function
①	LCD panel	Displays the setting of temperature, humidity and time, measured data (Numeric indication and graphic indication), and alarm messages.
②	Tank Water Level indicator Empty~Full	The water level of inner tank is indicated on a scale of one to four. When the level is normal, the green lamp illuminates. When the level is low, the red [Empty] lamp illuminates. (See [Humidification procedure] on P.33.)
③	Temp. Heater lamp (Temperature heater lamp)	Lights up when the temperature heater is active.
④	Humi. Heater lamp (Humidification heater lamp)	Lights up when the humidity heater is active.
⑤	Refrigerator lamp (Refrigeration unit lamp)	Lights up when the refrigeration unit is active.
⑥	Defrost Running lamp (Defrosting operation lamp)	Lights up when either forced defrosting or automatic defrosting operation is active.
⑦	Normal Mode lamp	Lights up when the normal mode is active.
⑧	Program Mode lamp	Lights up when the program mode is active.
⑨	Alarm lamp	Lights up when any of alarm is activated.

## 3-4 Overview of operation

Two operation modes, which are normal and program mode, are available. In program mode, there are five patterns of program from No.1 to 11.

For more detail about the setting procedure, please refer to the key operation manual.

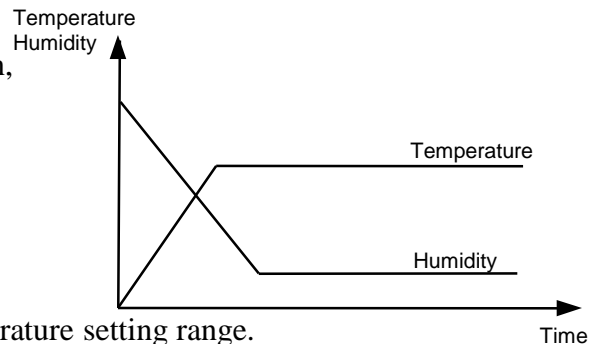
### Normal mode

#### • Set-point control operation

After setting a temperature and starting the operation, the unit controls the temperature at the set point.

- \* Temperature setting range  $-15.0 \sim 85.0^{\circ}\text{C}$   
(Input range  $-20.0 \sim 90.0^{\circ}\text{C}$ )
- Humidity setting range  $25.0 \sim 98.0\% \text{RH}$   
(Input range  $0 \sim 98.0\% \text{RH}$ )

- Program and normal mode share the same temperature setting range.
- Refer to the humidification control range on P.4 to set humidity value.
- Although the humidity input range is  $0 \sim 98.0\% \text{RH}$ , the actual control operation starts from  $2\% \text{RH}$ .

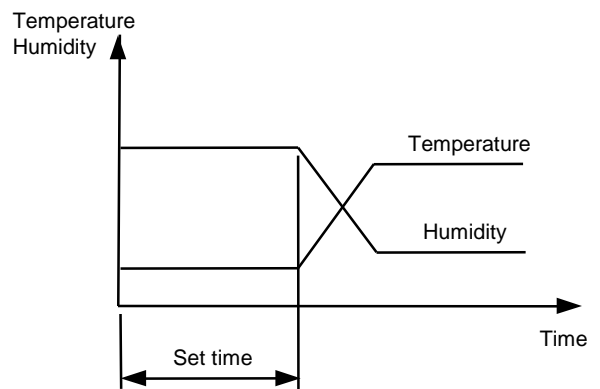


### Program mode

#### 1. Program 1 (Auto start program)

You can set a temperature, humidity and time of onset. After the setting time elapses, operation starts and continues at the set temperature.

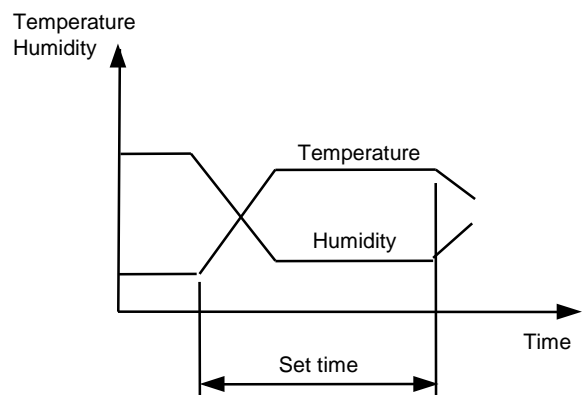
- \* Time setting range : 1 minute  $\sim$  99 days 23 hours 59 minutes.



#### 2. Program 2 (Auto stop program)

You can set a temperature, humidity and stop time. After the setting time elapses, operation stops.

- \* Time setting range : 1 minute  $\sim$  99 days 23 hours 59 minutes.





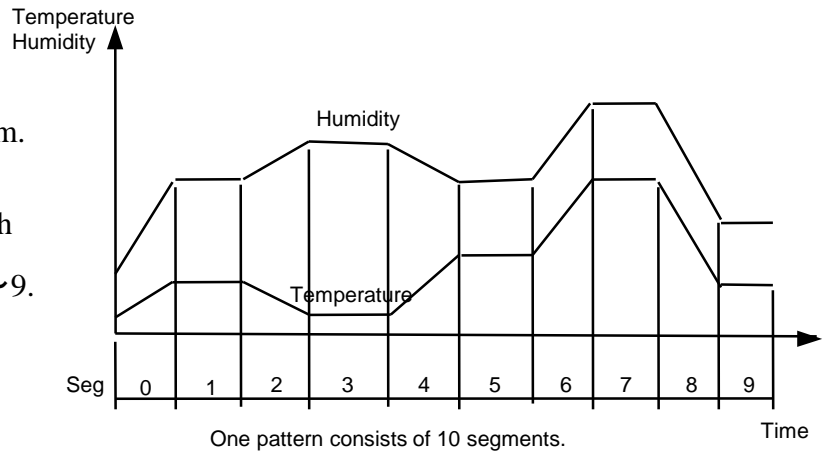
### 3. Program 3~9 (User's program)

You can set a temperature, humidity, time and repetition times to operate the program. One user's program is composed of 10 segments (Seg. 0~9) and you can set a temperature, a humidity and a time to each segment. The repetition time can be set previously to each user's program No. 3~9.

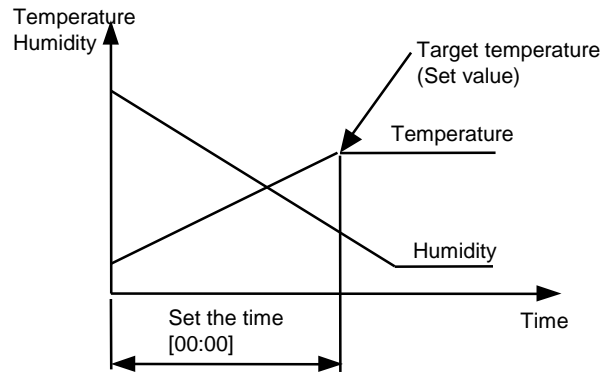
\* Time setting range : 1 minute~99 days 23 hours 59 minutes.

The operation starts under

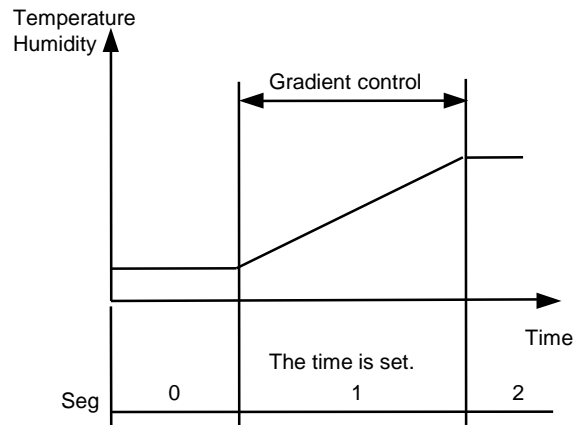
- (1) Target temperature precedent control,
  - (2) Target humidity precedent control, or
  - (3) Time precedent control
- depending on the time setting.



- (1) Target temperature precedent control  
When you set the time [00:00], the operation is continued until the temperature reaches to the target point  $\pm 0.3^{\circ}\text{C}$  being independent of the time.



- (2) Target humidity precedent control  
When you set the time [00:00] and change the target humidity without changing the target temperature, the operation is continued until the temperature reaches to the target point  $\pm 0.3^{\circ}\text{C}$  being independent of the time.



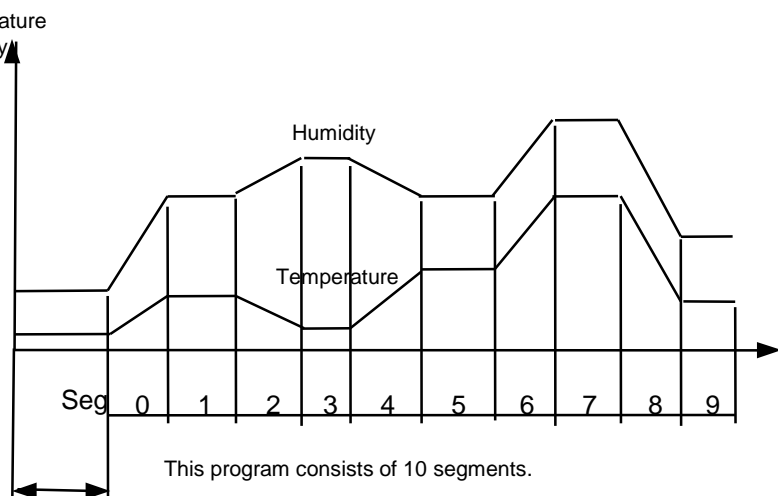
- (3) Time precedent control  
When you set a time within the setting range 1 minute~99 days 23 hours 59 minutes, the gradient control is executed. The gradient rate is resulted from that the difference between the previous set value and the current set value is divided by the set time.

\* The segment 0

### 4. Program 10 (Auto start and user's program)

You can set an user's program (including 10 segments, repetition times) and the time of onset. start delay time. When the time of onset elapses, the setting user's program is started. After the program is repeated as you set, it stops automatically.

\* Time setting range : 1 minute~99 days 23 hours 59 minutes.



## 5. Program 11 (Combination program)

You can combine some user's programs (No. 3~9) and set the repetition times.

Normal control can be combined at the end of the combination program.

\* 6 programs (including normal) can be combined as a maximum.

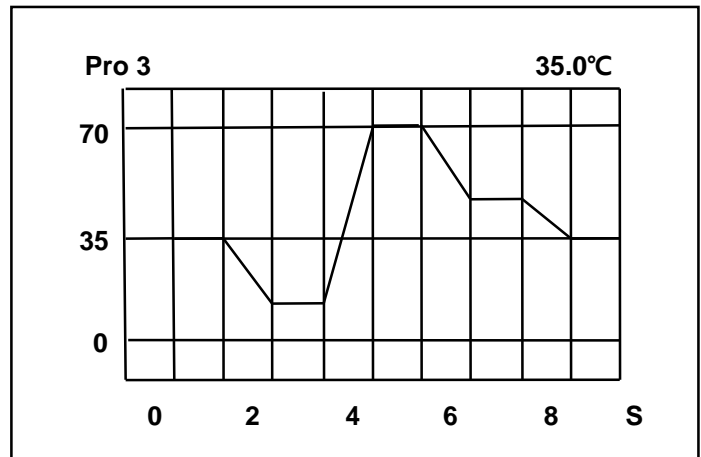
\* The setting of the repetition times for each user's program (No. 3~9) becomes void, and you can set the repetition times for whole of combined programs.

### Graphic indication

The settings and control status of user's program can be checked visually by a graphic indication. Temperature and humidity is switched over.

This function is available for user's programs (No. 3~9), and the screen is switched by [Screen] key.

Temperature graphic screen



### Maintenance mode

Temperature and humidity indication calibration can be set. Also, this mode measures and displays the time for humidification tray, wet-bulb wick, and condenser filter, which are required maintenance work, and measures and displays total operation time of unit.

If you reset the time to zero after completing the maintenance work (cleaning or replacing the part), it is useful to estimate the next maintenance timing.

Press [Mainte.] key to change to the maintenance mode.

Maintenance mode screen

MAINTENANCE MODE	
1.Temp.Cal	0.0 °C
2.Humi.Cal	0.0 %RH
4.Wet-Bulb wick	12345 h
5.C.Filter	12540 h
6.Total Run Time	14567 h

\* Calibration of temperature indication (Temp.Cal) :  $\pm 10^{\circ}\text{C}$

Calibration of humidity indication (Humi.Cal) :  $\pm 10\% \text{RH}$

You can calibrate the indicated value within the above range.

### 3-5 Safety and alarm function

This unit has safety and alarm functions as below.


When you face the trouble, please refer to [Troubleshooting] on P.35 and follow the instructions.

#### Safety function

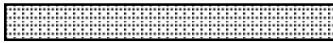
Safety device	Function	Cause
Mains switch	Turns off to shut down the power.	Electric leakage or excess current occurs.
Over heat protector for temperature inside the chamber	When the temperature inside the chamber exceeds the setting temperature for over heat protector, the alarm message [TH] is displayed with flashing and all control operations are stopped.	- The setting temperature for over heat protector is too low. -Due to some trouble of temperature controller, SSR or chamber fan, the temperature inside the chamber exceeds the alarm temperature
Boil-dry protector for humidification tray	When the top and bottom humidification tray are empty, the alarm message [TH1] (for top) and [TH2] (for bottom) are indicated with flashing and all control operations are stopped.	- The humidification tray is not supplied water. - Low water level of the tray. -Due to some trouble of temperature controller or SSR, temperature inside the chamber exceeds the alarm temperature
Overload relay holding circuit for refrigeration unit	When the refrigeration unit works under overload (overheat) or start-up, the alarm message [OLR] is indicated with flashing and all control operations are stopped.	-The refrigeration unit works or starts up under overload (overheat) . -Due to overheat operation exceeding the cooling capacity, temperature inside the chamber rises abnormally. - The environmental temperature exceeds 35°C. - Low voltage
High pressure switch for refrigeration unit	When the refrigeration unit works under high pressure and the pressure value exceeds its upper limit, the alarm message [HP] is indicated with flashing and all control operations are stopped.	- The refrigeration unit works under overload (overheat). -Due to overheat operation exceeding the cooling capacity, the temperature inside the chamber rises abnormally - The environmental temperature exceeds 35°C. - The fan motor for condenser breaks down.

#### Alarm function


Some alarm functions continue to control or stop the control operation depending on its significance of the cause.  
The unit is incorporated the watch-dog system which detects crash of CPU and resets the circuit by self-diagnosis.

Alarm message is indicated with flashing at  part of LDC panel .  
When several alarms occur simultaneously, 4 alarms can be indicated with in order of precedence.

#### Alarm indication in Normal mode

		
	SET	MEAS
Temp	19.5	<b>19.5</b> °C
Humi	80.0	<b>80.0</b> %RH
Total Time	003/09:28	

#### Alarm indication in Program mode

Pro 3 		
Seg 4		
Repeat	2	001/10:18
	SET	MEAS
Temp	23.5	23.5°C
Humi	70.0	70.0%RH
Total Time	003/09:28	

Alarm name	Alarm message	Cause
Overheat protection alarm for chamber	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [TH] flashes.</li> </ul>	The overheat protector for chamber works.
Overheat protection alarm for top humidification tray	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [TH1] flashes.</li> </ul>	The overheat protector for top humidification tray works.
Overheat protection alarm for bottom humidification tray	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [TH2] flashes.</li> </ul>	The overheat protector for bottom humidification tray works.
Overload alarm for refrigeration unit	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [OLR] flashes.</li> </ul>	The overload relay for refrigeration unit works.
High pressure alarm for refrigeration unit	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [HP] flashes.</li> </ul>	The high pressure switch for refrigeration unit works.
SSR alarm for temperature controlling heater	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [SSR] flashes.</li> </ul>	The SSR (noncontact relay) breaks down which turns on and off the temperature controlling heater.
SSR alarm for humidity controlling heater (Top/Bottom)	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [HSSR] flashes.</li> </ul>	The SSR (noncontact relay) breaks down which turns on and off the humidity controlling heater.
Disconnection alarm for temperature controlling heater	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [HTR] flashes.</li> </ul>	The temperature controlling heater is disconnected.
Disconnection alarm for humidity controlling heater (Top/Bottom)	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [HHTR] flashes.</li> </ul>	The humidity controlling heater (Top/Bottom) is disconnected.
Sensor fault alarm for dry-bulb temperature sensor	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [SNS1] flashes.</li> </ul>	The dry-bulb sensor is disconnected or short-circuits.
Sensor fault alarm for wet-bulb temperature sensor	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [SNS2] flashes.</li> </ul>	The wet-bulb sensor is disconnected or short-circuits.
Door alarm	<ul style="list-style-type: none"> <li>- Buzzer sounds for 1 second.</li> <li>- Chamber fan, temperature and humidification heater are stopped.</li> <li>- The alarm message [DOOR] flashes.</li> </ul>	The door is opened while controlling.
Low level alarm for water supply tank	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [TANK] flashes.</li> </ul>	The inner tank level is left being empty for 10 minutes.
Level sensor fault alarm for water supply tank	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [TKSN] flashes.</li> </ul>	The level sensor of inner tank breaks down.
Water supply alarm	<ul style="list-style-type: none"> <li>- Buzzer sounds for 15 seconds.</li> <li>- All operations are stopped.</li> <li>- The alarm message [FLW] flashes.</li> </ul>	Even if water is supplied by a pump, water cannot be pooled in the humidification tray (top/bottom) and wick holder.

Alarm name	Alarm message	Cause
Drain tank full alarm (when you attach an optional drain tank.)	- Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [DTK] flashes.	The drain tank (option) is filled up. (Approx. 10L)
Humidity upper limit alarm	- Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [HU2] flashes.	The measured humidity is left being at 100% or 0% over 5 minutes.
Overheat alarm	- Buzzer sounds for 15 seconds. - All operations are continued. - The alarm message [OVR] flashes.	After the measured temperature reaches to the set point, it exceeds 5°C or higher than the set point.
Overcool alarm	- Buzzer sounds for 15 seconds. - All operations are continued. - The alarm message [OVC] flashes.	After the measured temperature reaches to the set point, it exceeds 5°C or lower than the set point.
Power failure alarm	- Buzzer sounds for 15 seconds. - All operations are continued. - The alarm message [OFF] flashes.	The unit is shut down while operating.
Temperature control alarm	- Buzzer sounds for 15 seconds. - All operations are continued. - The alarm message [HU1] flashes.	The measured humidity deviates form the set value $\pm 20\%$ , and it is left for more than 60 minutes.
Cooling alarm	- Buzzer sounds for 15 seconds. - All operations are continued. - The alarm message [COL] flashes.	Although the refrigeration unit works and the heater stops, the temperature cannot be lowered 1°C under the below conditions. -5°C or higher measured temp. : during 30min. Lower than -5°C measured temp : during 60min.
Temperature gradient alarm	- Buzzer sounds for 15 seconds. - All operations are continued. - The alarm message [PRG] flashes.	The measured humidity deviates form the target value $\pm 5\%$ during the gradient control, and it is left for more than 10 minutes.
Watch-dog	* Indications disappear, and any key operation is not accepted. - All operations are stopped.	It detects crash of CPU due to an excess noise and stops the microprocessor.

### How to release alarm.

#### 1) In case of

Overheat protection alarm for chamber [TH]  
Overload alarm for refrigeration unit [OLR]  
High pressure alarm for refrigeration unit [HP]

Turn off the power switch of the unit once, solve the cause of alarm, and turn on the power switch again.

#### 2) In case of

Door alarm [DOOR]

When the door is closed, the alarm is released automatically.

\* [Clear] key cannot release the alarm.

#### 3) In case of other alarms

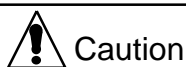
When you press [Clear] key, the alarm is released.

If the cause of the alarm is not solved, the alarm occurs again.

#### 4) In case of watch-dog

Turn off the power switch of the unit once, and turn on the power switch again.

## 4-1 Installation environment



### Caution

Use extreme caution when selecting installation site, where can be ventilated

Since this unit is equipped with an air cooled type refrigeration unit, it exhausts the heat. Install the unit in a well-ventilated or an air-conditioned location where the ambient temperature does not rise high by exhausted heat. The operating efficiency and the cooling power is worsened if the environmental temperature is raised. Also, refrigerator may be impaired because of overload and high pressure operation.



### Warning

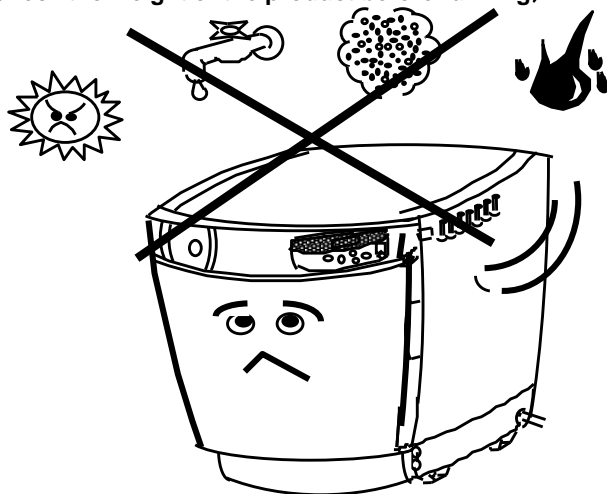
Do not install in a potentially hazardous location.

Since this unit is equipped with heater, it may cause a fire if you install it in a potentially hazardous location.

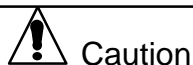
**Select the installation site that meets the following conditions;**

- No direct sun light
- Ambient temperature should be from 5 to 30°C.
- Well-ventilated or a location where can be ventilated well.
- No combustibile solid, liquid or gas around the unit.
- No dew condensation
- Lesser humidity and no dripping falls over the unit.
- Lesser dust
- Even and stable

(Check the weight of the product before running)



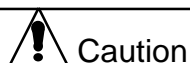
## 4-2 Environmental conditions



### Caution

Keep good ventilation space.

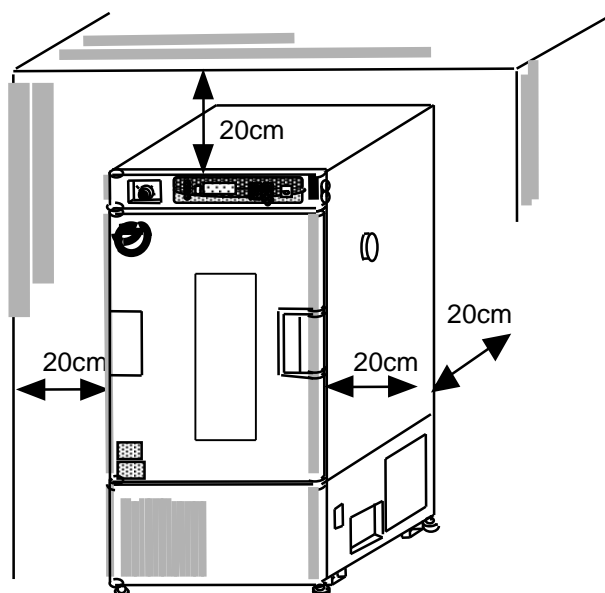
The minimum space is required as shown on the right figure to maintain excellent performance of the unit.



### Caution

Since the unit is a heavy product, use caution when carrying it.

KCL-2000W 153kg



## 4-3 Installation (Moving the unit / Removing rack / Installation)



Caution

Do not tilt the chamber unit.

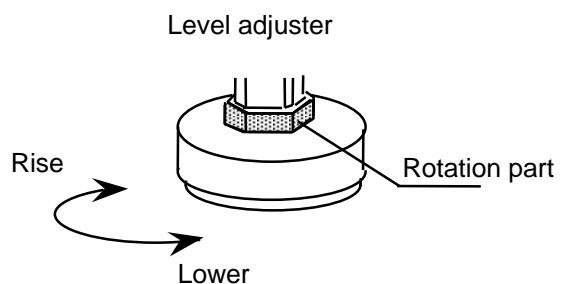
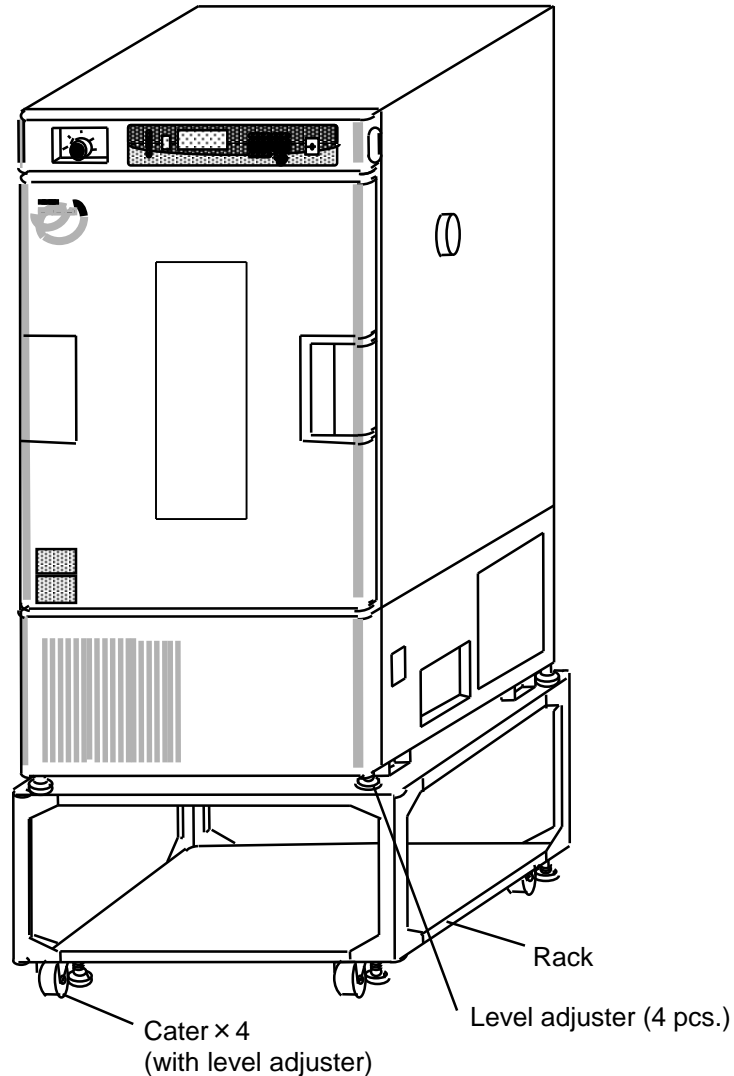
This unit is equipped with refrigeration unit. Do not move it with tilting or laying along.

### Precaution for moving the unit

- (1) Turn each level adjuster (4 pcs.) clockwise with a spanner, and be free from the floor. Then casters are released. (4 parts)
- (2) Move the unit to your desired installation site.
  - \* Moving over steps or uneven place may damage the casters.
  - Lift and carry the unit to move on such place.
- (3) Lock casters at installation site.
  - Turn each level adjuster (4 pcs.) counterclockwise with a spanner (opposite side distance: 17) to fix the unit.
  - Keep the unit horizontal, with adjusting 4 level adjusters.
  - \* This adjustment is temporary.

Make sure the position where external water-supply tank is set up before installing the unit.

Adjust the level adjusters to fix casters and to keep the unit horizontal.



## Removing rack and installation without rack

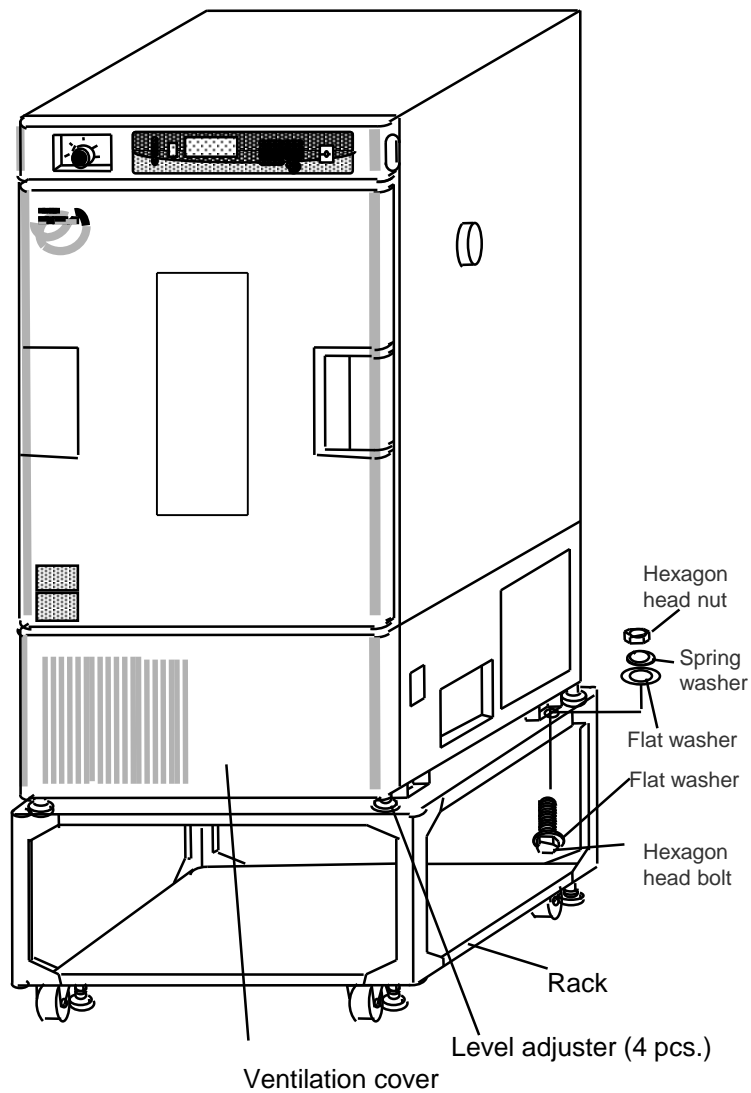
- (1) The unit is fixed to the rack with hexagon head bolts and nuts (4 parts).

Loosen hexagon head bolts and nuts with using two spanners (opposite side distance : 13).

- (2) Move the unit gently to the installation site.

Adjust four level adjusters to make the unit horizontal with using a spanner (opposite side distance : 17).

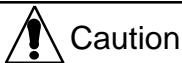
\* This adjustment is temporary.



Make sure the position where external water-supply tank is set up before installing the unit.

When you lift or move the unit, do not hold the ventilation grill part to prevent falling down the unit.

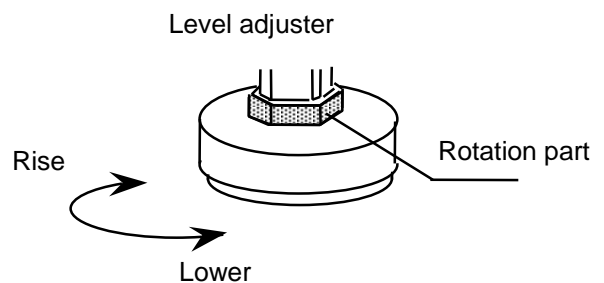
## 4-4 Installation --- Adjustment of level ---



Make sure that the unit is set up in a horizontal position.

Put spirit level on the top of the unit to make sure that it is in a horizontal position. When the unit is not horizontal, adjust four adjusters either of unit or rack with using a spanner (opposite side distance : 17) .


If the unit is not horizontal, the wick holder may not be supplied the water during operation, or supplied water may overflow from the wick holder or from the humidification tray (top/bottom), which may increase the purified water consumption.





If you cannot prepare a spirit level, you can adjust four adjusters temporarily to make the filled water surface of the bottom humidification tray horizontal. Refer to [Humidification procedure] on P.33 to know more details.



## 4-5 Connection of utility

 <b>Warning</b>
Check the voltage, phase and capacity of the power source before plugging. Wrong connection may cause a fire or electric shock hazard.

 <b>Warning</b>
Ground this unit correctly. Do not ground to gas or water pipe.

 <b>Warning</b>
Do not use branching socket Excess current may burn cable or cause a fire.

Model	Required power source	
	Voltage	Capacity
KCL-2000W	AC-220V	7A

- (1) Check the type of the unit, and required voltage, phase and capacity as it is shown in the right table.
- (2) Check the outlet to be used.  
(Do not connect to the unit yet.)

## 5-1 Preparation

	Action item
Using the unit as an environmental chamber	Complete the procedure 1~11 all. Set depending on your purpose.
Using the unit as a incubator	Complete the procedure 2, 4, 6, 7, 8, 9, 10, 11, and 12. Use the unit with turning on the [Manual Drain] key.

### 1.Attaching a rack for external water supply tank

You can attach the rack for external water-supply tank to either right or left side of unit as desired.

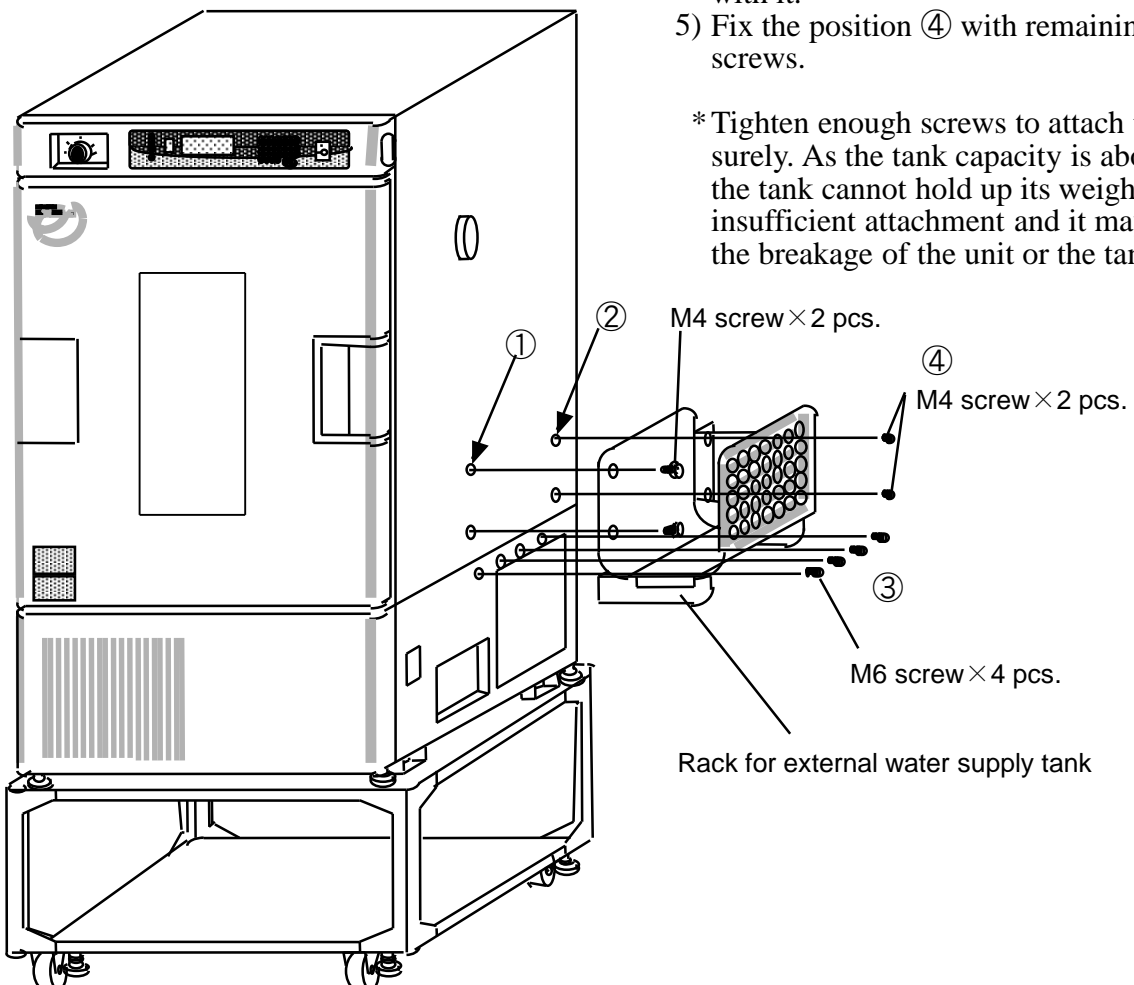
Before shipment the rack for external water supply tank is prepared for attaching to the right side of unit.

If you would like to attach it to the left side of unit, you need to reassemble the rack.

(1) In case a rack is attached to the right side

- 1) Loosen screws attached to the right side with a cross slot screwdriver.  
- M4 screw × 4 pcs. - M6 screw × 4 pcs.
- 2) Attach temporarily the rack for external water supply tank to the position ① and ② with supplied two of M4 screws as shown.
- 3) Fix the position ③ with removed four M6 screws.
- 4) Remove the screw which is attached in the procedure 2), and fix the hole below ① with it.
- 5) Fix the position ④ with remaining two M4 screws.

\*Tighten enough screws to attach the rack surely. As the tank capacity is about 20L, the tank cannot hold up its weight with insufficient attachment and it may cause the breakage of the unit or the tank rack.

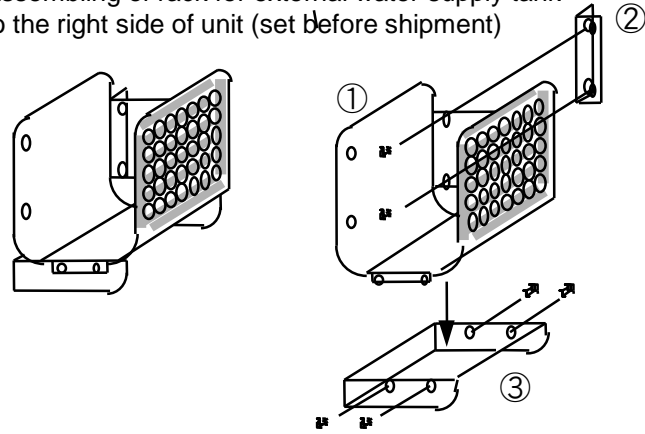


(2) In case a rack is attached to the left side

- 1) Reassemble the rack for external water supply, which is assembled for attaching to the right side before shipment.
- 2) Loosen screws attached to the left side with a cross slot screwdriver.  
- M4 screw × 4 pcs. - M6 screw × 4 pcs.
- 3) Attach temporarily the rack for external water supply tank to the position ① and ② with supplied two of M4 screws as shown. Use the supplied fixing plate to tighten the part ①.
- 4) Fix the position ③ with removed four M6 screws.  
Remove the screw which is attached in the procedure 2), and fix the hole below ① with it.
- 5) Fix the position ④ with remaining two M4 screws which are removed in the procedure 1).

\* Tighten enough screws to attach the rack surely. As the tank capacity is about 20L, the tank cannot hold up its weight with insufficient attachment, which may damage the unit or the tank rack.

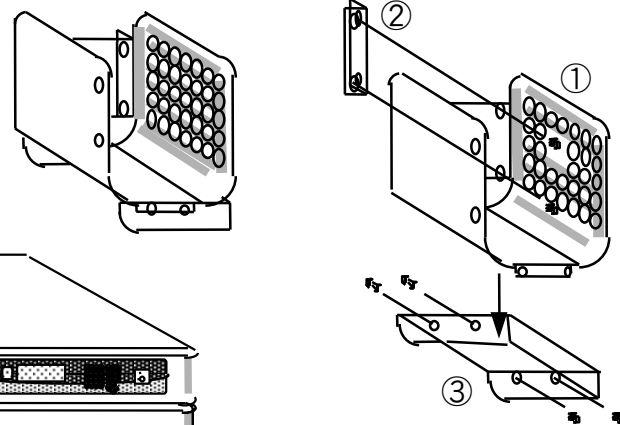
Assembling of rack for external water supply tank to the right side of unit (set before shipment)



Fix between ① and ② with two M4 screws.

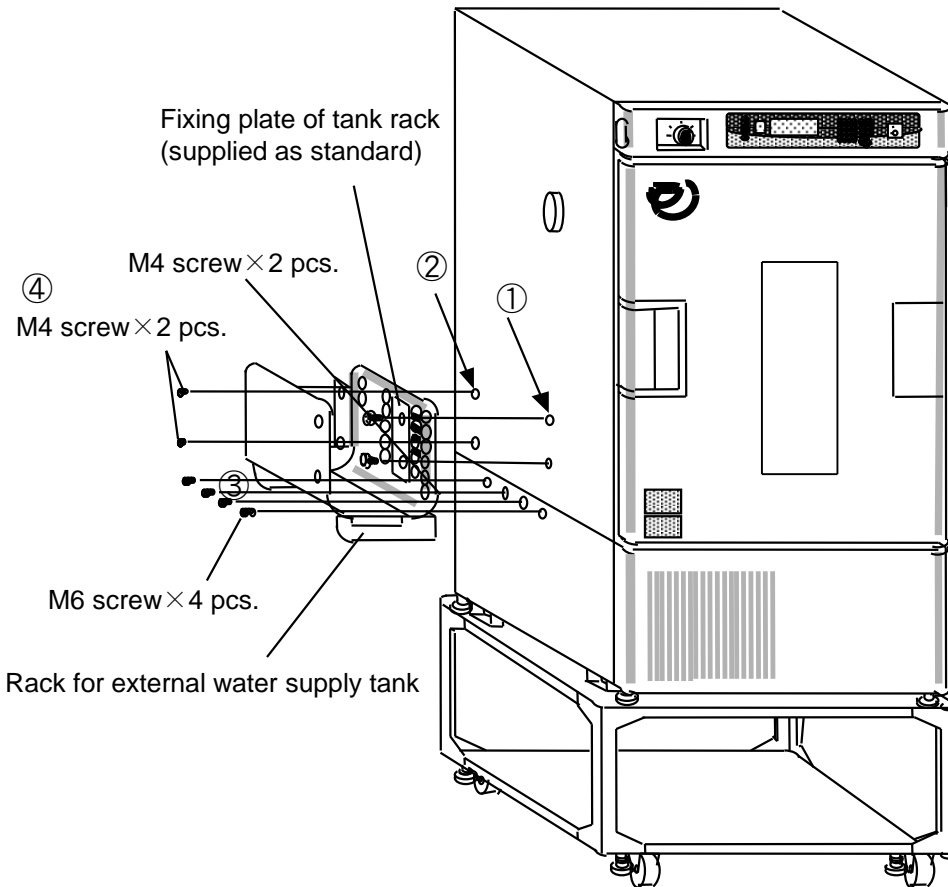
Mount it on ③, and fix with four M4 screws.

Assembling of rack for external water supply tank to the left side of unit

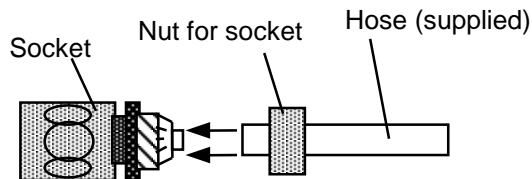


Fix between ① and ② with two M4 screws.

Mount it on ③, and fix with four M4 screws.



- \* When attaching the tank to the left side of unit, replace the hose of water-supply hose set with the supplied another hose. Make sure that no leakage is found from connecting parts after replacement.

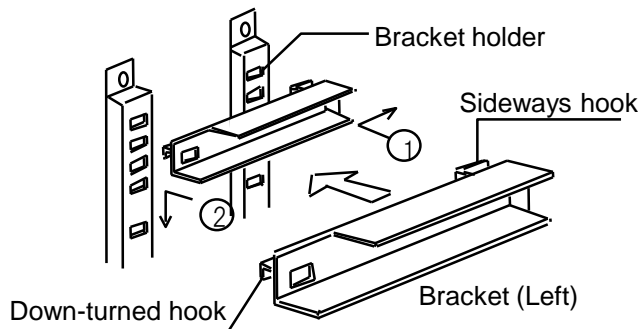


Replacement of hose of water supplying hose set


Put the hose into the nut for socket, connect it to the socket, and tighten the nut. Connect the L-shaped socket to the another end of hose, and fix it with a hose band.

## 2. Setting shelves

- (1) Check which bracket is for right and for left. The bracket must be attached with setting the down-turned hook into the front side bracket holder and the sideways hook into the back side bracket holder.
- (2) First inset the sideways hook into a hole of the bracket holder, and push it backward surely.
- (3) Next inset the down-turned hook into a hole of the front side of bracket holder, and push it downward surely.
- (4) Make sure that each hole level is even between the front and the back.
- (5) After setting all shelves, check the level of each face-to-face bracket is even to set shelves horizontally.
- (6) Put shelves on each bracket.

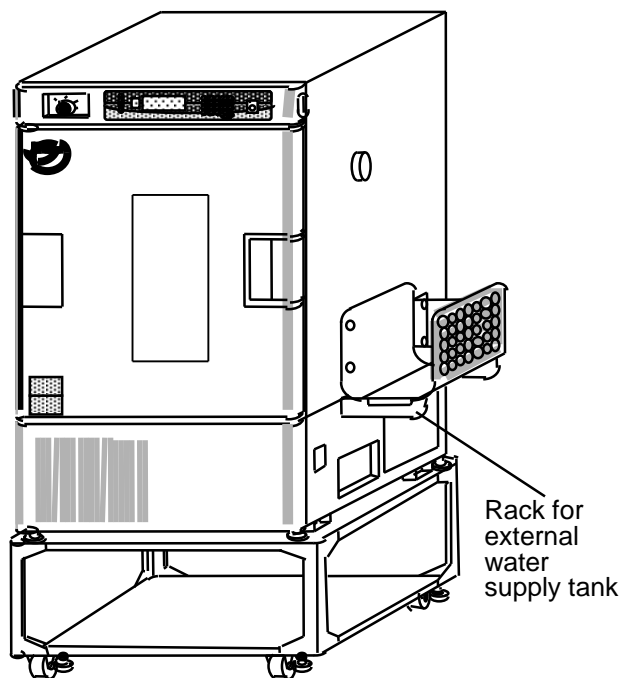
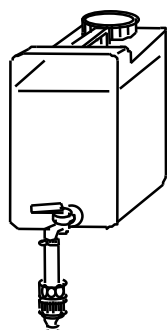


## 3. Preparation of water-supply

 <b>Caution</b>
<p>Use purified water such as ion-exchange water or distilled water for humidifying.</p> <p>Non-purified water pollutes humidification heater, wet-bulb wick, and tubings. It obstructs the normal humidification control. And it may occur water leakage or other troubles.</p>

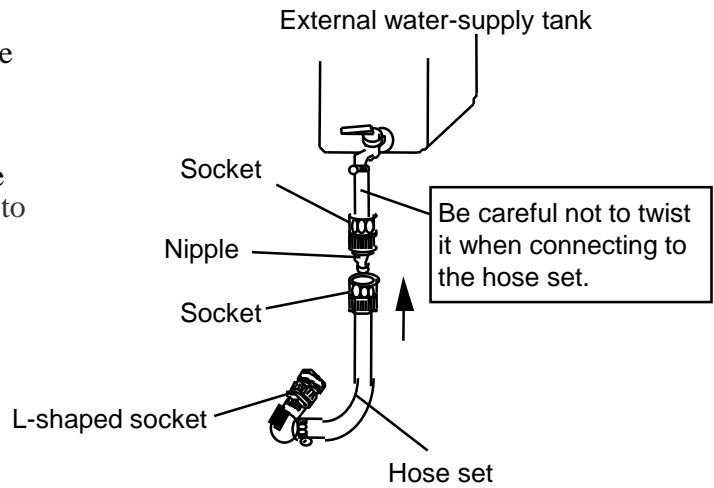
- (1) Supply purified water into the supplied external tank which electric conductivity is  $10\mu\text{s}/\text{cm}$  or less. The tank has 20L capacity.
- (2) Mount the tank on the rack.

External water supply tank



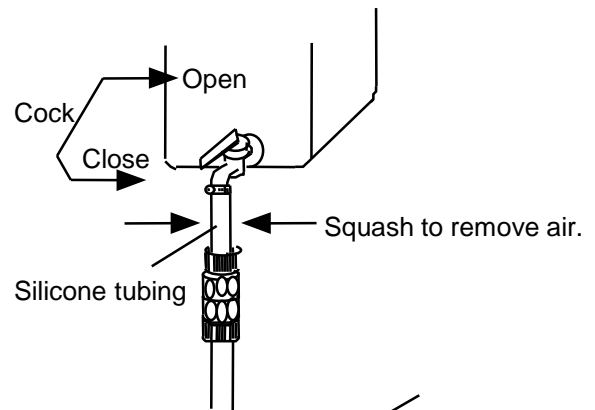
- (3) Connect the socket of hose set to the nipple of external water-supply tank.  
Just push the socket to attach tightly.

To disconnect them, hold either one of the sockets and slide it in a direction opposite to the nipple.

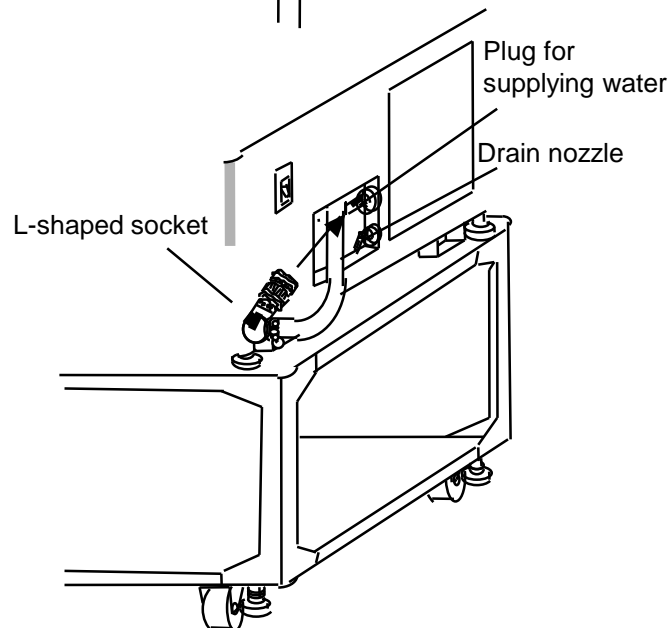


- (4) Open the stopcock of the external water-supply tank, and squash the silicone tubing several times to remove included air completely. If you remove the air successfully, air bubbles are found in the tank.

If air bubbles are remained in the tubing, water cannot be supplied.

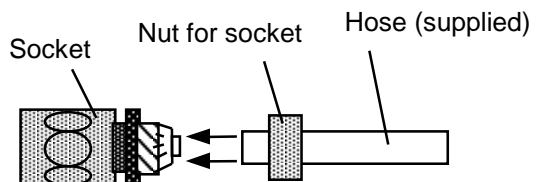


- (5) Attach the socket of hose set to the water-supply plug. Just push the socket to attach tightly (Push it until you hear the click.) To disconnect, push the black socket part backward.



\* If you use a cartridge type water purifier (ERN) in place of the external water supply tank, replace the hose of hose set with the supplied another hose for the cartridge purifier. Make sure that no leakage is found between the faucet and connecting port of the unit.

\* When using a cartridge water purifier, attach a pressure regulator to keep the supplying pressure 0.1MPa or lower.



Replacement of hose of water supplying hose set

Put the hose into the nut for socket, connect it to the socket, and tighten the nut. Connect the L-shaped socket to the another end of hose, and fix it with a hose band.

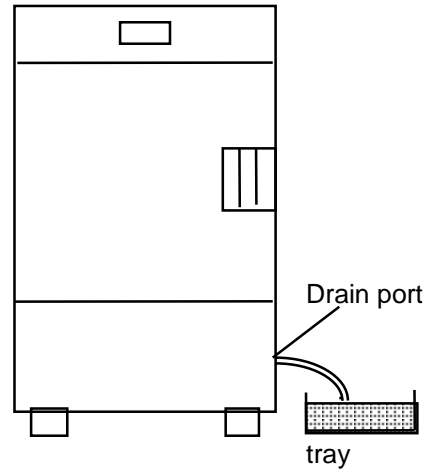
#### 4. Connecting drain hose



Caution

#### Check the drainage condition.

Drain humidifying water into drainage ditch or tray (not supplied with the unit).  
Check the drainage volume and condition regularly to prevent water leak.

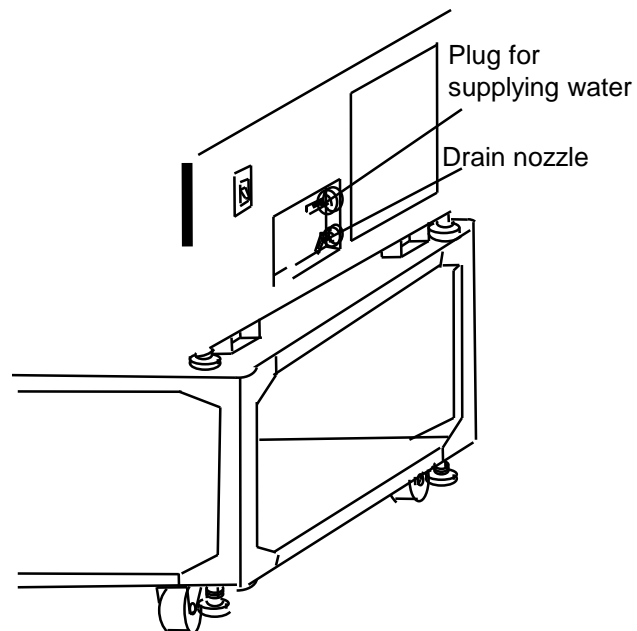


If the drain hose bends or its end is soaked into the tray, or if you use a hose other than supplied, the water may not be drained from the unit because of tubing resistance or the drained water may overflow from the tray. Cut the hose in exact length with distance from the tray.

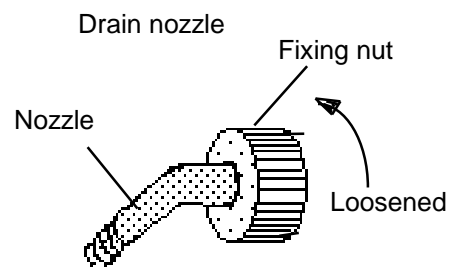
Set temperature (°C)	Set humidity (%RH)	Supply/Drain volume (mL/h)
20	90	70
25	60	85
40	75	135
60	95	80
85	95	130

- (1) Connect the supplied drain hose to the drain nozzle.
- (2) Put the tray for drained water.

\* The overflowed water from the humidification tray (top/bottom) and drained water from the chamber and the drop receiver, and forced drained water are collected into the tray.



While operating the unit or right after completing the operation, the drained water may be hot depending on the operating temperature. Connect tubing not to touch it directly. Be careful of draining from the optional drain tank.



With loosening the fixing nut, you can change the direction of drain nozzle. After changing the direction, tighten the fixing nut surely.

## 5. Attaching wet-bulb wick



### Caution

#### Change the wet bulb wick regularly.

When the wet bulb wick is deteriorated (discolored), replace it with new one. The life of the wick differs depending on the operating temperature, humidity, and water quality. However, replace the wick at least once in a month. If you use the same wick for a long time, its performance is worsened, and normal humidity control cannot be provided. Also, it will cause water leak because of saturation state and cause a crash of humidity control parts.

Dry and wet bulb method is adopted to measure the humidity. Cover the temperature sensor for wet-bulb with the wet-bulb wick surely by following the below procedures.

- Wet-bulb wicks are supplied 5 pieces singly with aluminum package. Clean your hands with some soap before opening the package not to get the wick dirty.
- Wet the wet-bulb wick with purified water, and put the temperature sensor for wet-bulb into it.

\* The wet-bulb wick must be capped on the temperature sensor for wet-bulb. If you cap it on the temperature sensor for dry-bulb by mistake and the operation is started, the temperature and humidity cannot be measured properly, and may cause some troubles.

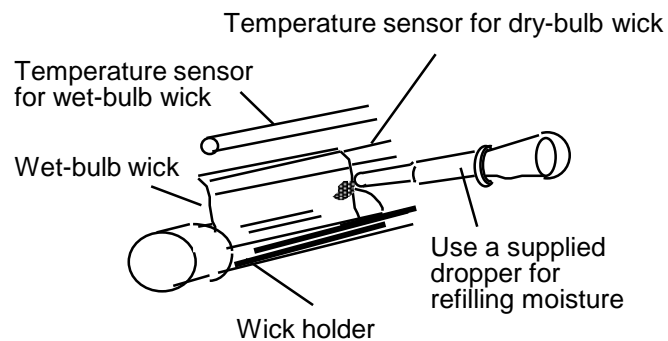
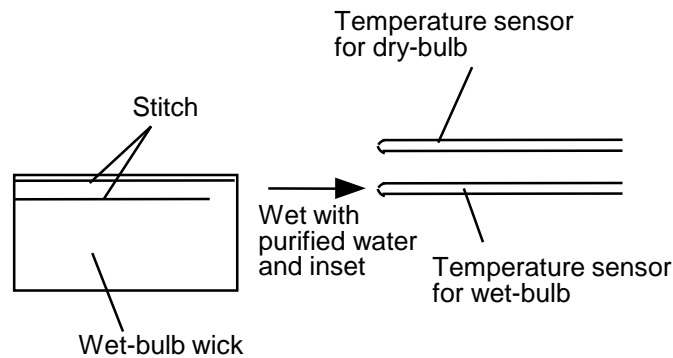
- \* You must wet the wet-bulb wick with purified water enough before operation. If it is not sufficient, refill some purified water by a supplied dropper.
- \* Remove the wet-bulb wick in advance, when only the temperature is controlled without humidity control or when operating at 5°C or less.

\* If you reposit the wet-bulb wick after opening, keep it dry and put it into the aluminum bag, and zip it. The aluminum bag blocks oxygen and moisture vapor.

\* You can check the wet-bulb wick for dryness by the following way.

Attach the wet bulb wick and turn on [Manual Drain] key. When the humidifying operation is active even while the operating temperature is within not-humidified range (5°C or lower set temperature), the wet-bulb wick is dry.

You must wet the wet-bulb wick with purified water enough before operation. If once the wet-bulb wick is dried completely, sometimes it cannot include any moisture. In such a case, replace the wet-bulb wick with new one.



#### Operation without humidity control

Turn on [Manual Drain] switch. Water is not supplied into the humidification tray and the wick holder. Set the humidity [0%RH] and start the operation. The humidity control does not become active even if water is supplied into the humidification tray and the wick holder.

When the setting temperature is less than 5°C, water is drained automatically from the humidification tray and the wick holder.

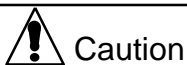
- \* Do not refer the humidity indication when the wick holder does not have any humidifying water.

## 6. Putting samples and vessels inside the chamber



**Do not use flammable materials such as organic solvent.**

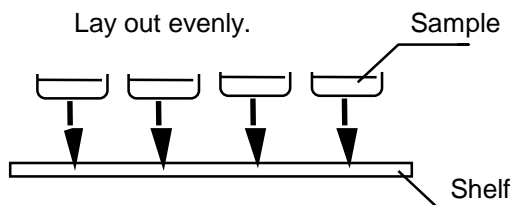
Since the temperature inside the chamber subjects to high, some sample materials may be vaporized, and may ignited or exploded. Ignitable materials are nitrates, nitro compounds, etc. and explosive materials are salt peroxides, inorganic peroxides, salt nitrates, organic solvents etc. This unit is not designed with explosion-proof structure.



**Do not jam samples into the chamber. Place samples evenly.**

Do not block the air supplying port with vessels. It may worsen the convection inside the chamber and reduce temperature uniformity, and cause mechanical troubles.

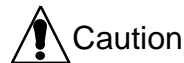
- (1) Open the door.  
When you pull the handle, the door lock is released and the door is opened.
- (2) Lay out samples on a shelf with keeping uniform distance.  
(The load capacity per shelf is 15kg.)



\* Due to the characteristics of this unit, the moist sample is dried if no temperature control was done. Vaporized moisture may make dew condensation and frost. To reduce drying of sample, cover each vessel with a lid.

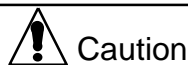
\* Do not block the air suction port and fan with samples when you put them into the chamber.  
(Convection in the chamber is obstructed. The temperature control alarm may be activated in some cases.)

- (3) Close the door gently.  
If the door is not closed completely, operation does not start. (Door alarm is displayed.)



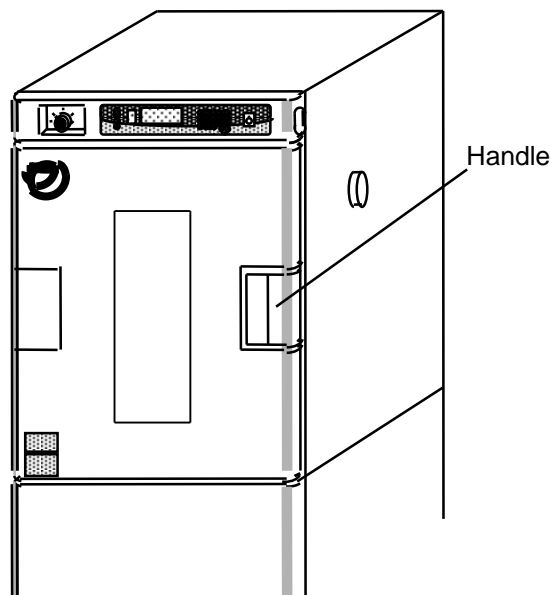
**Check the allowable temperature limit of the vessel.**

Since the temperature inside the chamber will be high depending on the setting temperature, some vessels may be melted. Check the allowable temperature limit before starting operation.



**When placing glass wares, set the temperature carefully.**

If you place glass wares into the chamber and set the temperature at 0°C or lower, frozen sample may break the glass wares and cause you physical injury. Use extreme caution when handling glass wares.



Do not spill the samples or water when putting them into the chamber. If you do so, it may cause a crash of the unit, which may lead electric shock caused by leakage. If you spill it accidentally, wipe it off immediately.

The drain port is placed at the bottom of chamber to drain condensed water. The condensed water cannot be drained completely depending on the environmental condition or the plateau of unit. Do not put samples on the bottom surface of chamber to avoid blocking the drain port and air suction port. Put samples on each shelf.

- Observation window is glassware. If you damage the window glass may be broken and cause you physical injury. Use care when handling it.
- Heater for reducing dew condensation (on the chamber side) starts working for observation window depending on setting temperature. If the heater is turned on, door part situated around the observation window may be in high temperature (lower than approx. 60°C). Be careful when touching the part.

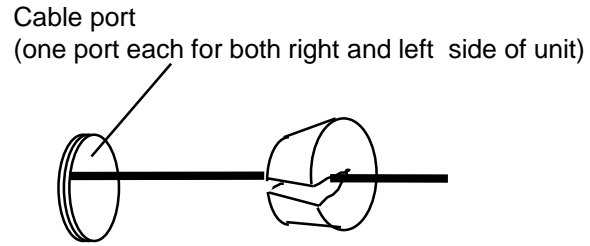


## 7. Using cable port (Connection of monitoring devices)

Use the port depending on your purpose.

The cable port (one port each for both right and left side of unit) can be used to connect some monitoring tools or to connect cables of inner devices to outer electric power supply port.

Embed a supplied silicone stopper into the cable port which is made a lengthwise cut in. It prevent entering moisture into the chamber. The silicone stopper is supplied one piece as standard.



## 8. Connection of recorder (Analog) output terminal

Use the terminal depending on your purpose.

### - Recorder (Analog) output terminal for measured temperature

The measured temperature is output DC1mV per 1°C.

Output accuracy is  $\pm 2.6^\circ\text{C}$  of the measured temperature.

<<A case of output>>

Measured temperature :  $-15.0^\circ\text{C}$  → Recorder output :  $-15.0 \pm 2.6$  mV

Measured temperature :  $85.0^\circ\text{C}$  → Recorder output :  $85.0 \pm 2.6$  mV

### - Recorder (Analog) output terminal for measured humidity

The measured humidity is output DC1mV per 1%RH.

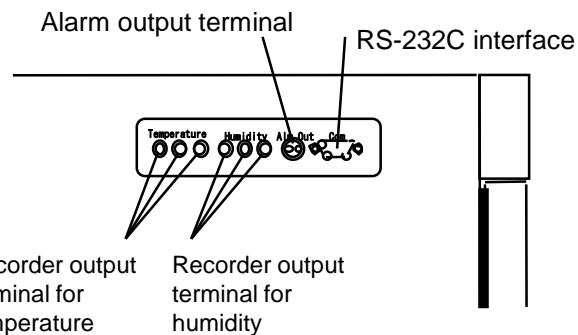
Output accuracy is  $\pm 2.0\%$ RH of the measured humidity.

<<A case of output>>

Measured humidity : 25.0%RH → Recorder output :  $25.0 \pm 2.0$  mV

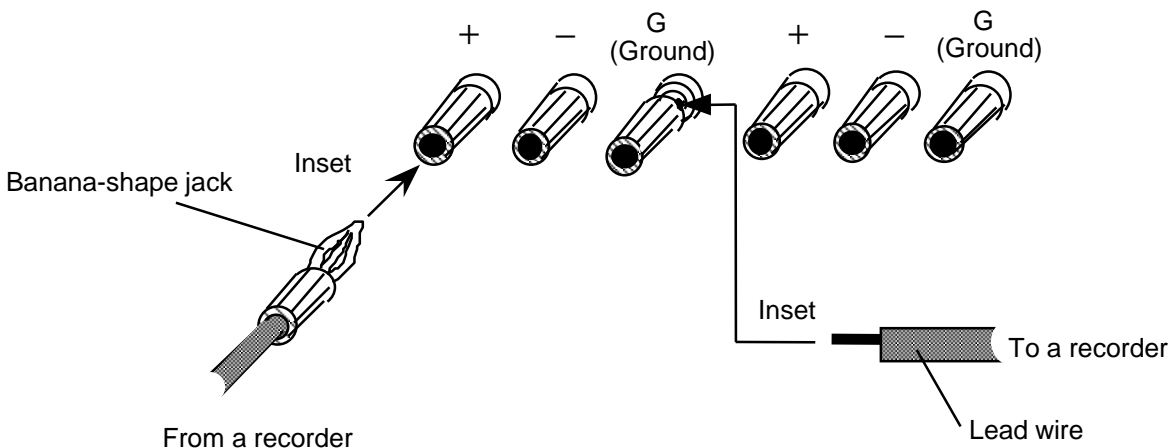
Measured humidity : 85.0%RH → Recorder output :  $85.0 \pm 2.0$  mV

Left view of unit



Temperature

Humidity



## 9. Connection to RS-232C interface

Use the interface depending on your purpose.

The unit can communicate with a host computer through the RS-232C interface.

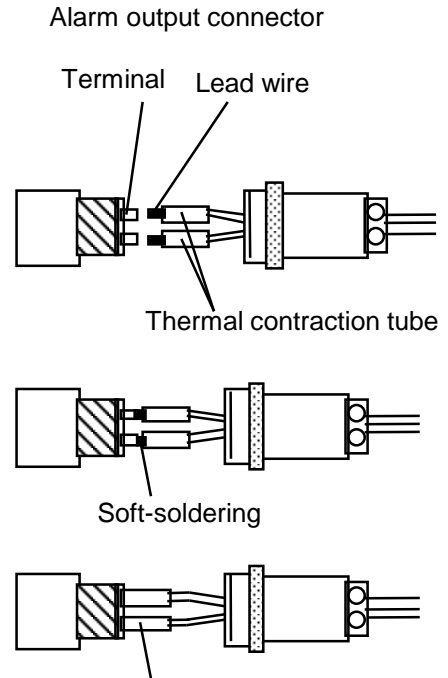
The communication speed is 9600BPS as fixed. Refer to the page 49 and 50 of the key operation manual.

## 10. Connection of alarm output terminal

Use the terminal depending on your purpose.

When a safety function is active, the terminal outputs and indicates the trouble of the unit at contact point. The contact point capacity is AC250V, 5A with resistant load. When the unit is in abnormal status, it is turned ON (It is turned OFF in normal status).

- (1) Disassemble the supplied alarm output connector, and soft-solder the lead wires of external device to each terminal as shown on the right figure.
  - \* To avoid short circuit between both terminals, insulate the wire with each thermal contraction tube.
  - \* Do not use without soft-soldering.
- (2) Assemble the connector again.
- (3) Connect the alarm output plug to the port [Alm Out].



\* Soft-solder lead wires, and contract thermal contraction tubes with a hair dryer.

## 11. Connection of an optional drain tank

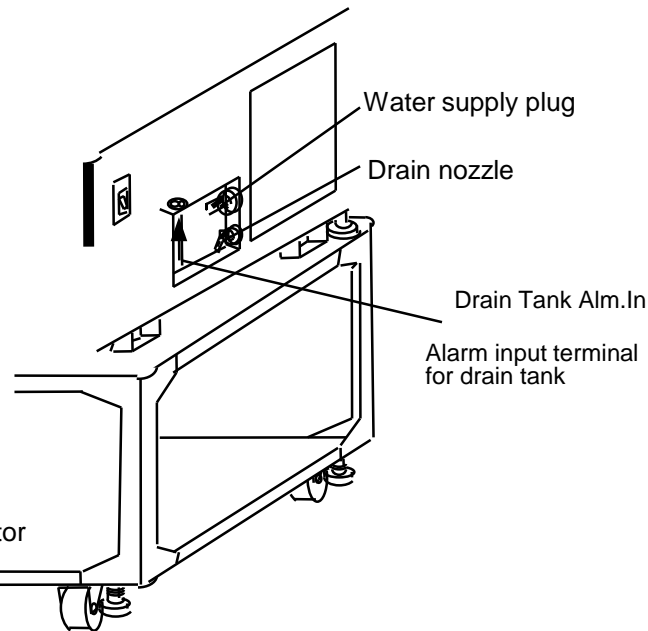
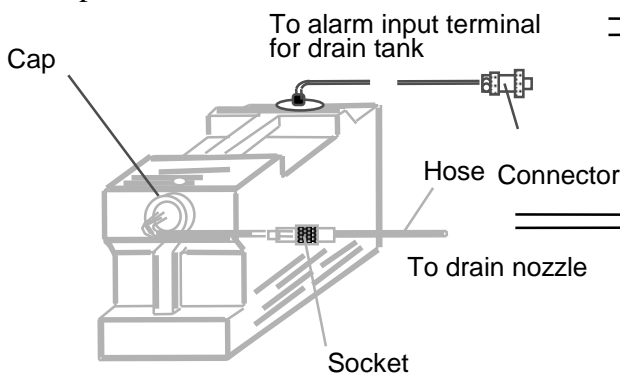
Use the drain tank depending on your purpose.

The capacity of drain tank is 10L, and it collects the drained water from the chamber. When the tank is full, the alarm [DTK] is indicated on the LCD panel of unit, and the humidification is stopped.

Drain the water from the tank before the water level exceeds 10L on the gauge.

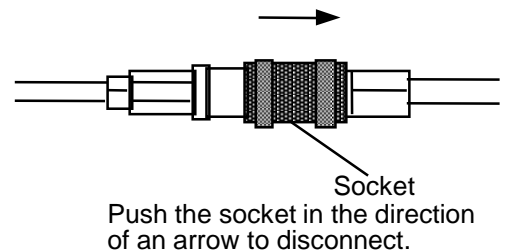
Hold the tank with the rack, connect the connector to the alarm input terminal, and connect the hose to the drain nozzle.

- \* Do not twist the hose or do not hang lower than the inlet of drain tank. The water may not be drained to the tank because of piping resistance, or overflow from the chamber. Cut the hose proper length in accordance with the place of the tank.



When draining water from the tank, remove the socket of drain tank hose. If you would like to drain the water from the unit, drain it out into a tray. Disconnect the input terminal connector, remove the cap and drain the water.

- \* Push the black part of socket in the direction of an arrow to disconnect it. To connect again, inset the socket part until you hear a click.



Push the socket in the direction of an arrow to disconnect.

## 12. Connection of mains plug

Make sure that the power switch and the mains switch are turned off, and disconnect the mains connector from AC outlet port.

## 5-2 Operation



### Caution

Do not open the door while operating the unit at a high temperature (humidity).

If you open the door while operating the unit at a high temperature (humidity), fan stops working, however, high-temperature vapor may blow out and burn your hands. Sometimes it may lead to mechanical trouble of unit. Before opening the door, stop running the unit and make sure that the temperature inside the chamber is cooled down.

### 1. Setting of over-heat protector

Set the over-heat protector.

Turn the knob to set the upper temperature limit.

The knob is turned clockwise fully (at 93°C) before shipment.

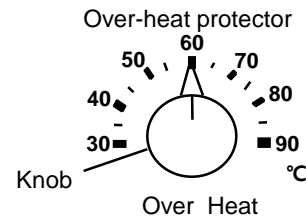
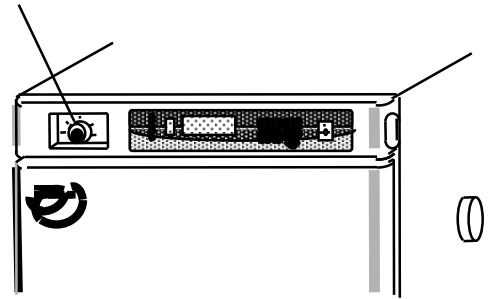
Generally it is set 10°C higher than the set point when the set range is 20~80°C.

When the set temperature exceeds 80°C, turn the knob clockwise fully (at 93°C).

When the set temperature is low (lower than 20°C), set the limit temperature 30°C or little higher.

\* In case that the over-heat protector works, see the chapter [6. Trouble shooting] on page 35.

Over-heat protector



### 2. Setting of temperature and humidity

Turn on the leakage breaker and power switch.

The initial indication is displayed for about 5 seconds.

Note) The indication [Ver \*.\*] is version of the unit.

About 5 seconds after turning on power switch, the normal mode display appears.

\* The temperature is set at 20.0°C and the humidity is 0.0%RH before shipment.

\* If you stop the unit previously in the normal mode, the set temperature and humidity at the time of shutdown are backed up. If the normal mode indication is not active, you can change the mode to normal by [Mode] key.

To know more details about operational keys, see the key operation manual prepared as a separated volume.

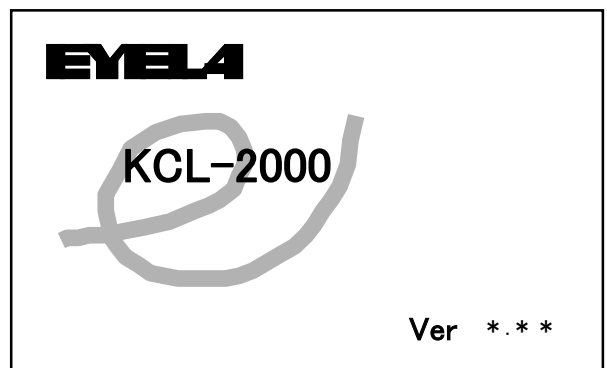


### Caution

If you face some troubles, stop using the product immediately.

When some troubles occur, turn off the leakage breaker immediately, and check the unit by referring to the chapter [Troubleshooting].

Initial display



Normal mode display

	SET	MEAS
Temp	20.0	19.5°C
Humi	0.0	55.0%RH
Total Time		000/00:00

The chamber wall, the bottom plate of chamber, and the packing may have dew condensation depending on the setting temperature or surrounding environment. However, it gives no effect on the performance and functional capability of the unit.

The chamber has 2 drain ports at the bottom plate to drain the condensed water.

To reduce the bottom puddle, tilt the unit just a little back. Be careful not to tilt too much. The water volume of wick holder decreased.

\* While operating the programmed gradient control, the temperature and humidity control may be little deviated due to the switching of the refrigeration unit.

\* The temperature and humidity control may be little deviated when the ambient temperature is changed.

### 3. Defrost operation

#### About frost formation

In case that the operation is executed at 30~40°C or lower temperature with controlling temperature and humidity, [Cooling alarm (COL)] or [Temperature/Humidity control fault] may be activated because of frost formation on cooling part.

You have a choice of the interval mode (automatic defrosting) or manual mode (forced defrosting) as defrost operation.

\* Use the operation below 0°C for a measure of one-day low temperature experiment.

#### (1) Interval defrost operation (Automatic defrosting)

If the interval defrost operation is selected by [Int.Defrost] key, the defrost operation is executed every hour automatically when the setting temperature is 40°C or lower.

On account of the hot gas flows into the cooling coil, the chamber temperature and humidity are fluctuated for about 10 minutes every hours. (The fluctuation band depends on the operating condition.)

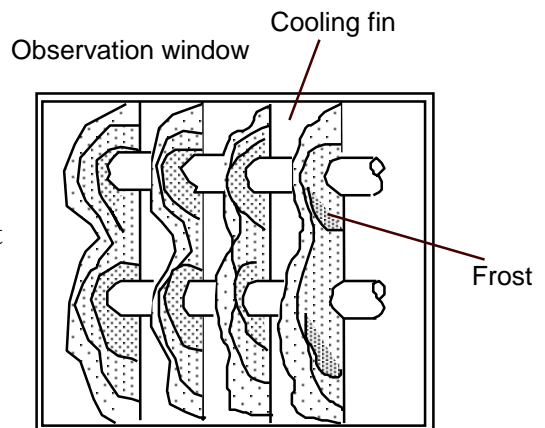
\* Use this mode for the operation beyond 24 hours with 5~15°C of set temperature, or more than 1 week with 15~25°C.

\* The performance of defrosting is worsened when selecting interval mode in low ambient temperature.

#### (2) Manual defrost operation (Forced defrosting)

[Cooling alarm (COL)] or [Temperature/Humidity control fault] may be activated by forming frost on cooling part in case of the following conditions. Check frost formation through the observation window and execute the forced defrost operation if needed.

- 1) Temperature and humidity is controlled under 30~40°C or lower setting temperature.
- 2) Interval defrost operation is executed when the setting temperature is at 5°C or lower.
- 3) Interval defrost operation is executed when the ambient temperature is low.
- 4) In case the ambient humidity is high.



Fluctuation bands of chamber temperature and humidity while operating with interval defrost mode are shown as below.

(Room temperature: 20°C, measured at the center of chamber.)

Operating at 5°C, 80%RH → Approx. +3.5°C, Approx. +15%RH  
Operating at 15°C, 80%RH → Approx. +2 °C, Approx. +13%RH  
Operating at 25°C, 80%RH → Approx. +2 °C, Approx. +13%RH  
Operating at 30°C, 80%RH → Approx. +1.3°C, Approx. +12%RH  
Operating at 40°C, 80%RH → Approx. +1 °C, Approx. +12%RH

Take out all samples and vessels from the chamber before forced defrost operation is started. Sample materials may be damaged by fluctuation of temperature and time passage.

The frost formation on the cooling coil is dissolved in water drop by defrost operation and it flows and be collected into the bottom humidification pan. However, some water may not be drained through the overflow port. Turn on [Manual Drain] switch before the forced defrost operation is started.

### 1. Start of manual defrost operation (Forced defrosting)

Stop the control operation or turn on [Manual Drain] (forced draining) key switch during control operation.

If you press [Defrost] key, the setting temperature will be at 25°C regardless of operation mode, and forced defrost operation will start working automatically.

- Refrigerator lamp illuminates.
- Defrost Running lamp illuminates.
- Temp. Heater lamp illuminates. \* Depending on the temperature inside the chamber.

### 2. Performance of defrost operation

When setting temperature at 25°C for defrost operation and the operation is continued for 20 minutes, it stops automatically and the temperature inside the chamber returns to the setting temperature that was active when the control operation was stopped, or control operation before defrosting will restart.

If the defrost operation is executed immediately after the refrigeration unit stops, you need to wait 80 seconds until it restarts and hot gas flows into it. This is a timer for protection of refrigeration unit.

\*Even if the temperature inside the chamber does not reach to 25°C (defrost temperature), the operation stops automatically after elapsing 20 minutes.

### 3. Manual stop of Defrost operation

If you would like to stop manually while operating defrost, press [Defrost] key again.

### 4. Humidification

#### (1) Turn on [Water Supply] key.

The water is supplied into the internal tank from the external tank until it is full. (Approx. 10L)

#### (2) Check the water level of the internal tank.

See the indicator of [Tank Water Level] on the control panel to check the supplying status. The indicator [Tank Water Level] is changed from [Empty] (red) to level 1~3 and to [Full] (green) illumination in proportion as increasing of water.

#### (3) Turn on [Run Stop] key.

When the water level reaches to Level 1 even if it is not full, the solenoid pump works and the water is supplied into the top and bottom humidification tray and the wick holder.

- \* About 10 minutes after turning on [Run Stop] key, the water is supplied into the top and bottom humidification tray and the wick holder.
- \* While draining (Manual Drain key is turned on.) or when the setting temperature is lower than 5°C, the water is not supplied into the top and bottom humidification tray and the wick holder. Except above conditions and when the setting humidity is 0.0%RH, the humidification control is not executed although the water is supplied into the top and bottom humidification tray and the wick holder.

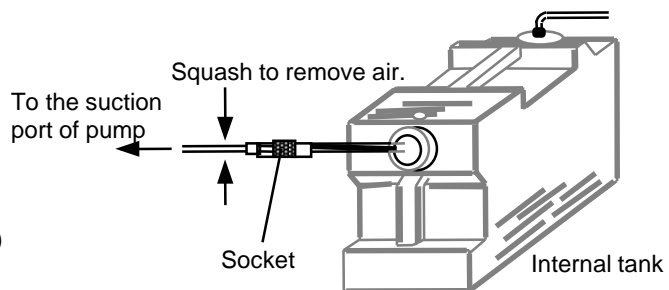
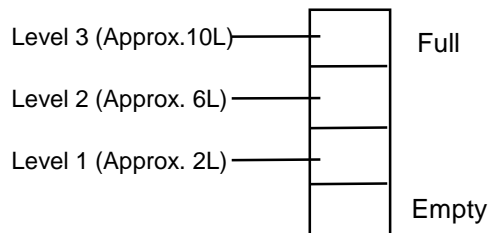
- \* If once the level reaches to 3 (or Full) and it lowers to the level 1, the water is supplied automatically from the external tank to the internal tank. If the water level raised to the level 3 (or Full) from 2, turn off [Water Supply] key once, and turn on it again.

The required time for filling water into the internal tank depends on the position of external tank (whether it is set on the right or left side) or layout of hose connection.

Required time until the internal tank is full (10L).

- In case the external tank is set on the observer's right      Approx. 20 minutes
- In case the external tank is set on the observer's left.      Approx. 35 minutes

Tank Water Level



#### In case the solenoid pump does not work.

The hose of supplying side may include air. Open the ventilation cover and squash the hose during the operation to remove air.

When supplying water into the top and bottom humidification tray and wick holder, you will hear the operating noise of electro magnetic pump and solenoid valve. However, it is not a malfunction. Also, you will hear the operating noise of solenoid valve when selecting cooling capacity of refrigerator, and while defrosting operation is active.

(3) When you do not hear the operating noise, turn OFF the [Run Stop] key once, and open the door to check that the water is supplied into the top and bottom humidification tray and the wick holder.

- If the water is not supplied into the wick holder or supplied in so much that it brims over, you must adjust the front and back level adjuster. (Raise or lower about 5mm.)

- Check that the heater goes under the water in the top humidification tray through the observation window for top humidification tray. Also, check that the heater goes under the water in the bottom humidification tray through the suction port.

Make sure that the water is not drained from the overflow port of the bottom humidification tray, and that the water surface is in parallel with the bottom humidification tray. If it is not in parallel, adjust the right or left level adjuster of the unit.

- \* The checkup of draining from the overflow port come into operation in initial water supply only. While operating or immediately after operation, water drop form cooling part is collected and overflowed.

- \* When checking the water supply condition and the water level, turn OFF [Run Stop] key once, and make sure that the chamber temperature is cooled down, then open the door to prevent burning with hot vapor blowing.

(4) Turn ON the [Run Stop] key to start the operation.

### 5. Shutdown

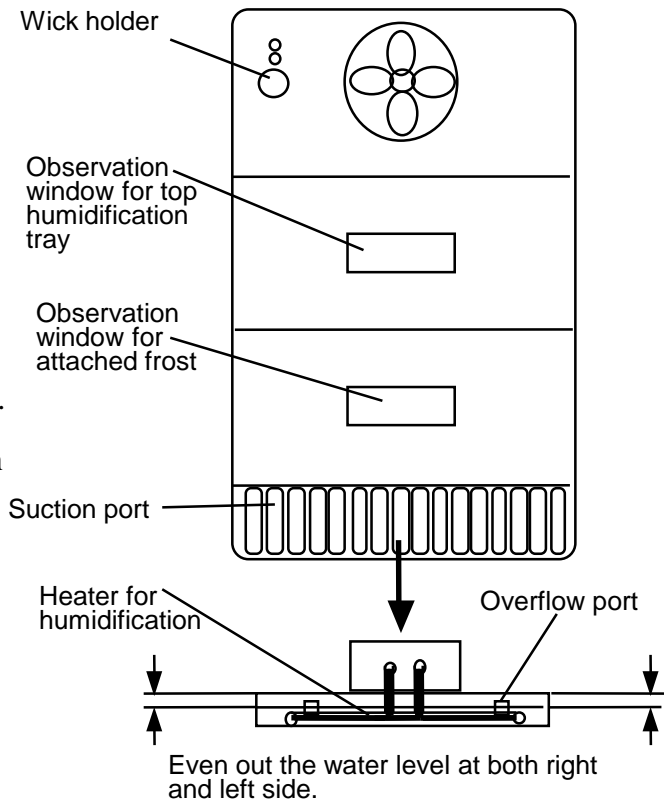
Turn OFF the [Run Stop] key first, the power switch next, and then turn OFF the leakage breaker in the last instance.

### 6. After operation

If you do not use the unit for a prolonged period, turn on the [Manual Drain] key to drain the water from the top and bottom humidification tray. Moreover, drain the water from both the external and internal water supply tank.

To drain from the internal tank, refer to P.45.


Turn OFF the power switch first, and the leakage breaker. Additionally, unplug the mains connector from AC outlet port.



When the electro magnetic pump stops working, and wick holder and humidification tray (top & Bottom ) are not supplied water without indicating 「FLW」 alarm, hose on water-supplying side may have air leak. Execute forced drainage several times by pressing 「Manual Drain」key to remove the air completely and supply the water once again.

The refrigeration unit starts working in about 80 seconds after turning on the power switch. (Function of refrigeration unit protecting timer)

You will hear the click sound of solenoid valve when switching refrigeration unit power, and when defrosting.

 **Caution**

If you do not use the unit for a prolonged period, drain water from the unit.

If you do not use or continue to use the unit for a prolonged period, water stain and scale attach, or the level sensor failure may be occurred because of attached algae.

## 6 Troubleshooting

Trouble	Cause	Measure
Residual current device can not be turned on.	Electric leakage occurs.	Stop using the product immediately and call your local dealer or closest customer service center.
	Excess current occurs.	
No display is shown on indicator after turning on power switch.	Mains connector is unplugged. Or it is not plugged surely.	Turn off the power switch and the residual current device, and plug the mains connector completely to AC outlet port.
	The electric power is not supplied.	Turn on the switch board.
	Residual current device is not turned on.	Turn on the mains switch.
	Residual current device is impaired	Stop using the product immediately and call your local dealer or closest customer service center.
	The power switch is impaired.	
	The temperature control circuit board has some trouble.	
The refrigeration unit does not work.	The refrigeration unit breaks down.	
	The overload relay holding circuit for refrigeration unit works. (Refer to P.15, 16.) See the clause [OLR] (Overload of refrigeration unit) alarm.	Reduce the load of refrigeration unit.
		Keep the ambient temperature lower than 35°C.
	The high pressure switch for refrigeration unit works. (Refer to P.15, 16.) See the clause [HP] (High pressure) alarm.	Connect the unit to a proper voltage AC outlet port.
Reduce the load of refrigeration unit.		
The chamber is not cooled down.	The setting temperature is not suitable.	Check the setting temperature.
	The refrigeration unit does not work.	Stop using the product immediately and call your local dealer or closest customer service center.
	The refrigeration gas leaks.	
	The refrigeration fan breaks down.	
	The chamber circulation fan breaks down.	
The cooling power is not sufficient.	The refrigeration gas leaks.	
	The ambient temperature exceeds 35°C.	Keep the ambient temperature lower than 35°C.
	Due to cramped conditions of samples, the air circulation in the chamber is not sufficient	Reduce the quantity of samples and vessels.
	Refrigerator has frost formation.	Monitor the attached frost, and run the manual (forced) defrost operation on some regular basis.
	The filter is clogged with dust.	Clean the filter.
	The ventilation port is blocked with some obstructions.	Keep off obstructions in front of the ventilation port.
Temperature inside the chamber is not stable	Due to cramped conditions of sample, the air circulation in the chamber is not sufficient	Reduce the quantity of samples and vessels.
	The chamber circulation fan breaks down.	Stop using the product immediately and call your local dealer or closest customer service center.

Trouble	Cause of trouble	Countermeasure
The temperature does not reach to the set point.	The air circulation in the chamber is not sufficient due to cramped conditions of sample.	Reduce the quantity of samples and vessels.
	The overheat protector works. (Refer to P.15, 16.) See the clause [TH] (Over heat) alarm.	Set the temperature for over heat protector 10°C higher than the setting temperature for temperature controller while the temperature inside the chamber is between the setting value and 80°C. If the setting value is higher, set the knob at maximum (93°C).
	The ambient temperature is lower than 5°C.	Keep the ambient temperature higher than 5°C.
The internal water supply tank is not supplied water. (The level monitor does not raise.)	[Water Supply] key is turned off.	Turn on the [Water Supply] key.
	The external water supply tank is empty.	Supply the purified water.
	The external water supply tank is set at low place.	Use a supplied rack for external water supply tank. (Refer to the chapter [Preparation] on P.22.)
	The water supply hose includes air.	Remove air by referring to the chapter [Preparation] on P.22.
The wet-bulb wick holder is not supplied water.	The attached algae increases in the connected tubes for water supply.	Clean connected tubes referring to the chapter [Preparation] on P.42. Or call your service agent.
	Some parts of tube is clogged.	
	The strainer of the internal tank tube is clogged.	
	The solenoid pump breaks down.	Stop using the product immediately and call your local dealer or closest customer service center
	The water supply hose connected from the solenoid pump includes air.	Open the ventilation cover and squash several times to remove air.
Water overflows from the wick holder and humidification tray, and piles up in the chamber bottom.	The unit is tilted toward too much.	Lower the back level adjusters about 5mm.
The humidification control does not start.	The set humidity is 0.0%RH.	Set the humidity.
	The [Manual Drain] key is turned on. (Force draining mode is active.)	Turn off the [Manual Drain] key.
	The internal water supply tank is empty.	Supply the purified water.
	The wet-bulb wick is not attached.	Attach the wet-bulb wick by referring to P27.
	The wet-bulb wick is dried.	Refill the water or replace it with new one. Refer to P.27.
	Water is not enough in the wet-bulb wick, and it is dried.	Adjust the unit horizontally by referring to the chapter [Installation] on P20, and [Humidification] on P33.
	The temperature is set to lower than 5.0°C.	Set the temperature by referring to [Humidity control range] on P4.
Observation window has dew condensation	Condensation is formed depending on setting temperature, ambient temperature and the temperature inside the chamber.	Refer to Page 45. When the exposed surface on the window has dew formation, wipe it off with soft cloth depending on the situation.



Trouble		Cause	Measure
Overflowed water is not drained from the overflow port of bottom humidification tray, and the drain port at the bottom of chamber.		The drain hose is twisted.	Layout the tube connection not to get the resistance of water level.
		The drain hose end soaked.	
		The strainer of drain port at the bottom of chamber is clogged.	Clean connected tubes referring to the chapter [Preparation] on P.42.
		The tray for drained water is placed at higher than the drain port of unit.	Place the receiver at lower place than the drain port.
The controlled humidity fluctuates. (It deviates $\pm 3\%RH$ or more.)		The wet-bulb wick is not wet enough.	Pour water over all of wet-bulb wick.
		The wet-bulb wick is dirty.	Replace it with new one. Replace the wet-bulb wick at least once in a month.
		The humidity is out of the control range.	Check [Humidification control range] on P4. Set the value within the range.
		The source voltage is not stable.	Connect the unit to another AC outlet that has stable voltage.
		The ambient temperature fluctuates due to wind flow from an air conditioner.	Move the unit to some other place where no wind flows.
Breakout of abnormal noise		The circulation fan of chamber breaks down.	Stop using the product immediately and call your local dealer or closest customer service center.
		The fan motor for condenser breaks down.	
		The refrigeration unit breaks down.	
		The solenoid pump starts.	The noise "gee" indicates the operation of solenoid pump. It is normal unless it is higher.
Alarm message is indicated and alarm lamp illuminates.		Refer to the clause [Alarm function] on P15.	
Alarm message is indicated.	Overheat of chamber is indicated. - Alarm message [TH] blinking All controls stops.	The overheat protector for the temperature inside the chamber works.	Set the overheat protection temperature to $+10^{\circ}C$ of set point when the temperature control is run within the set temperature $\sim 80^{\circ}C$ . Turn the knob of protector clockwise fully ( $93^{\circ}C$ ) when running at higher than $80^{\circ}C$ .
	Overheat of top heater for humidification is indicated. - Alarm message [TH1] blinking All controls stops.	The boil-dry protector for top heater for humidification works.	Stop using the product immediately and call your local dealer or closest customer service center.
	Overheat of bottom heater for humidification is indicated. - Alarm message [TH2] blinking All controls stops.	The boil-dry protector for bottom heater for humidification works.	Stop using the product immediately and call your local dealer or closest customer service center.

	Trouble	Cause	Measure
Alarm message is indicated.	Overload alarm of refrigeration unit is indicated. - Alarm message [OLR] blinking All controls stops.	The overload relay of refrigeration unit works.	If it occurs although the proper ambient temperature is kept and the suitable power source voltage is supplied, check the filter. If the filter is dirty, clean it. Nevertheless the alarm occurs frequently, stop using the product and call your local dealer or closest customer service center.
	High pressure alarm of refrigeration unit is indicated. - Alarm message [HP] blinking All controls stops.	The high pressure switch of refrigeration unit works.	
	SSR failure of heater for temperature control is indicated. - Alarm message [SSR] blinking All controls stops.	The SSR (non-contact relay), which switches ON and OFF the heater for temperature control, is impaired.	Stop using the product immediately and call your local dealer or closest customer service center.
	SSR failure of humidification heater (top/bottom) is indicated. - Alarm message [HSSR] blinking All controls stops.	The SSR (non-contact relay), which switches ON and OFF the humidification heater, is impaired.	Stop using the product immediately and call your local dealer or closest customer service center.
	Disconnection of heater for temperature control is indicated. - Alarm message [HTR] blinking All controls stops.	The heater for temperature control is disconnected or causes short circuit.	Stop using the product immediately and call your local dealer or closest customer service center.
	Disconnection of humidification heater (top/bottom) is indicated. - Alarm message [HHTR] blinking All controls stops.	The heater for temperature control is disconnected or causes short circuit.	Stop using the product immediately and call your local dealer or closest customer service center.
	Dry-bulb temperature sensor fault is indicated. - Alarm message [SNS1] blinking All controls stops.	The dry-bulb temperature sensor is disconnected or causes shorted out.	Stop using the product immediately and call your local dealer or closest customer service center.
	Wet-bulb temperature sensor fault is indicated. - Alarm message [SNS2] blinking All controls stops.	The wet-bulb temperature sensor is disconnected or causes short circuit.	Stop using the product immediately and call your local dealer or closest customer service center.

	Trouble	Cause	Measure
Alarm message is indicated.	Door alarm is indicated. - Alarm message [DOOR] blinking Chamber fan and both heaters for temperature control and humidification stop working.	Door is opened during control operation.	Close the door.
	Low level alarm of water supply tank is indicated. - Alarm message [TANK] blinking Humidification control stops.	(1) It occurs when the level of the internal tank is [Empty] and it is kept for more than 10 minutes even though the [Water Supply] key is turned on,  (2) It occurs immediately when the level of the internal tank is [Empty] in case [Water Supply] key is turned off.	(1) It can be released by [Clear] key. When it is released, water supply action starts soon. Check the water level of the external tank and whether the hose includes air, if water cannot be supplied.  (2) It cannot be released by [Clear] key. Turn On [Water Supply] key first, and press [Clear] key to release it. And supply water into the external tank. Or turn ON [Manual Drain] key to release the alarm.
	Level sensor failure of water supply tank is indicated. - Alarm message [TKSN] blinking Humidification control stops.	The level sensor of water supply tank breaks down.	Stop operation immediately and call your service agent.
		The float switch may malfunction because of attached algae.	Clean the switch by referring to the chapter [Maintenance and Check-up] on P.42.
	Water supply fault is indicated. - Alarm message [FLW] blinking Humidification control stops.	The wick holder and humidification tray (top/bottom) cannot be filled with water, although the water supply pump works.	The pump cannot supply water if the hose of suction side includes air. Open the ventilation cover and squash the hose several times to remove the air.
	Full drain tank alarm is indicated. (Optional tank) - Alarm message [DTK] blinking Humidification control stops.	The optional drain tank is full. (10L)	Drain the water, and press [Clear] key to release the alarm. After the alarm is released, the control operation is continued.
	Upper limit fault of humidity is indicated. - Alarm message [HU2] blinking Humidification control stops.	The measured humidity is 100% or lower than 0% and it is kept for more than 15 minutes. (When the measured temperature is lower than 0°C, the humidification control is out of range, and 0% or 100% is indicated.)	Check the tube connection and the condition of wet-bulb wick. The alarm can be released by [Clear] key.
	Overheat alarm is indicated. - Alarm message [OVR] blinking All controls are continued.	After the measured temperature reached to the set-point, it rise 5°C or more than the setting temperature.	This alarm occurs a little later on when the measured temperature is within ±1°C range of set temperature. Wait awhile until the measured temperature reaches to ±1°C range of set temperature, immediately after you set temperature or defrost operation. Also, it may occur when the door is opened or closed, or any obstruction blocks the ventilation port of chamber. The alarm indication can be cleared by [Clear] key.

	Trouble	Cause	Measure
Alarm message is indicated.	<p>Overcool alarm is indicated.</p> <ul style="list-style-type: none"> <li>- Alarm message [OVC] blinking</li> </ul> <p>All controls are continued</p>	<p>After the measured temperature reached to the set-point, it rise 5°C or more than the set temperature.</p>	<p>This alarm occurs a little later on when the measured temperature is within ±1°C range of set temperature. Wait awhile until the measured temperature reaches to ±1°C range of set temperature, immediately after you set temperature or defrost operation.</p> <p>Also, it may occur when the door is opened or closed, or any obstruction blocks the ventilation port of chamber. The alarm indication can be cleared by [Clear] key.</p>
	<p>Power failure alarm is indicated.</p> <ul style="list-style-type: none"> <li>- Alarm message [OFF] blinking</li> </ul> <p>All controls are continued</p>	<p>Power failure occurs while controlling and the unit recovers.</p> <p>Or the unit is shut down by the power switch without stopping the operation by [Run Stop] key, and the unit started up again.</p>	<p>The operation is continued from the time of shutdown with keeping elapsed time, set temperature and humidity.</p> <p>The alarm indication can be cleared by [Clear] key.</p>
	<p>Humidity control fault is indicated.</p> <ul style="list-style-type: none"> <li>- Alarm message [HU1] blinking</li> </ul> <p>All controls are continued</p>	<p>Although the normal humidity control is continued, the measured humidity exceeds ±20%RH range of the set humidity in 60 minutes.</p> <p>It is thought to be aftereffects of sharp change of set value of temperature and humidity, shortage of wick moisture, or freeze-up of wick, obstructions of ventilation port, or storage of hygroscopic or evaporable samples.</p> <p>Or the humidification tray (top/bottom) becomes empty and boil-dry, and the heater for humidification (top/bottom) is stopped automatically. or the heater fault occurs, and it causes above-mentioned status.</p>	<p>Check the setting, wet-bulb wick condition, water supply status, and samples in the chamber.</p> <p>The alarm indication can be cleared by [Clear] key.</p>
	<p>Cooling fault is indicated.</p> <ul style="list-style-type: none"> <li>- Alarm message [COL] blinking</li> </ul> <p>All controls are continued</p>	<p>Although the refrigeration unit works and the heater stops, the measured temperature cannot be lowered 1°C per following period.</p> <ul style="list-style-type: none"> <li>- Measured temp.: -5°C or higher → 30 minutes</li> <li>- Measured temp.: less than -5°C → 60 minutes</li> </ul>	<p>The alarm may occurs because the temperature is influenced by the humidification control when the humidity is out of its control range or the ambient temperature is high. Set the humidity within the control range, and lower the ambient temperature.</p> <p>Check the maximum cooled temperature in the cooling curve with 35°C room temperature,</p> <p>If the refrigeration unit does not work or you hear abnormal noise from it, the unit must be repaired.</p> <p>The alarm indication can be cleared by [Clear] key.</p>
	<p>Temperature gradient fault is indicated.</p> <ul style="list-style-type: none"> <li>- Alarm message [PRG] blinking</li> </ul> <p>All controls are continued</p>	<p>The measure temperature deviates from the ±5°C range of the target point during the gradient control, and it is kept for 10 minutes or longer.</p> <p>Or the setting of gradient exceeds the control performance of this unit.</p> <p>And the alarm may occur when the door is opened or closed.</p> <p>[Example] When the alarm occurs in the segment 5 of Program 3, [PRG3S5] is shown,</p>	<p>The alarm indication can be cleared by [Clear] key.</p>

Trouble		Cause	Measure
Alarm message is indicated.	Watch-dog * All indications disappear, and any key operation is not accepted. All controls are stopped.	It detects the crush of temperature controller by excessive noise, and stop the microprocessor.	The unit can recover if the noise is solved and the unit is turned off once and started up again. Though some of backed up data may be cleared. Run the zero clear operation. (Refer to the page 48 of the key operation manual.)

Pressing [Clear] key can cancel the alarm message and stop the buzzer sound. Otherwise the buzzer stops automatically 15 seconds later, even if you do not press [Clear] key. The door alarm buzzer stops about 1 second later.

However, the alarm that stops the control operation cannot be released completely by [Clear] key. Turn off the power switch once, and turn on it again.

If the alarm cannot be released, or when the alarm occurs frequently even though the unit is restarted, run the zero clear operation to return all settings to default values before shipment. (Refer to page 48 of the key operation manual.)

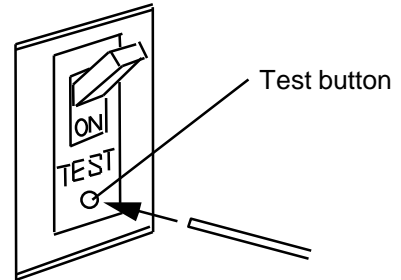
If that alarm still occurs, it is presumable that some parts cause troubles. Call your local dealer or closest customer service center and inform them the current detailed status and the indicated alarm message.

## 7-1 Operation test for residual current device

**Caution**

Conduct operation test regularly for residual current device

If residual current device has any trouble, it may cause electric shock when leakage occurs. Conduct test once or more time in a month.



## 7-2 Cleaning and caring the product

**Warning**

Do not disassemble the unit.

There are heating part and electric parts inside of the unit. Do not disassemble the unit to prevent electric shock hazard or injuries.

**Caution**

Clean or care the unit after it is cooled enough.

Clean or care the unit after it is cooled enough to avoid burning your hands.

**Caution**

Use proper cleaning material.

Do not use cleanser, benzine acid liquid or other petroleum emulsion. Do not pour water directly on the exterior or inside of unit. It may cause electric shock hazard or may damage the unit.

**Caution**

Do not touch the cooling fan with your bare hands.

Do not touch the cooling fin with your bare hand. Edgy fin may cut your hands.

Clean or care the unit after turning off the power switch, residual current device and unplugging mains connector from the AC outlet.

**1. Cleaning exterior of unit**

For cleaning the unit, wipe with soft wring-up wet cloth.

To remove greasy dirt, use some neutral detergent, if needed. And clean off the detergent with a cloth.

## 2. Cleaning the chamber

Clean the chamber interior as appropriate with removing bracket holder, brackets, shelves, and bottom plate.

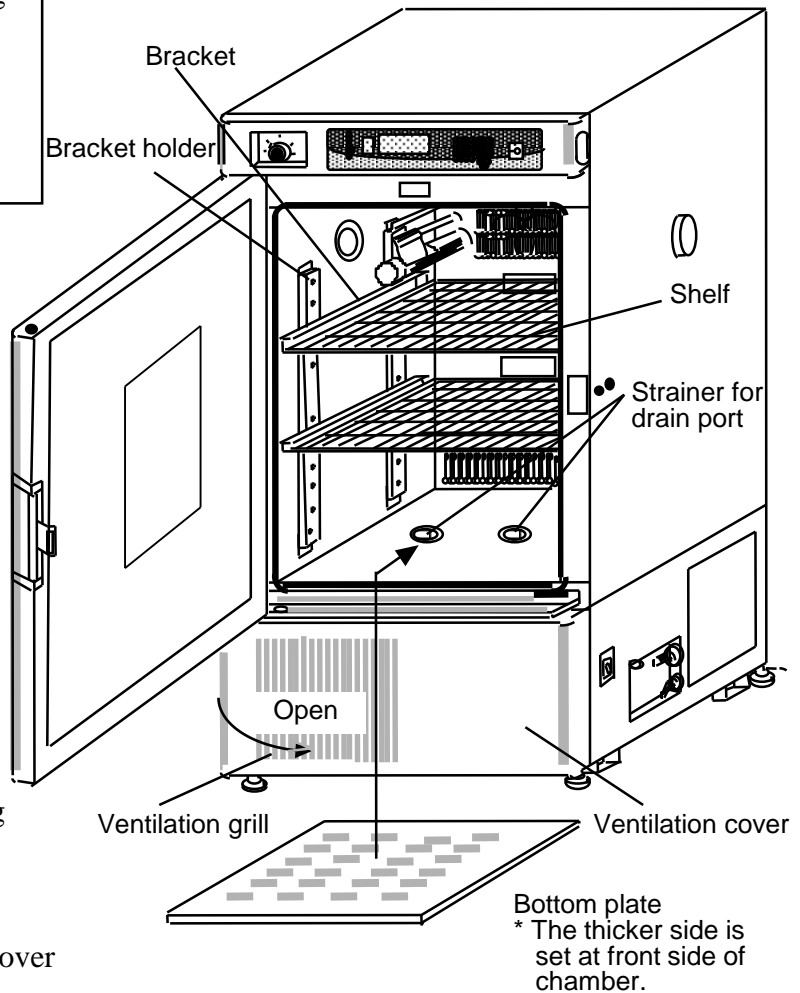
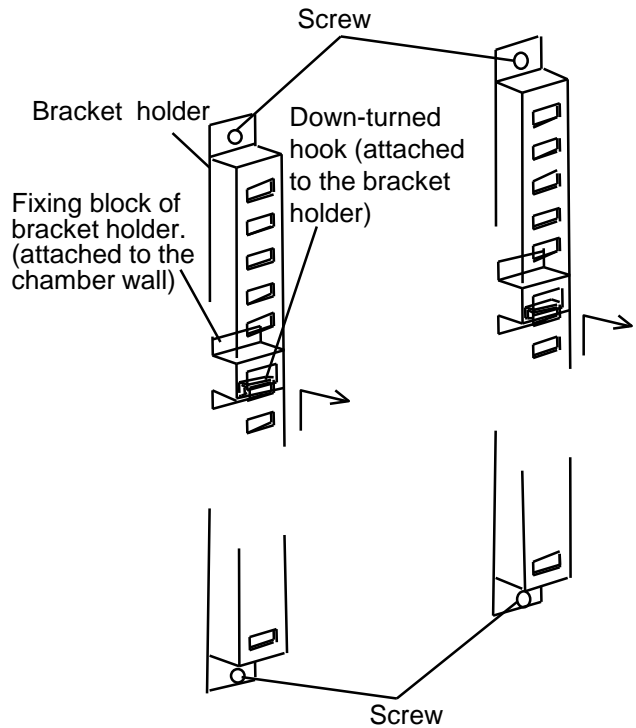
Wipe with soft wring-up wet cloth.  
To remove greasy dirt, use some neutral detergent, if needed. And clean off the detergent with a cloth.

To remove the bracket holder, loosen both top and bottom screw of holder and slide the holder upward. Repeat the same step for other three holder.

You will find a strainer for drain port at the bottom of chamber, after the bottom plate of chamber is taken out.  
Clean the strainer.

\*\*\* Antibacterial silver stainless steel \*\*\*  
In this unit antibacterial silver stainless steel is used as the material of interior. Antibacterial silver stainless steel has high antibacterial spectrum at 99% or more in multiple screening test of antibacterial effective (Film coherent method). The effect is also shown in our sampling test of chamber air to be beneficial for antibacterial ability.

Bracket holder, brackets and a part of chamber interior is not made of antibacterial silver stainless steel.

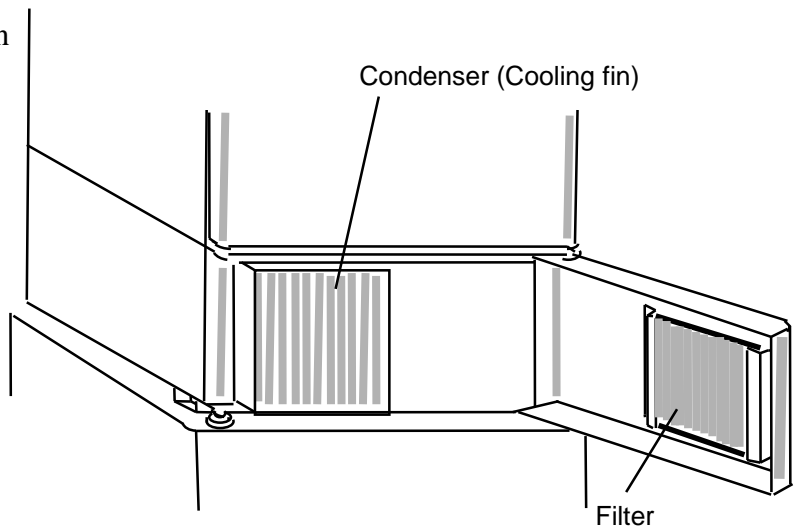


## 3. Cleaning of refrigeration unit filter

The operation with the clogged filter worsens the cooling performance. Also, some troubles are caused on the refrigeration unit.  
Clean the filter on a regular schedule depending on environmental or operating condition.

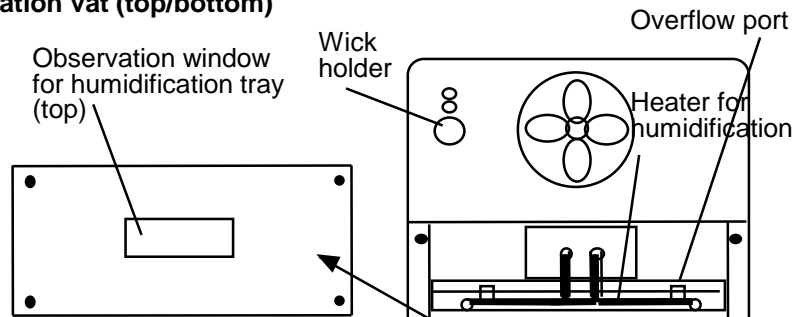
- (1) The filter is attached at inside of the ventilation port.  
Hold the left edge of the ventilation cover with your hand, and pull it open.

- (2) Take out the filter from the ventilation cover.
- (3) Tap the filter to remove dust, and wash it with water. (Use some neutral detergent, if needed.)
- (4) Dry the filter enough. (Since the filter is made of heat-sensitive material, do not use dryer and etc.)
- (5) Attach the filter to the ventilation cover, and close it.



#### 4. Draining from wick holder and humidification vat (top/bottom)

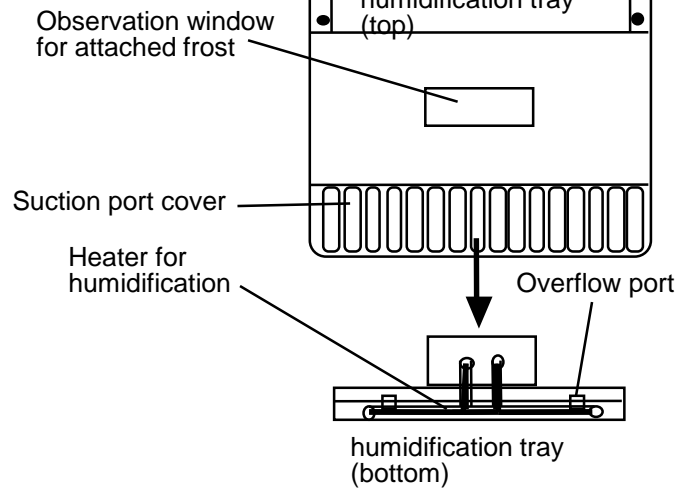
If you use the unit for a prolonged period, water stain and scale or some algae attach. Press [Manual Drain] key to run the forced draining operation, and change the water during periodic intervals. The water is drained completely for about 5 minutes later.



#### 5. Cleaning of humidification trays (top/bottom)

You can find the top humidification tray through the observation window. And the bottom humidification tray is put in the back of the suction port cover. Clean both humidification trays regularly.

- (1) Turn on the [Manual Drain] key to drain the water of wick holder and both humidification trays.
- (2) Turn off the power switch and the mains switch.
- (3) Loosen four screws of the second step plate from the top of rear side, which has the observation window.
- (4) Hold the bottom edge of suction port cover, and pull it to detach.
- (5) Clean both top and bottom humidification vat. As each tray has a strainer, remove it to clean.



\* You can ask the maintenance of unit to your service agent at regular intervals.

#### 6. Check-up of wet-bulb wick

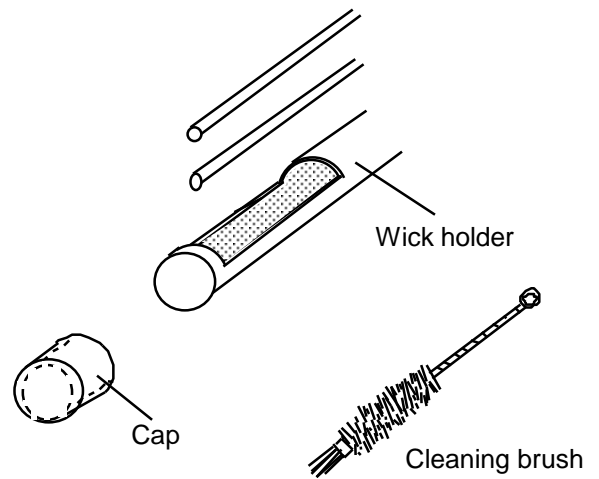
The wet-bulb wick is a consumable part accessory. Check it as needed depending on the operating condition. If it is discolored or deteriorated, replace it with new one. Change the wick every month. (Refer to the clause of attaching of wick on P.27.)

Description	Quantity	Cat. No.
Wet-bulb wick	1 dozen	205190



## 7. Check-up of wick holder

If you use the unit for a prolonged period, water stain and scale or some algae attach. Press [Manual Drain] key to run the forced draining operation, and change the water during periodic intervals. The water is drained completely for about 5 minutes later.



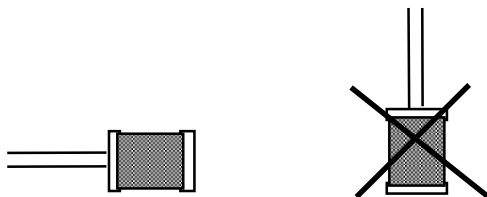
## 8. Check-up and cleaning of internal water-supply tank and strainer for pump

If you use the tank for a prolonged period, some algae attach. Change the water during periodic intervals.

Open the ventilation cover at the front of unit following same procedure for the refrigeration unit filter (P.44). Pull out the drain hose from the unit, and remove the drain stopper to drain the inner water into some receiver which capacity must be 10L or more.

Detach the socket of pump tube (suction side), and remove the cap of tank to clean the strainer.

Rinse the strainer with clean water. Attach the strainer not to mistake its attaching direction. It must be attached crosswise as shown below.



Set up the strainer as shown in the picture above

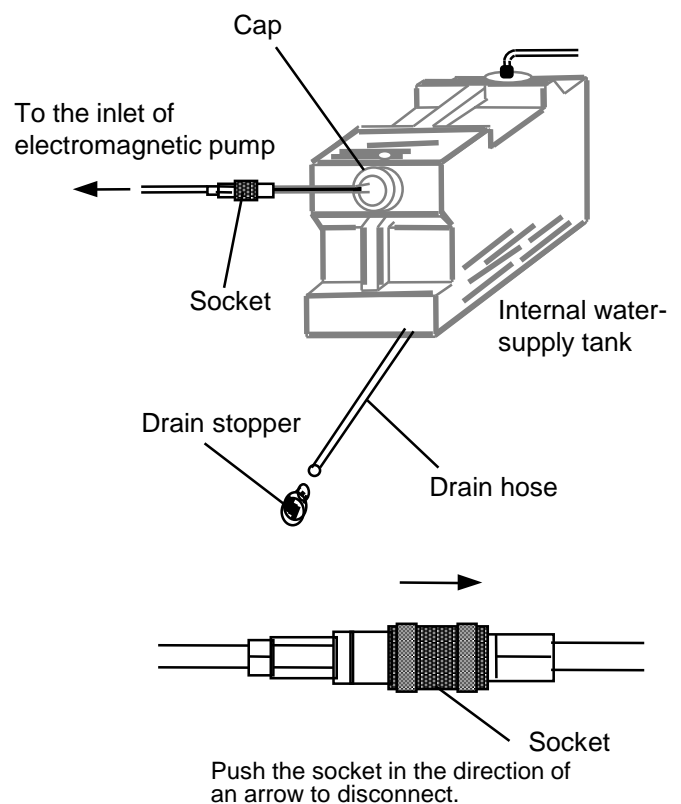
When you clean or maintenance the unit, turn off the power switch and the mains switch, and disconnect the mains plug from AC outlet port to prevent receiving electric shock and avoid to cause some mechanical trouble of unit.

## 9. Check-up and cleaning of other flow lines.

Open the ventilation cover. If the internal water supply tank or connected flow lines are dirty, please call your local dealer or closest customer service center.

## 10. Cleaning observation window

Observation may have dew condensation depending on setting temperature, ambient temperature, ambient humidity and temperature in the chamber. Wipe it off with soft cloth if needed.



- Observation window is glassware. If you damage the window, glass may be broken and cause you physical injury. Use care when handling it.
- Heater for reducing dew condensation (on the chamber side) starts working for observation window depending on setting temperature. If the heater is turned on, door part situated around the observation window may be in high temperature (lower than approx. 60°C). Be careful when touching the part.
- When using the unit at high setting temperature, humidity and low ambient temperature, inner side of the observation window may have dew condensation even though the heater for reducing dew condensation heater is turned on. Also, the outside of the window may have dew condensation when the setting temperature is low (lower than 0°C), and humidity and ambient temperature is high. Though it does not cause any trouble, use the unit at about 20°C (room temperature) when the setting temperature and humidity is high, and when the setting temperature is low, use it in a low humidity location.
- It takes some times to reduce dew condensation after the heater for reducing dew condensation (on the chamber side) is turned on.

## 8 Disposal of the unit

To dispose the unit, follow the disposal standard of your country.

	Model	Net weight	Overall dimensions
Main unit	KCL-2000W	127 kg	600W × 751D × 1285H mm
		26 kg	635W × 755D × 410H mm
Coolant	R-134a	245g	—

## 9 After-sales service

1. When the unit does not work well, please refer to the section “Troubleshooting” and follow the instructions.
2. If that failure mode still remains, please call your local dealer or closest customer service center.