

EYELA

Environmental Chamber

KCL-2000A**Instruction Manual****Important**

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

**Read carefully the chapter [For safety operation]
before operating this unit.**




Keep this instruction manual beside the unit.

For safety operation

1. Warning signal words

Any flammable material such as organic solvent cannot be contained in this unit. On account of the function and characteristic, some parts of this unit will be heated 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	Indicates a strained hazardous situation which, if you use incorrectly, could result in death or serious injury.
 Warning	Indicates a potentially hazardous situation which, if you use incorrectly, could result in death or serious injury.
 Caution	Indicates a potentially hazardous situation which, if you use incorrectly, may result in injury or physical damage.

We investigate enough possible hazards during the operation, however it is very difficult for us to find every hazardous occasions. Therefore this manual cannot describe all hazardous operations. Please follow this manual and be careful to operate the unit, to prevent injuries or physical damages.

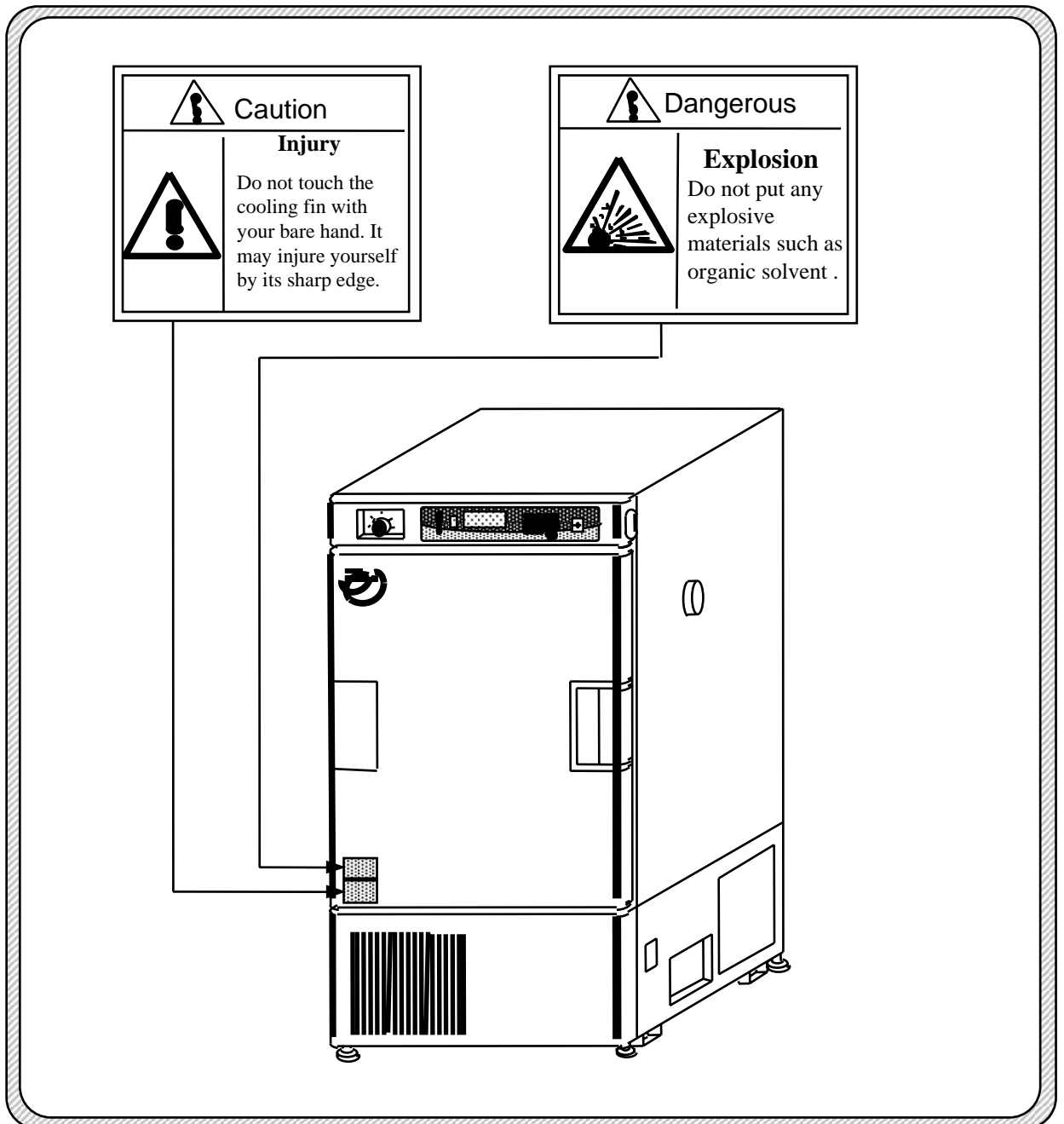
2. Warning label

A warning label is attached to the unit to refer the most important clause.

The attached position is shown as below.

Be careful to use the unit referring warning messages.

- * When the warning label is worn and hardly show the message, change it with a new one.
Please order us a new label.



Introduction

This instruction manual describes the procedure of installation, operation, trouble shooting, maintenance / check-up, and disposal for Environmental chamber KCL-2000A.

Read this manual carefully before operation.

We have the key operation manual for this unit to provide an explanation of key operation. Refer it to operate the unit.

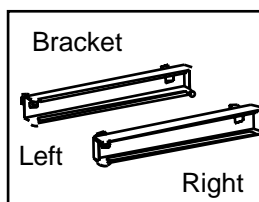
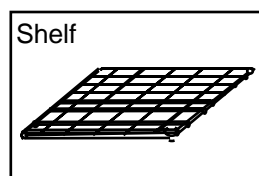
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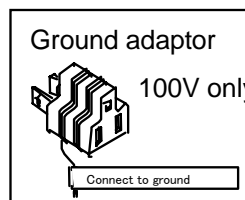
Packing contents

Check quantities referring to the below table.

Model		KCL-2000A	Model		KCL-2000A
Contents			Contents		
1	Main unit	1	12	Wet-bulb wick	5
2	Shelf	2	13	Drain hose	1
3	Bracket Right	2	14	Silicone stopper	1
	Left	2	15	Alarm output connector	1
4	Hinge bearing	1	16	Dropper	1
5	Right bottom hinge	1	17	Washing brush	1
6	External water tank	1	18	Ground adaptor	1
7	Rack for Ext. water tank	1	19	Instruction manual	1
8	Fixing plate for rack of tank	1	20	Key operation manual	1
9	Screw	2			
10	Water supplying hose set	1			
11	Hose	1			



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



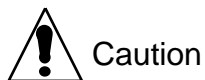
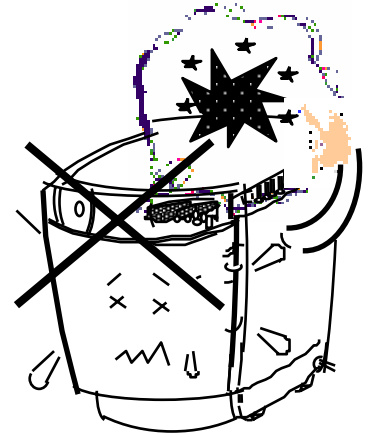
1 For safety operation

This unit is not an explosion-proof structure.
Take a sufficient care for safe operation in using the unit.



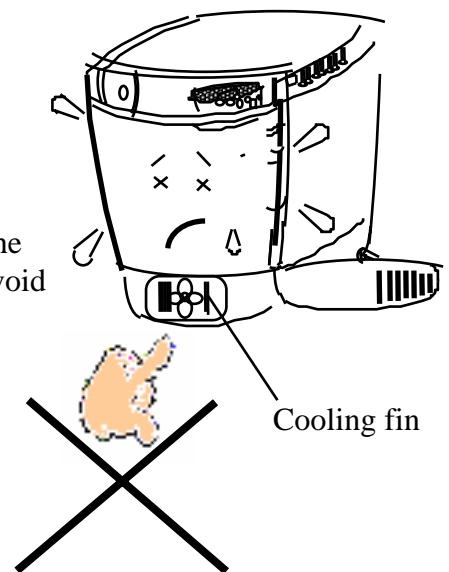
Do not put igniting materials as organic solvent into the chamber.

While operating, temperature of inside of the unit is so high that sample materials may be vaporized, and ignited or exploded. Igniting materials are nitrates, nitro compounds, etc. and explosive materials are chloride peroxides, inorganic peroxides, salt nitrates, organic solvents etc. This unit is not an explosion-proof structure.



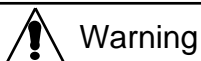
Do not touch the cooling fin with your bare hand.

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

2-1 Application



Do not remodel.
Do not use out of applications.

Remodeling or use out of applications may cause electric shock hazard and mechanical troubles.

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-2000A
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 ±0.5°C/±3%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"> • Set/Measured temperature, Set/Measured relative humidity, Total time (1 min.~999 days 23 hrs. and 59 min.) • Graphic display (Switch-over)
Defrosting system *2	<ul style="list-style-type: none"> • Normal mode : Automatic control by microprocessor (Interval defrosting mode) • Manual mode (Manual start, Automatic stop/Manual stop)
Program	<ol style="list-style-type: none"> 1.Auto-start program (1 min.~99 days 23hr. 59min.) 2.Auto-stop program (1 min.~99 days 23hr. 59min.) 3.User's program (7 patterns) <ul style="list-style-type: none"> • 1 pattern : contains Max. 10 segments, 1 min.~99 days 23hr. 59min./1 segment • Repetition time of program : 1~999 times or endless • Program type : Target precedence control of temperature and humidity, Step control, Gradient control
Other functions	<ul style="list-style-type: none"> • RS-232C interface • Recorder output terminal for temperature and humidity • Alarm output terminal (Contact voltage type) • Calibration of temperature indication • Maintenance mode • External water supply • Forced draining • Input terminal for drain tank alarm
Safety features	<p>Electric leakage and excess current breaker, Door switch Independent over temperature protector (Variable type +30~+93°C) Independent over temperature 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.</p>
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 pce. as standard with 2 brackets
Shelf size	468W × 375D (mm)
Pitch of bracket holder / No. of columns	40mm pitch 5 levels/2 columns
Door	Without observation window (not having inner door) Opened from side to side by changing door hinge
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 : 10 μs/cm or less
Tank capacity	Inside : Approx. 10L (Detachable) Outside : Approx. 20L (connected by one-touch socket)

Model	KCL-2000A
Recorder output	Measurement of temperature : 1°C/1mV Measurement of humidity : 1%RH/1mV
Alarm output	Contact capacity AC250V 5A Normal : OFF Abnormal : ON
Drain port	Nozzle OD 11 × ID7 mm
Ambient temperature range	5 ~35°C
Overall dimensions *3	635W × 755D × 1695H mm
Net weight *4	145kg
Power input	15A 1.5kVA
Rated power source	AC100V 50/60Hz

*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 temp. and humidity 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.

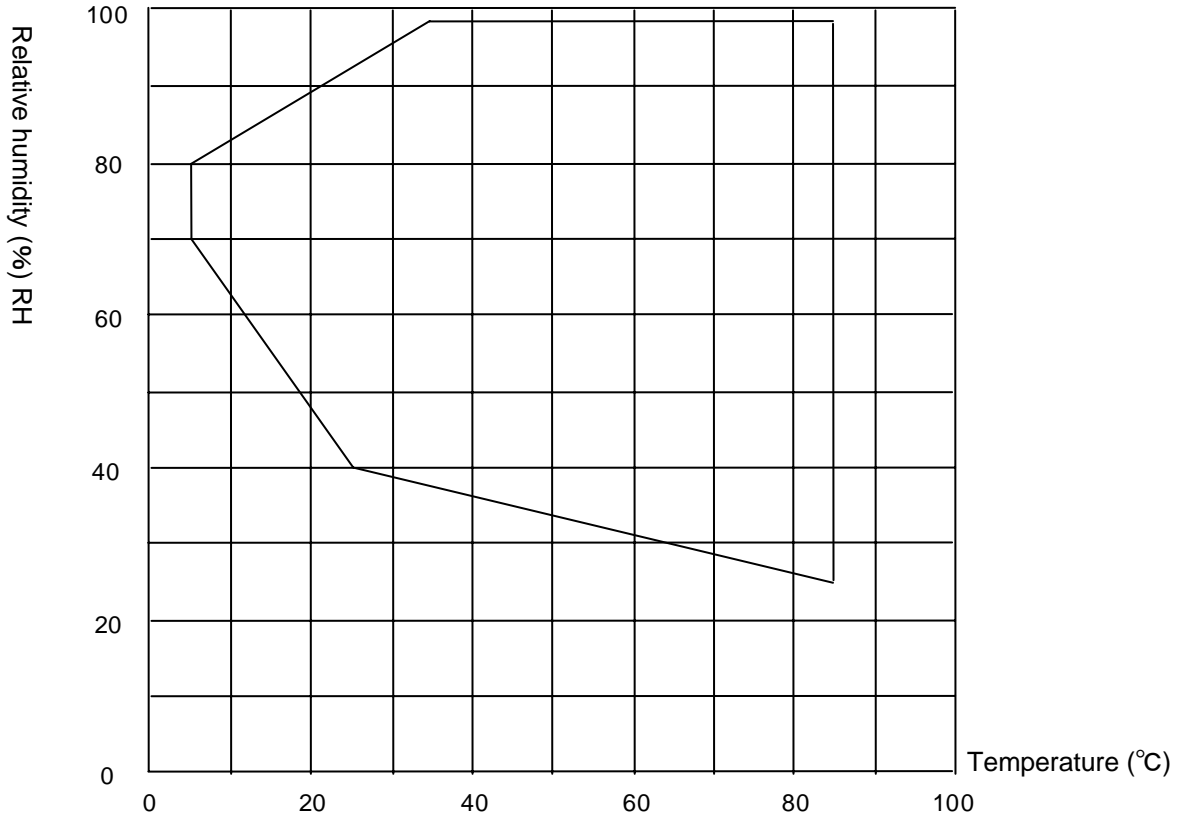
If the rack is not used, the net weight is about 119kg.

*

The require time to heat and cool, and to humidify, temperature and humidity control accuracy, and temperature and humidity uniformity depend on the environmental temperature, power source voltage, with load or without load.

Humidification control range

(1) 20°C room temperature, unloaded condition



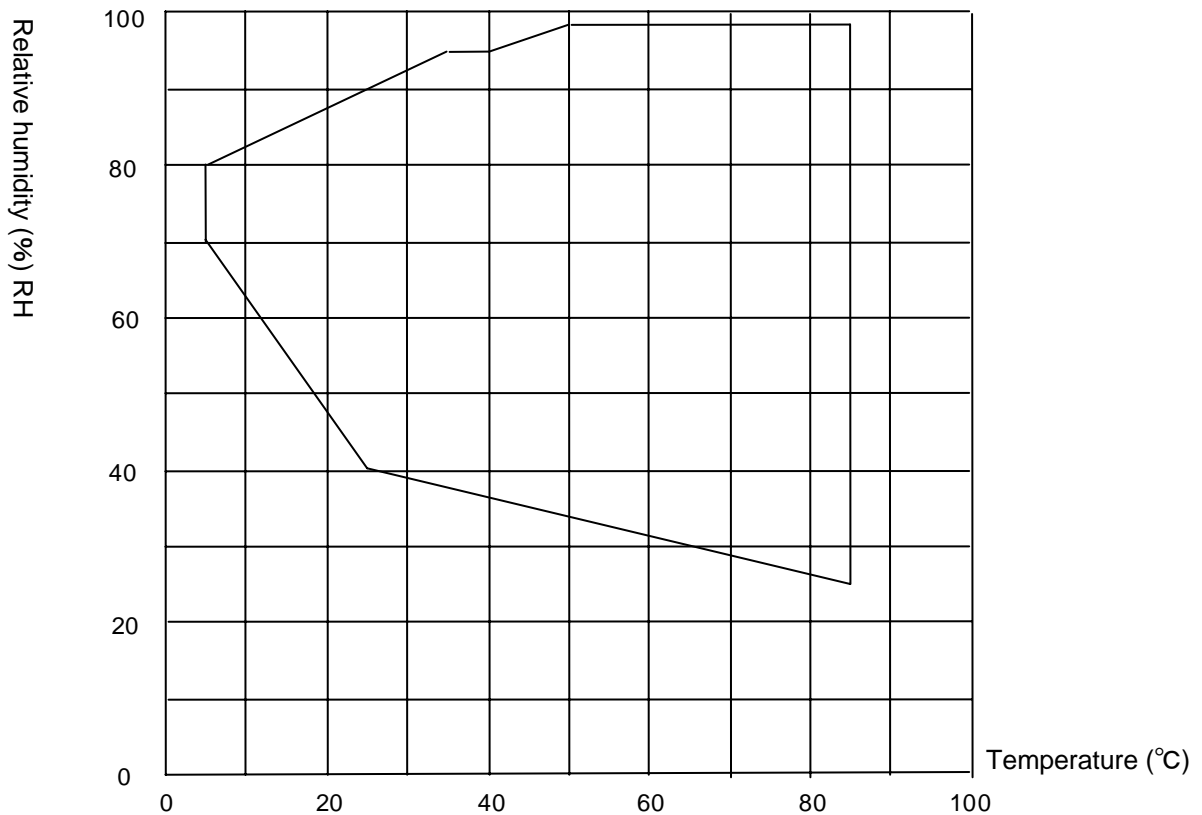
*1 Temperature control accuracy depends on the environmental conditions such as load condition.

*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 chamber temperature is raised about 3°C, and the chamber humidity is raised about 20%RH, when the defrosting mode works under 20°C of room temperature.

These variations depend on actual operating conditions.

(2) Reference data : 35°C room temperature, unloaded condition

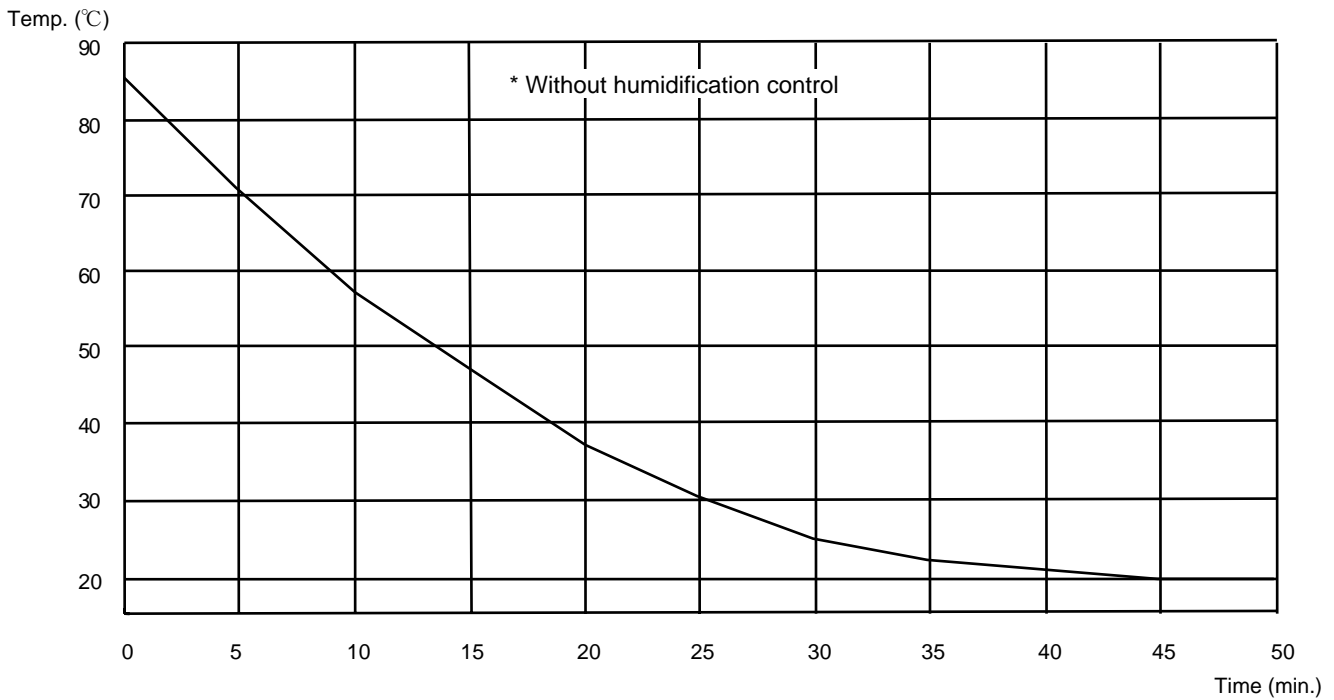


2-3 Heating and cooling data

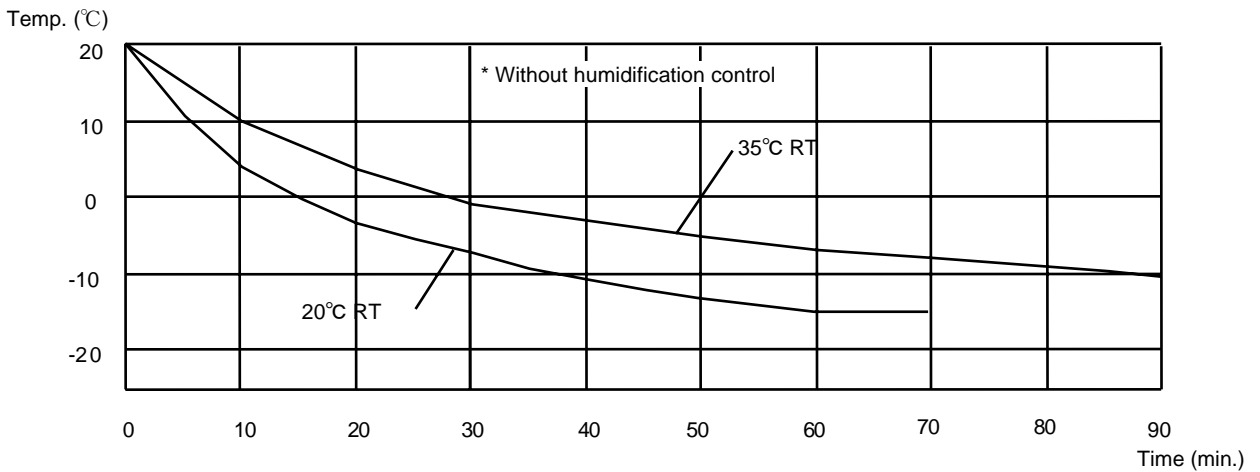
- AC-100V 50Hz
- Unloaded condition

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

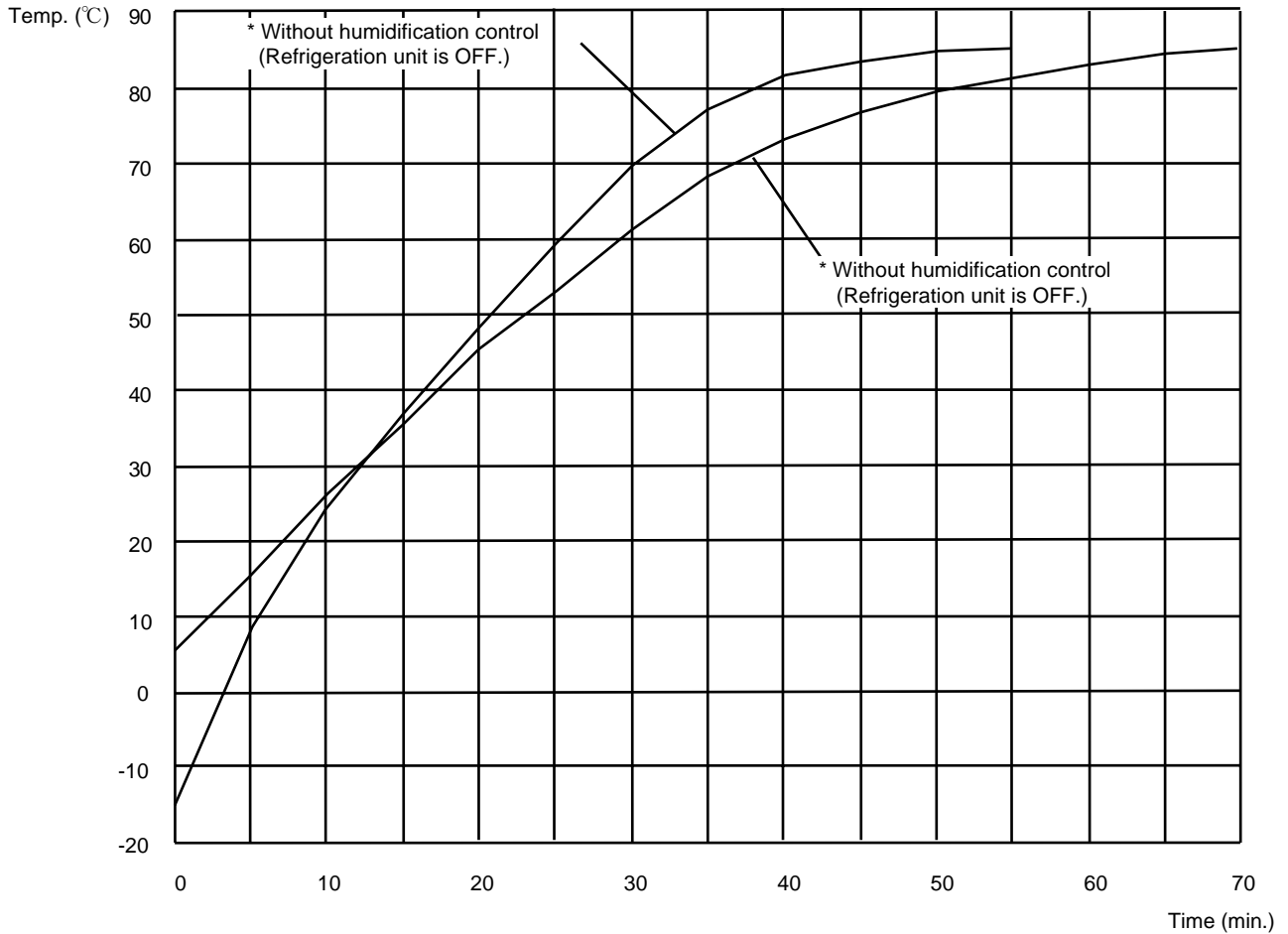
(1) 20°C room temperature, Cooling curve (85→20°C)



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



(3) 20°C room temperature, Heating curve (85→20°C)



2-4 Optional accessories

● Drain tank

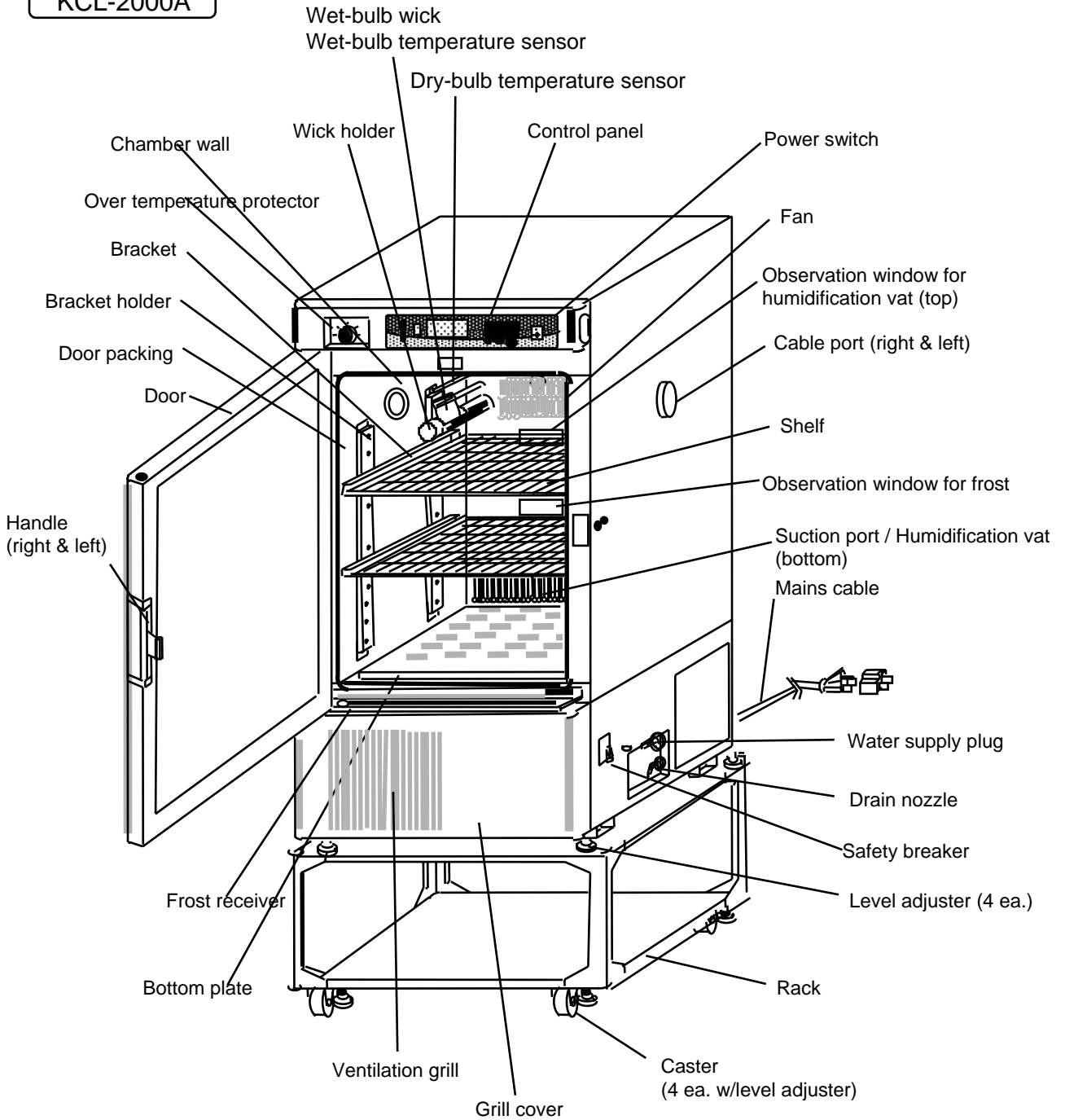
If 10L capacity drain tank is full (option), the unit indicates alarm message and stops temperature and humidity control.

Description	Drain tank
Cat. NO.	204960

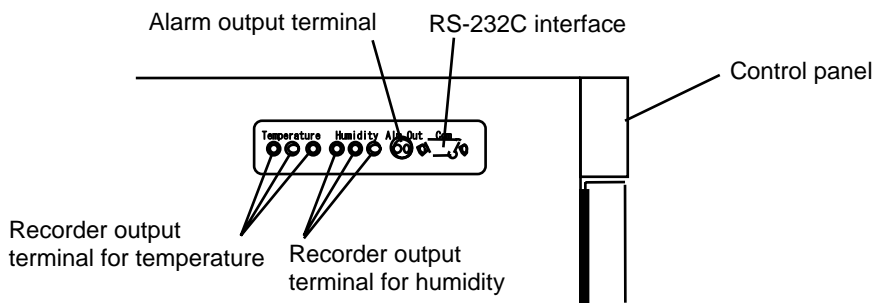
The tank cannot be used when the chamber is unit is not placed on a rack because the tank must be placed at 310mm or lower position than the chamber unit.

2-5 Descriptions

KCL-2000A

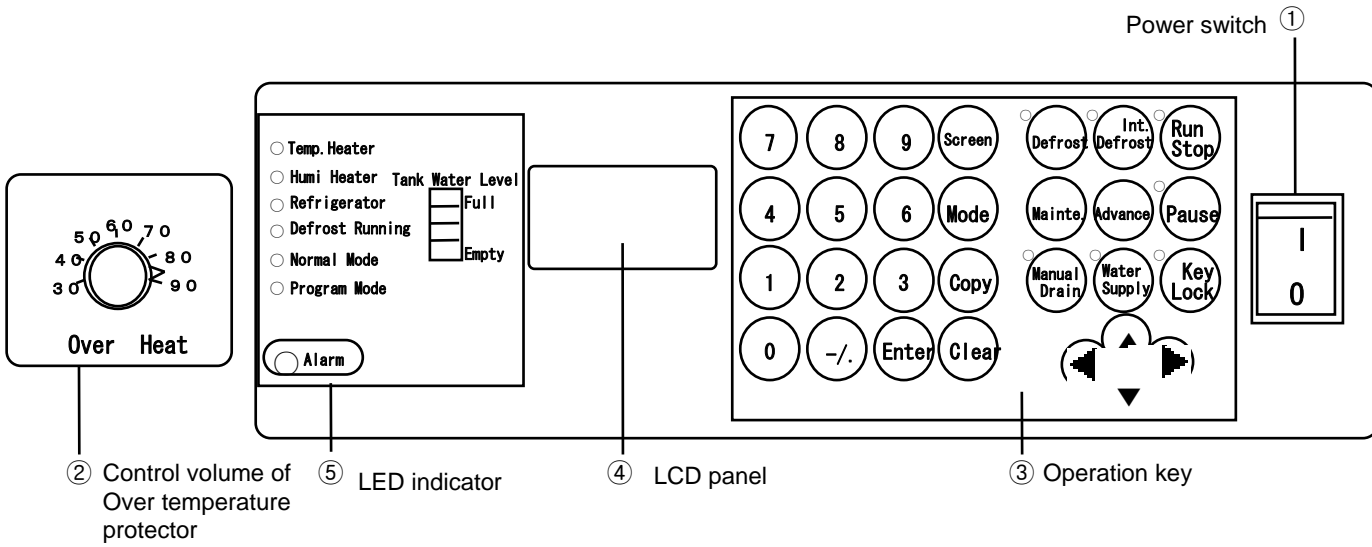


Left side view



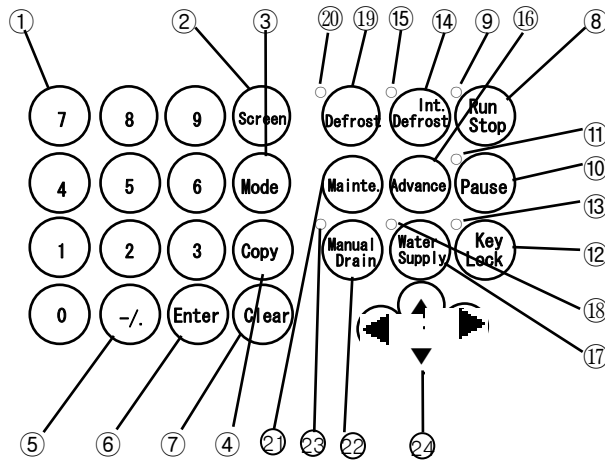
3 Descriptions and function of control panel

3-1 Control panel



No.	Description	Function
①	Power switch	It turns on and off the unit.
②	Over temperature protector	<p>You can set the over temperature protection value within the range 30 ~ 90°C through this volume switch.</p> <p>In case that the temperature is between the set point and 80°C, set the over temperature protection value 10°C higher than the set point. If the set point 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>

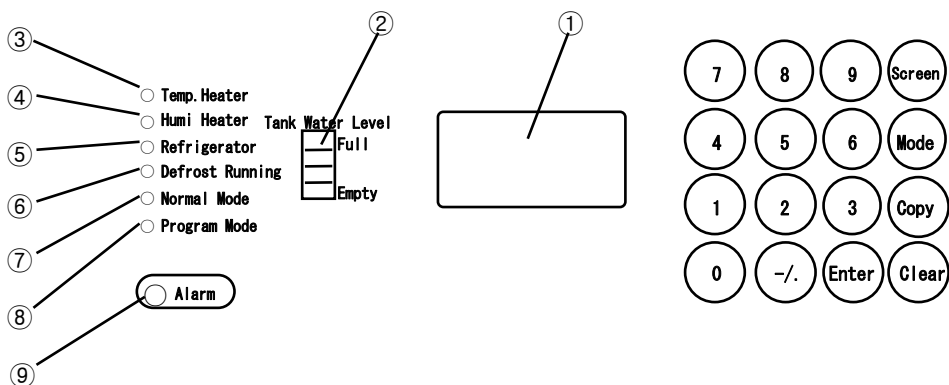
3-2 Operation keys and key lamps



No.	Description	Function
①	Numeric keypad [0] ~ [9] key	It is used to enter 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)	It changes over [Normal mode] and [Program mode].
④	[Copy] key (Copy function key)	The set temperature and humidity of the previous segment can be copied in user's program No.3 ~ 11. (The time cannot be copied. In the segment 0 this function does not work.
⑤	[-./] key	If you press this key in the lead of the value, [-(minus sign)] is entered, and if you press in the middle of the value, [(decimal point)] is entered.
⑥	[Enter] key	It sets the input data entry, switch of input mode.
⑦	[Clear] key (Clear key)	It clears the input data, releases alarms. * Some alarms cannot be released by this key. (Refer to the chapter [Release of alarm] on P.17.) And you can cleared all data of the selected program, if you select one program by [Mode] key.
⑧	[Run/Stop] key	Press and hold this key for more than 1 sec. to prevent operation mistake. The control operation is started or stopped.
⑨	[Run/Stop] key lamp	It illuminates 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 kept. If you press the key once again, the [Pause] function is released, the operation is continued.
⑪	[Pause] key lamp	It illuminates while the pause function is active.
⑫	[Key Lock] key (Operation key lock function)	Press and hold this key for more than 3 sec. to prevent operation mistake. All operation keys are locked except this key, and any key operation is not accepted. If you press the key once again for more than 3 sec., the [Key Lock] function is released.
⑬	[Key Lock] key lamp	It illuminates while operation keys are locked.

No.	Description	Function
⑭	[Int.Defrost] key (Automatic defrosting)	It 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℃ or lower. While operating, Defrost Running lamp illuminates.
⑮	[Int.Defrost] key lamp	It illuminates 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	It illuminates when the water supply is active.
⑲	[Defrost] key (Forced defrosting)	It turns ON/OFF the forced defrosting operation. Press this key when the control operation stops to run the defrosting operation. While operating the Defrost Running lamp illuminates.) When the defrosting operation is completed, it stops automatically.
⑳	[Defrost] key lamp	It illuminates when the forced defrosting operation is active.
㉑	[Meinte.] key (Maintenance mode)	This key change the operation to the maintenance mode. Temperature and humidity indication calibration can be set, and the measurement/indication of time for humidification vat, wet-bulb wick, and condenser filter, and measurement/indication of total operation time of unit
㉒	[Manual Drain] key (Forced draining)	The top and bottom humidification vat, wet-bulb wick vat can be drained by compulsion. While executing forced draining, the humidification control and water supply are stopped.
㉓	[Manual Drain] key lamp	It illuminates when the forced draining operation is active.
㉔	Cursor key [▲][▼]◀ ▶ []	It 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	It 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)	It illuminates when the temperature heater is active.
④	Humi. Heater lamp (Humidification heater lamp)	It illuminates when the humidity heater is active.
⑤	Refrigerator lamp (Refrigeration unit lamp)	It illuminates when the refrigeration unit is active.
⑥	Defrost Running lamp (Defrosting operation lamp)	It illuminates when either forced defrosting or automatic defrosting operation is active.
⑦	Normal Mode lamp	It illuminates when the normal mode is active.
⑧	Program Mode lamp	It illuminates when the program mode is active.
⑨	Alarm lamp	It illuminates when some alarm occurs,

3-4 Overview of operation

There are two operation modes normal and program.
There are five patterns of program from No.1 to 11.
See the key operation manual to know details of setting procedure and others.

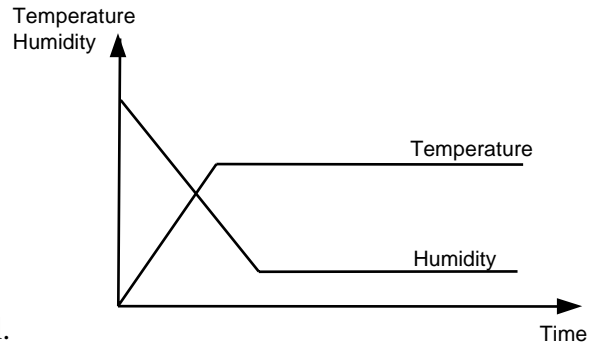
Normal mode

• Set-point control

After setting a temperature and start 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 $0\sim 98.0\%\text{RH}$)

- The setting range is same in program and normal.
- 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 $2\%\text{RH}$.

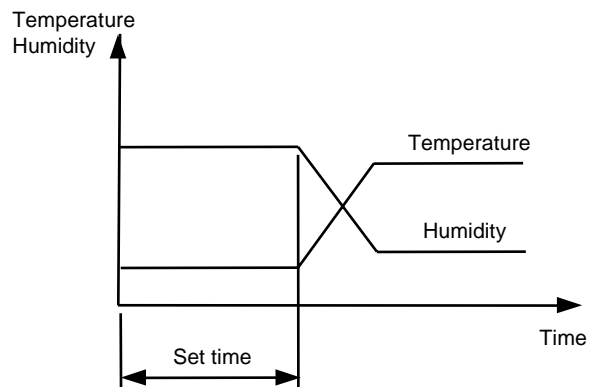


Program mode

1. Program 1 (Auto start program)

You can set a temperature, humidity and start delay time.
After the set time elapses, operation starts and continues at the set temperature.

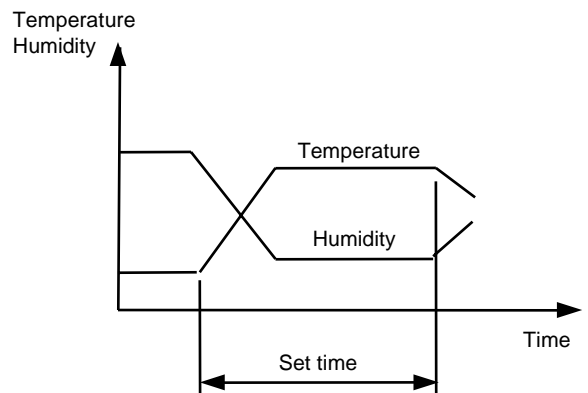
- * Time setting range : 1 minute \sim 99 days 23 hours 59 minutes.



2. Program 2 (Auto stop program)

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

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



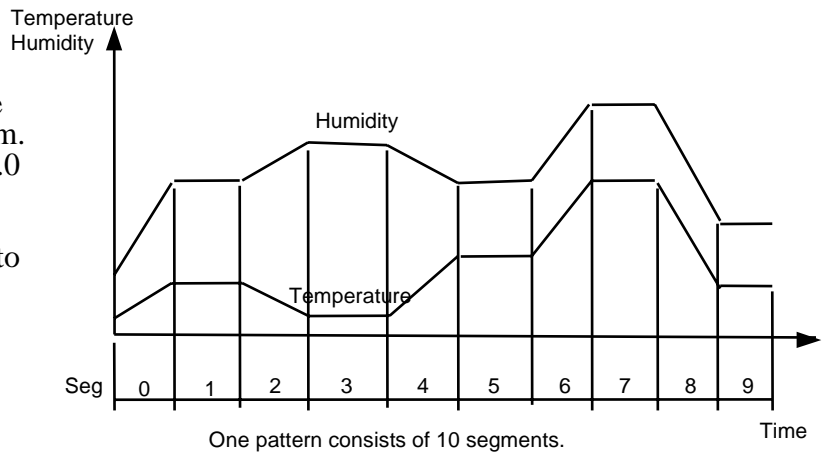
3. Program 3 ~ 9 (User's program)

You can set a temperature, humidity, time and repetition times to operate the program. One program consists 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.

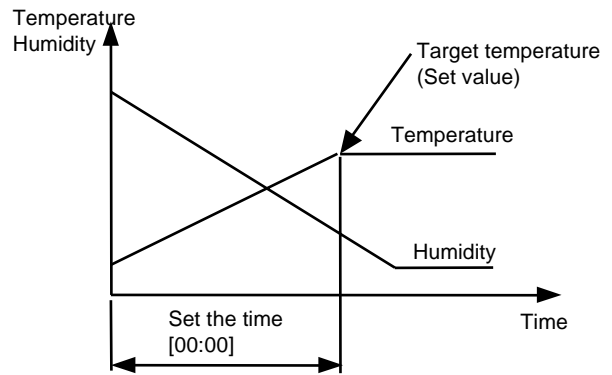
* Time setting range : 1 minute ~ 99 days 23 hours 59 minutes.

The operation starts under

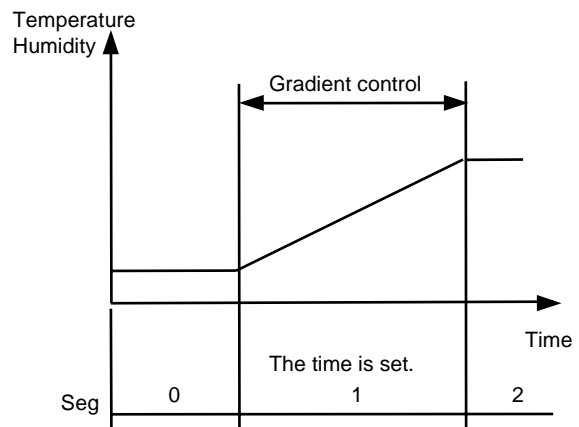
- (1) Target temperature precedent control,
 - (2) Target humidity precedent control, or
 - (3) Time precedent control
- depending on the time setting.



- (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.



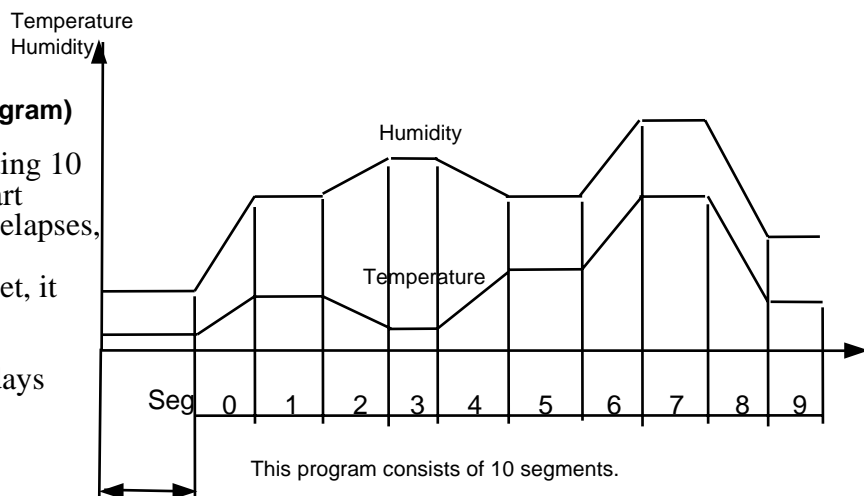
- (3) Time precedent control
When you set a time within the setting range 1 minute ~ 99 days 23 hours 59 minutes, the gradient control is executed. The gradient rate is resulted from that the difference between the previous set value and the current set value is divided by the set time.

* 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 start delay time. When the start delay time elapses, the set 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.

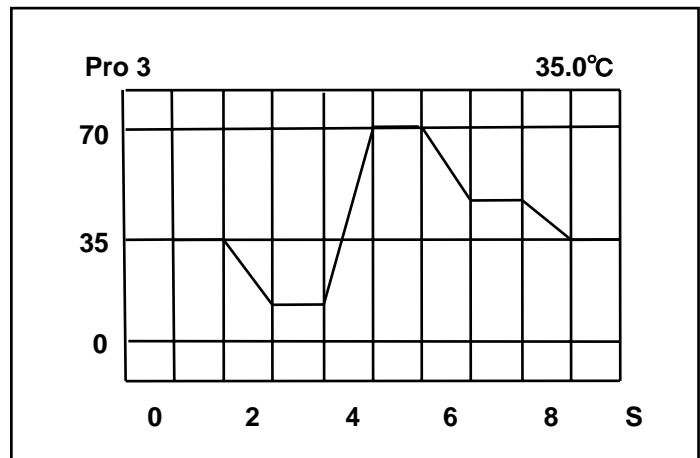
* The setting of the repetition times for each user's program (No. 3~9) becomes void, and you can set the repetition times for whole of combined programs.

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, and the measurement/indication of time for humidification vat, wet-bulb wick, and condenser filter, and measurement/indication of total operation time of unit.

After the maintenance work, if you reset the time to zero, it can be used 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 an abnormal operation occurs, solve it referring to [Trouble shooting] on P.16.

Safety function


Safety device	Function	Cause
Mains switch	It turns off to shut down the power.	Electric leakage or excess current.
Over temperature protector for chamber temperature	When the chamber temperature exceeds the alarm temperature, the alarm message [TH] is indicated with flushing and all control operations are stopped.	<ul style="list-style-type: none"> - The set temperature is too low. - The chamber temperature exceeds the alarm temperature due to some trouble of temperature controller, SSR or chamber fan.
Boil-dry protector for humidification vat	When the top and bottom humidification vat are empty, the alarm message [TH1] (for top) and [TH2] (for bottom) are indicated with flushing and all control operations are stopped.	<ul style="list-style-type: none"> - The humidification vat is not supplied water. - Low water level of the vat. - The chamber temperature exceeds the alarm temperature due to some trouble of temperature controller or SSR.
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 flushing and all control operations are stopped.	<ul style="list-style-type: none"> - The refrigeration unit works under overload (overheat) or start-up. - The chamber temperature rises abnormally due to overheat operation exceeding the cooling capacity. - 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 flushing and all control operations are stopped.	<ul style="list-style-type: none"> - The refrigeration unit works under overload (overheat). - The chamber temperature rises abnormally due to overheat operation exceeding the cooling capacity. - The environmental temperature exceeds 35°C. - The fan motor for condenser breaks down.

Alarm function


Some alarm function stops 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 flushing 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	19.5 °C
Humi	80.0	80.0 %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"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [TH] flashes. 	The overheat protector for chamber works.
Overheat protection alarm for top humidification vat	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [TH1] flashes. 	The overheat protector for top humidification vat works.
Overheat protection alarm for bottom humidification vat	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [TH2] flashes. 	The overheat protector for bottom humidification vat works.
Overload alarm for refrigeration unit	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [OLR] flashes. 	The overload relay for refrigeration unit works.
High pressure alarm for refrigeration unit	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [HP] flashes. 	The high pressure switch for refrigeration unit works.
SSR alarm for temperature controlling heater	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [SSR] flashes. 	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"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [HSSR] flashes. 	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"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [HTR] flashes. 	The temperature controlling heater is disconnected.
Disconnection alarm for humidity controlling heater (Top/Bottom)	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [HHTR] flashes. 	The humidity controlling heater (Top/Bottom) is disconnected.
Sensor fault alarm for dry-bulb temperature sensor	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [SNS1] flashes. 	The dry-bulb sensor is disconnected or short-circuits.
Sensor fault alarm for wet-bulb temperature sensor	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [SNS2] flashes. 	The wet-bulb sensor is disconnected or short-circuits.
Door alarm	<ul style="list-style-type: none"> - Buzzer sounds for 1 second. - Chamber fan, temperature and humidification heater are stopped. - The alarm message [DOOR] flashes. 	The door is opened while controlling.
Low level alarm for water supply tank	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [TANK] flashes. 	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"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [TKSN] flashes. 	The level sensor of inner tank breaks down.
Water supply alarm	<ul style="list-style-type: none"> - Buzzer sounds for 15 seconds. - All operations are stopped. - The alarm message [FLW] flashes. 	Even if water is supplied by a pump, water cannot be pooled in the humidification vat (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% for 15 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.

Release of 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 Installation

4-1 Installed place



Caution

Be careful of the installed place to ventilate enough and keep good air condition.

This unit incorporates an air cooled type refrigeration unit, so it radiates heat. Install the unit in a well-ventilated or an air-conditioned room not to raise the environmental temperature by heat radiation. The operating efficiency and the cooling power is reduced if the environmental temperature is raised. What is more that some troubles may occur by overload and high pressure operation of the refrigeration unit.



Warning

Do not install at a dangerous circumstance.

This unit equips a heater. Do not install at the dangerous circumstance to avoid fire hazard.

Install the unit at the following place;

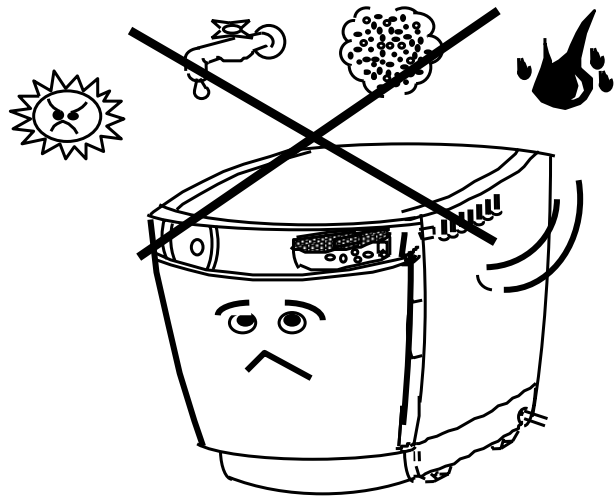
Away from heat source.

Ambient temperature is between 5 ~ 35°C.

Horizontal flat low humid place (non-condensation) where is not exposed to direct sun light, not vibrated, no explosive gas, no corrosive gas or chemical.

Good ventilation.

Free from dust.



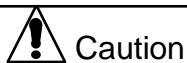
4-2 Environmental conditions



Caution

Keep good ventilation space.

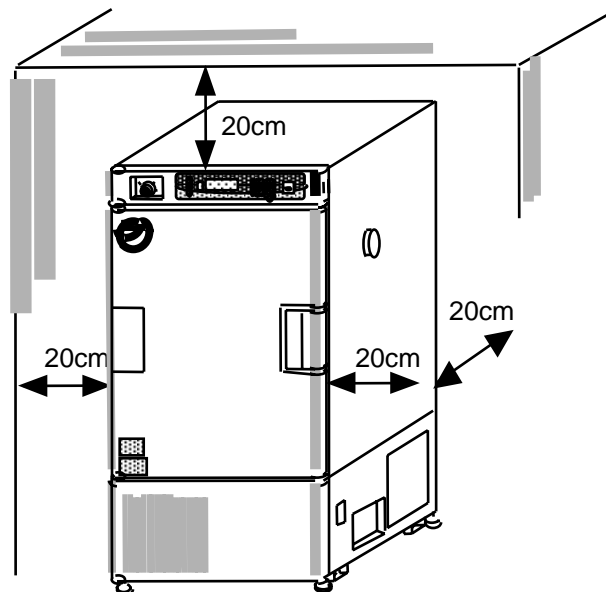
The minimum space is required as shown on the right figure to maintain excellent performance of the unit.



Caution

Be careful to transport the unit due to a hefty product..

KCL-2000A 145kg



4-3 Installation --- Transport / Removing of rack / Installation ---



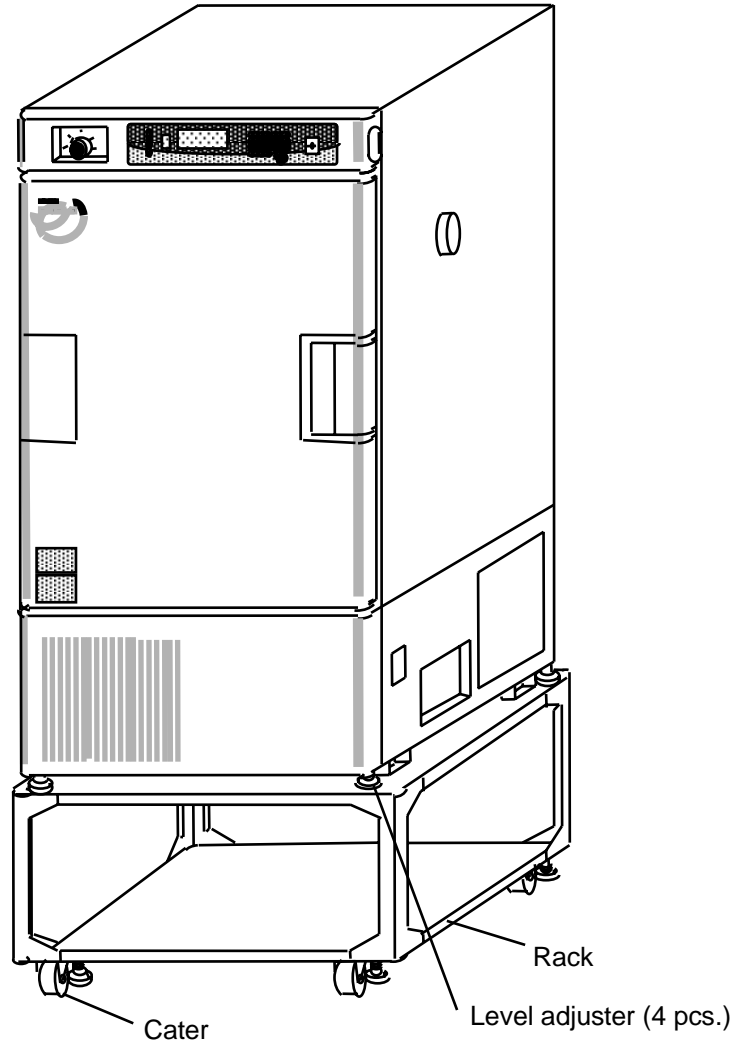
Caution

Do not tilt the chamber unit.

This unit equips a refrigeration unit. Do not transport it with tilting or laying along.

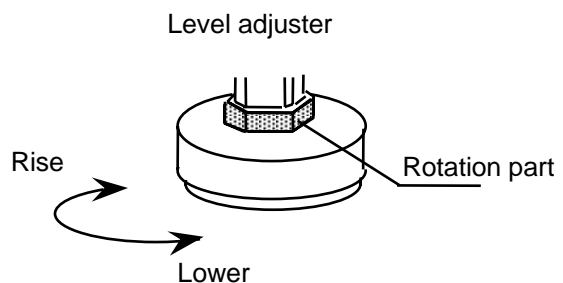
Precaution for transporting

- (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 where you install it.
* Step or uneven place gives shock to casters. Pull up the unit to move on such place.
- (3) Lock casters at installed place.
Turn each level adjuster (4 pcs.) counterclockwise with a spanner to fix the unit.
Keep the unit horizontal, with adjusting 4 level adjusters.
* This adjustment is temporary.



Change the door opening side and attach the external supply tank based on your arrangement first, and install the chamber unit.

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



Removing of rack and installation without rack

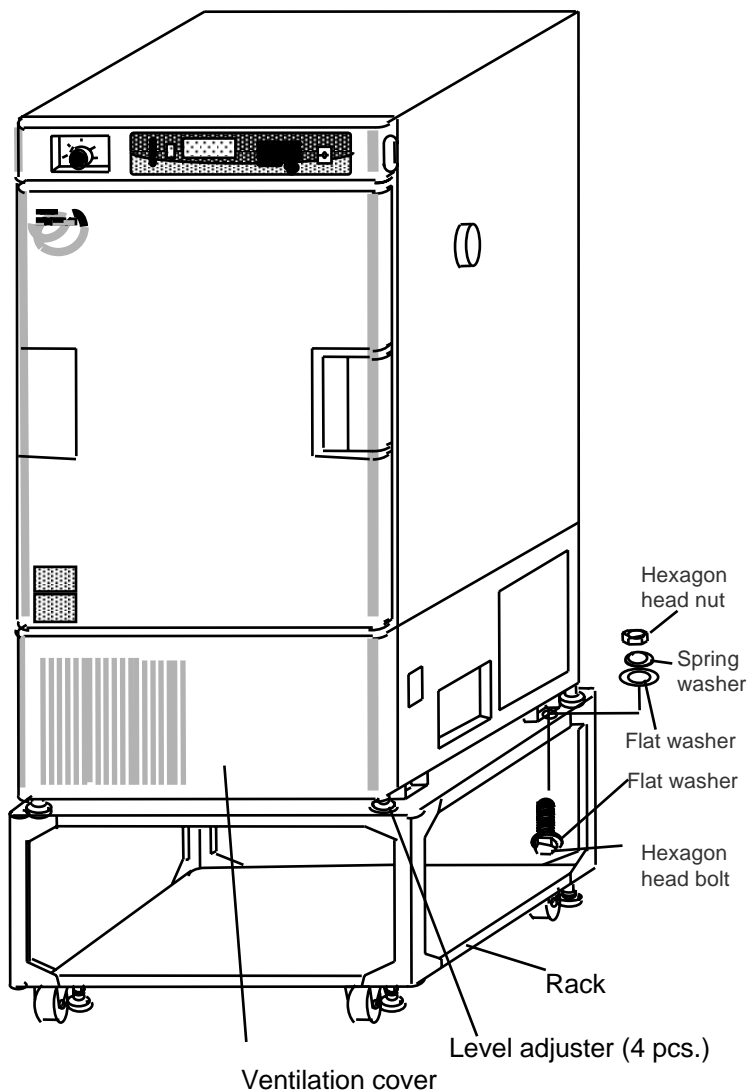
- (1) The unit is fixed to the rack with hexagon head bolts and nuts (4 parts).

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

- (2) Move the unit gently to the installed position based on your arrangement.

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

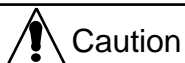
* This adjustment is temporary.



Change the door opening side and attach the external supply tank based on your arrangement first, and install the chamber unit.

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

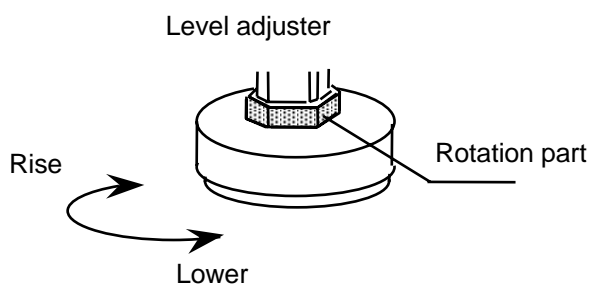
4-4 Installation --- Adjustment of level ---



Make sure that the unit is kept horizontal.

Take a alcohol level to make sure that the unit is kept horizontal.

When the unit is not horizontal, adjust four adjusters either of unit or rack with using a spanner (opposite side distance : 17) or a monkey spanner.



If the unit is not horizontal, the wick holder cannot be filled water. And the supplied water may spillover from the wick holder and overflow from the humidification vat (top/bottom). It increase the purified water consumption.

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

4-5 Connection of utility



Warning

Use a suitable voltage, phase, capacity and plug type.

Unsuitable power source may cause a fire or electric shock hazard.



Warning

Do not use a multi-plug extension cord.

There is a danger of fire of cable by excess current.

(1) Check the voltage, phase, current capacity of this unit. It is shown in the right table.

(2) Check the AC outlet to be used.
(Do not connect the unit yet.)

You can use a AC outlet with a ground core without adapter. (The right figure shows for AC100V unit.)

AC outlet without a ground core needs an adapter.
Ground the wire of adapter.
(The right figure shows for AC100V unit.)

Do not use a multi-plug extension cord.



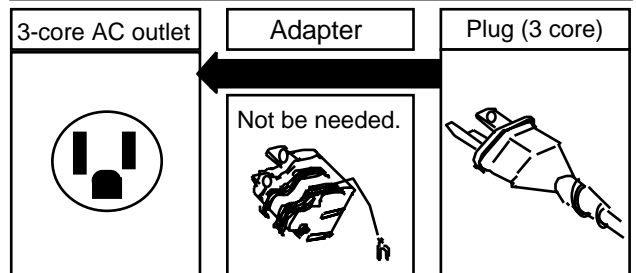
Warning

Ground this unit correctly.

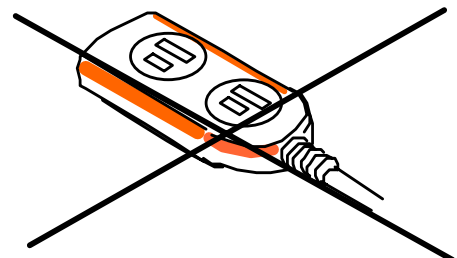
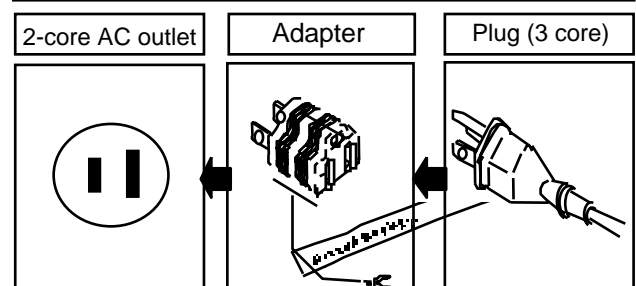
Do not ground to gas or water pipe.

Model	Power source	
	Voltage	Current
KCL-2000A	AC-100V	15A

Mains plug with ground core(100V)



Mains plug without ground core (100V)



5 | Operation

5-1 Preparation

	Action item
For controlling temperature and humidity	Complete the procedure 1~11 all. Set depending on your purpose.
For controlling temperature	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.

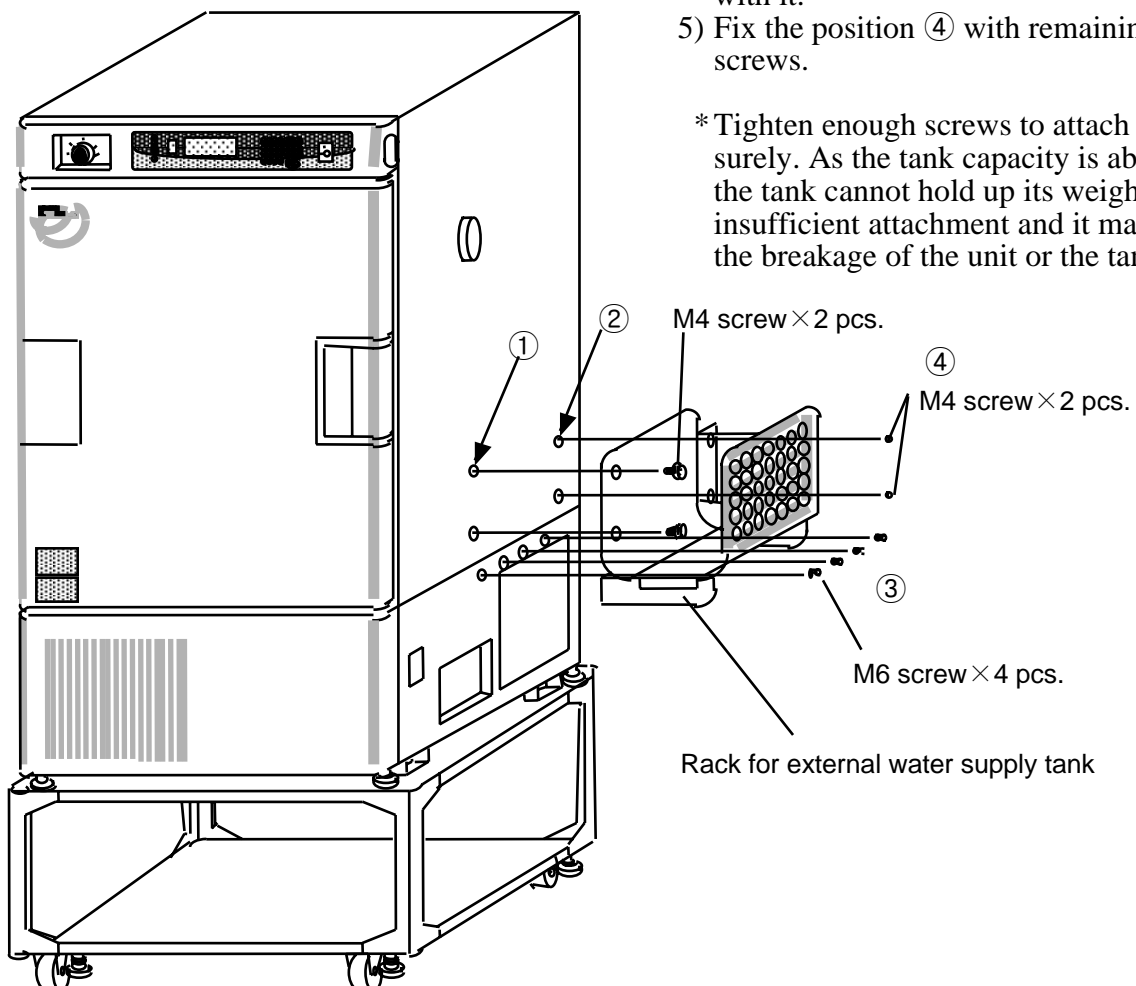
Before shipment the rack for external water supply tank is prepared for attaching to the right side of unit.

If you attach it to the left side of unit, move it to the left side.

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

- 1) Loosen screws attached to the right side with a plus screw driver.
- 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.

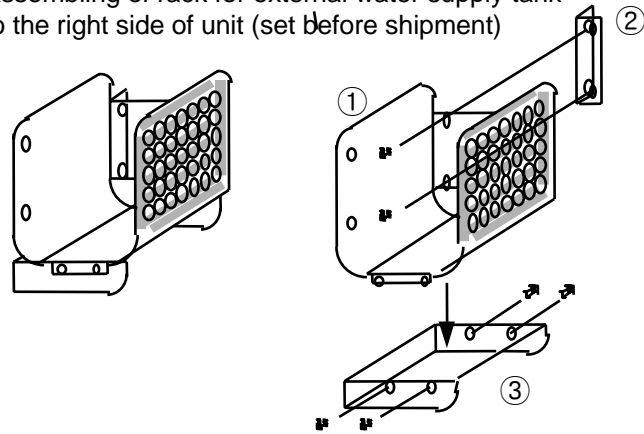


(2) In case a rack is attached to the left side

- 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 plus screw driver.
- 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 and it may cause the breakage of the unit or the tank rack.

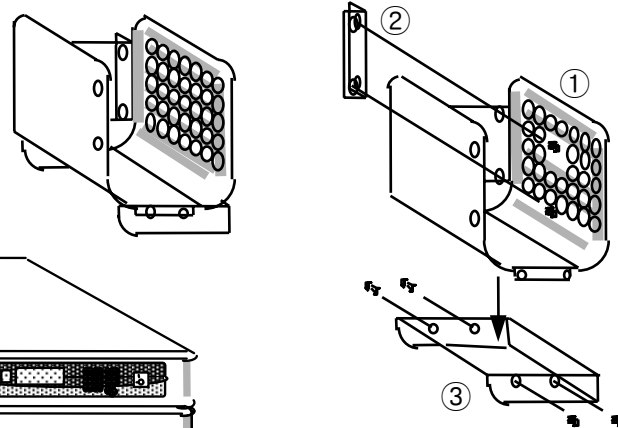
Assembling of rack for external water supply tank to the right side of unit (set before shipment)



Fix between ① and ② with two M4 screws.

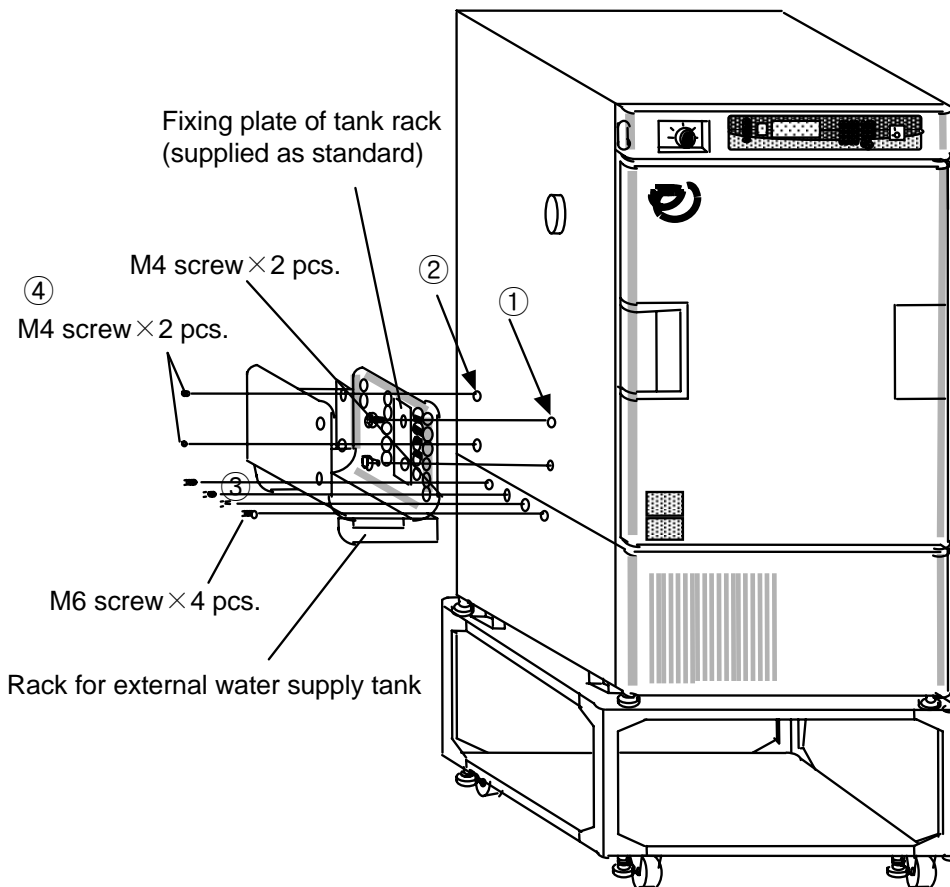
Mount it on ③, and fix with four M4 screws.

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

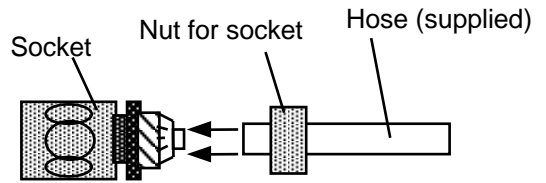


Fix between ① and ② with two M4 screws.

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



* When you attach the tank to the left side of unit, replace the hose of water supplying hose set by the supplied another hose. Make sure that any leakage is not found from connecting parts after replacement.

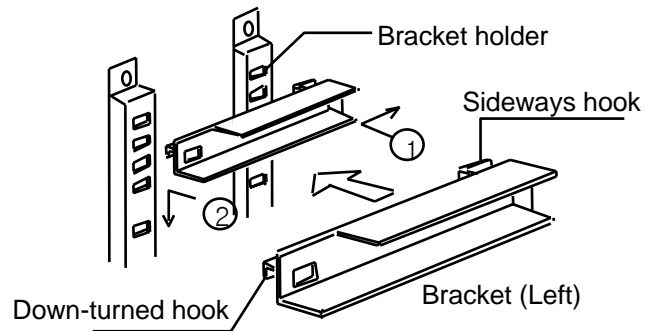


Replacement of hose of water supplying hose set


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 back side bracket holder, and push it backward surely.
- (3) Next inset the down-turned hook into a hole of the front side bracket holder, and push it downward surely.
- (4) Make sure that each hole level is even between the front and the back.
- (5) After you set all shelves, check the level of each face-to-face bracket is even to set shelves horizontally.
- (6) Put shelves on each bracket.

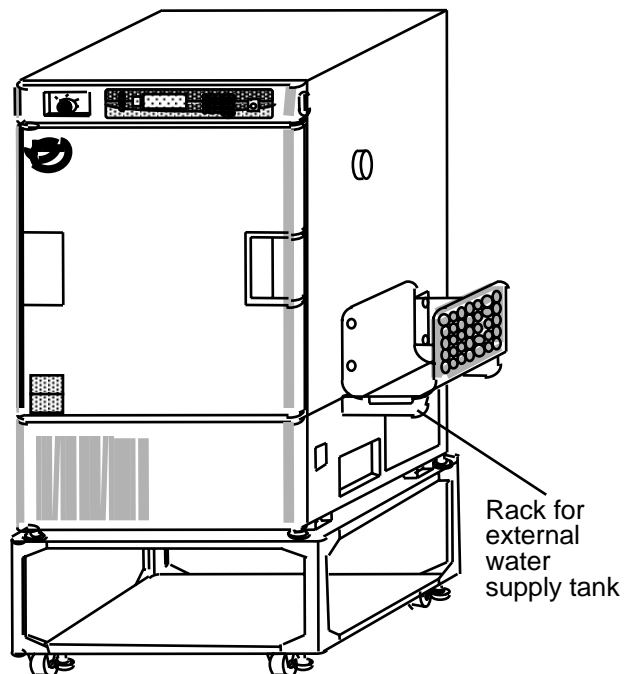
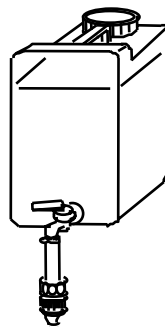


3. Preparation of water supply

 Caution
<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 some troubles.</p>

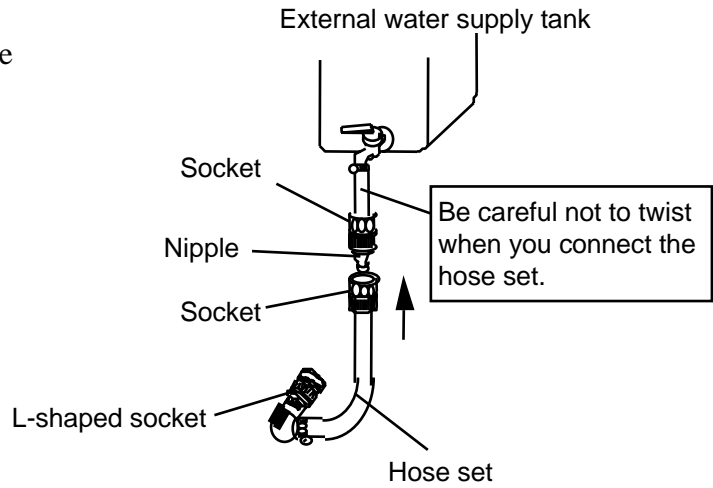
- (1) Supply purified water into the supplied external tank which electric conductivity is 10 μ s/cm or less. The tank has 20L capacity.
- (2) Mount the tank on the rack.

External water supply tank



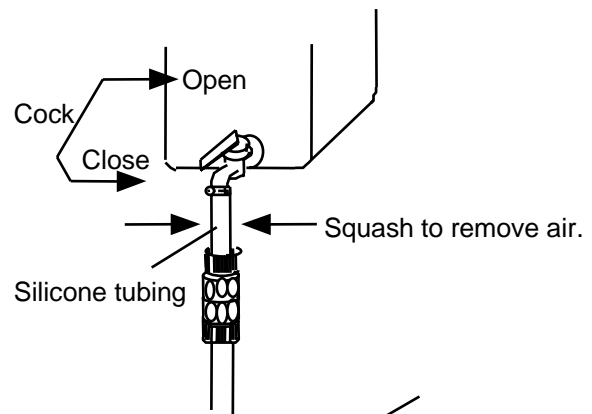
- (3) Connect the socket of hose set to the nipple of external water supply tank. Push it and easily attached.

To disconnect them hold either socket and slide in a direction opposite to the nipple.

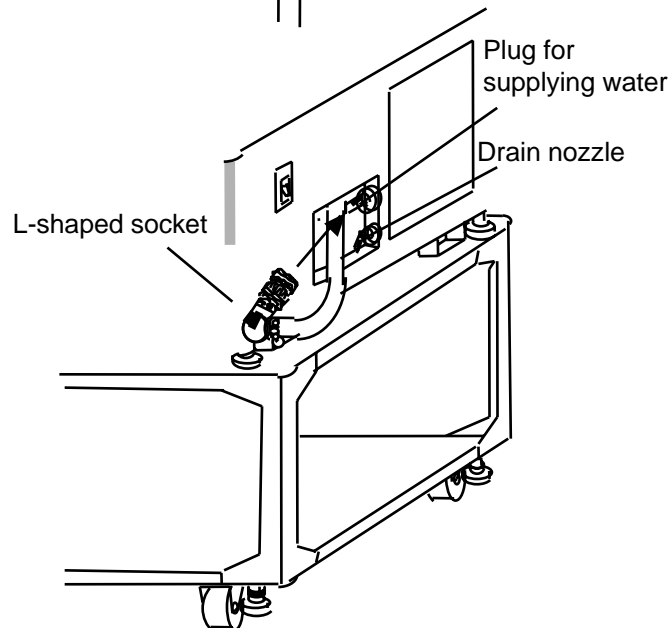


- (4) Close the cock of the external water supply tank, and squash the silicone tubing several times to remove included air completely. When you remove air successfully, air bubbles are found in the tank.

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



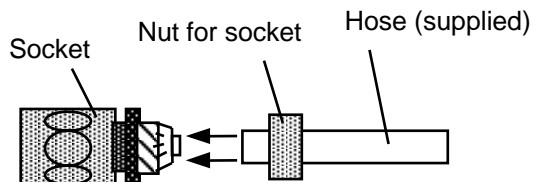
- (5) Attach the socket of hose set to the water supply plug. It is attached by one-touch. (You hear the click.) To disconnect, push the black socket part backward.



- * If you use a cartridge type water purifier (ERN) in place of the external water supply tank, replace the hose of hose set by the supplied another hose for the cartridge purifier.

Make sure that any leakage is not found between the faucet and connecting port of the unit.

- * When you use 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.

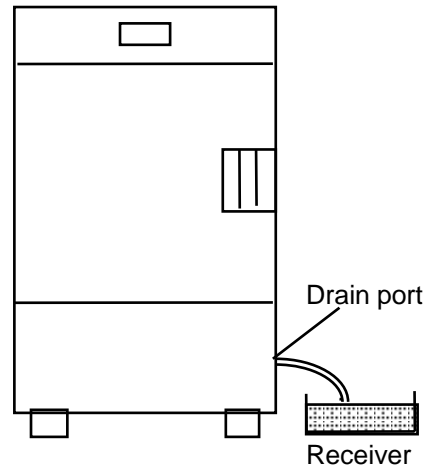
4. Connecting drain hose



Caution

Use purified water such as ion-exchange water or distilled water for humidifying.

Non-purified water pollutes humidification heater, wet-bulb wick, and tubings. It obstructs the normal humidification control. And it may occur water leakage or some troubles.

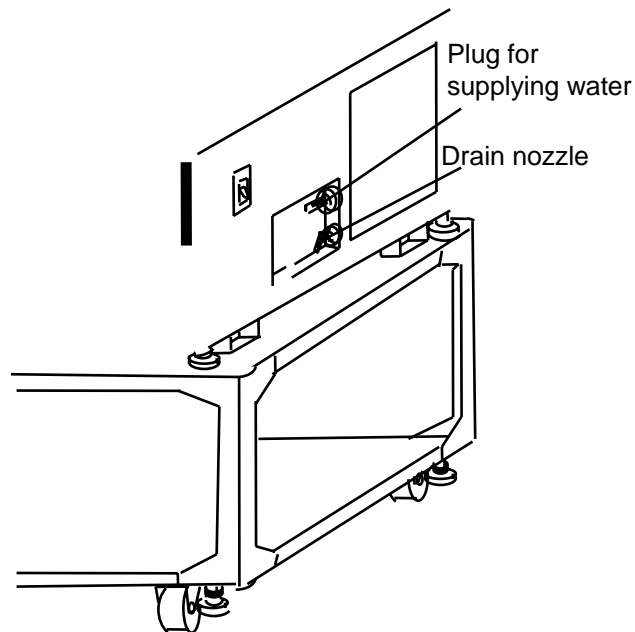


Set temperature (°C)	Set humidity (%RH)	Supply/Drain volume (mL/h)
20	90	70
25	60	85
40	75	135
60	95	80
85	95	130

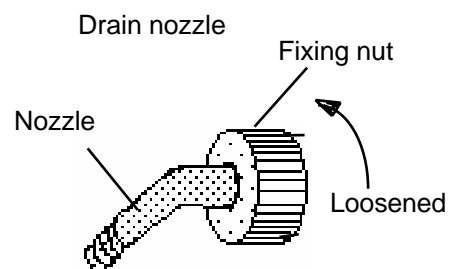
If the drain hose bends or its end is soaked into the receiver, or if you use a hose other than supplied, the water may not be drained from the unit by tubing resistance and the drained water may overflow from the receiver. Cut the hose in exact length with distance from the receiver.

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

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



While operating the unit or immediately after 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.



You can turn the nozzle direction with loosening the nut. After you change the nozzle direction, tighten the fixing nut surely.

5. Attaching wet-bulb wick



Caution

Change the wet-bulb wick on a periodic basis.

When the wet bulb wick is deteriorated (discolored), replace it by new one. The life of wick depends on the operating temperature, humidity, and water quality.

The indication of replacement is about one month as a maximum.

If the wick is used for a long time, its performance is turned down, and normal humidity control cannot be provided. It will cause water leakage by saturation state and breakage 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 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. wet-bulb wick

* 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.

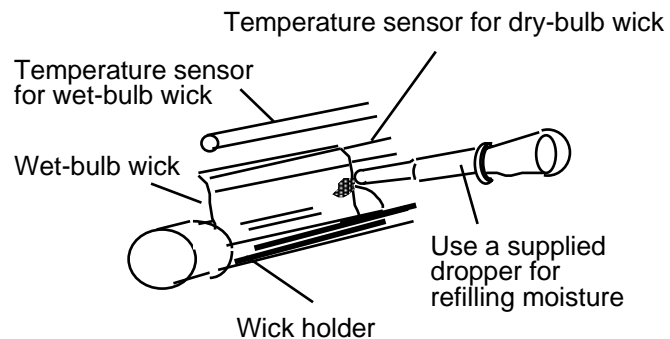
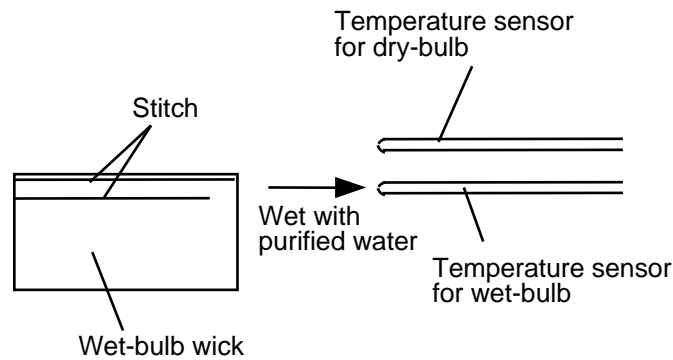
* Remove the wet-bulb wick in advance, when only the temperature is controlled without humidity control or when operating at less than 5°C.

* If you reposit the opened wet-bulb wick, keep it dry and put it into the aluminum bag, then close a zipper. 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 that case replace the wet-bulb wick by new one.



Without humidity control

* Turn on [Manual Drain] switch. Water is not supplied into the humidification vat 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 vat and the wick holder.

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

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

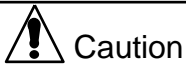
6. Putting of samples and vessels into the chamber



Danger

Do not use flammable materials such as organic solvent.

While operating, the chamber temperature is very high so that 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 an explosion-proof structure.

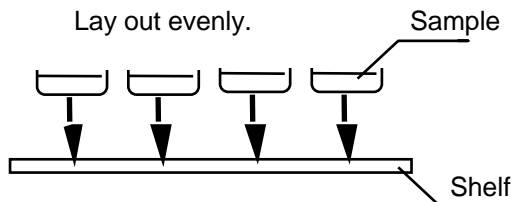


Caution

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

Do not block the air supplying port with sample vessels. Temperature uniformity is reduced and it threaten mechanical troubles.

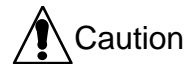
- (1) Open the door.
When you pull the handle, the door lock is released and the door is opened.
- (2) Lay out samples on a shelf with keeping uniform distance.
(The load capacity per shelf is 15kg.)



* Due to the characteristics of this unit, the moist sample is dried. Vaporized moisture 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.
(Air circulation in the chamber is obstructed. Sometimes the temperature control alarm may occur.)

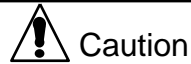
- (3) Close the door gently.
If the door is not closed completely, operation does not start. (Door alarm is displayed.)



Caution

Be careful of thermal resistance of used vessel.

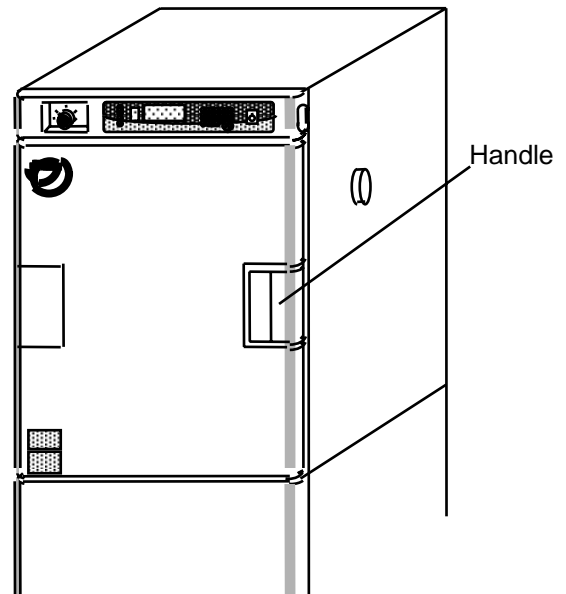
The inside of chamber will be heated at a high temperature depending on the set temperature. Some vessel materials are in danger of meltdown. Check the limit temperature of thermal resistance before operation.



Caution

Set temperature carefully, when you put glass wares into the chamber.

In case that you set glass wares into the chamber, samples will be frozen when the chamber temperature is lower than 0°C. Glass wares may be broken and you are at risk of injuring. Be careful to handle glass wares.



Do not spill the samples or water when you put them into the chamber. There is the danger of electric shock due to leakage as well as break down of the unit. If you spill accidentally, wipe off it soon.

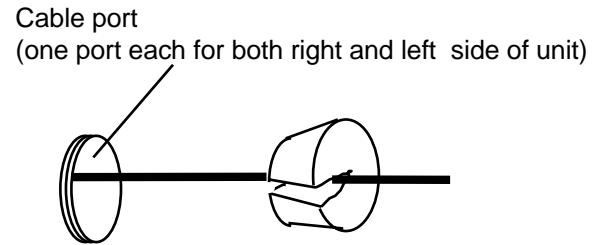
The drain port is placed at the bottom of chamber to drain condensed water. The condensed water cannot be drained completely depending on the environmental condition or the plateau of unit. Do not put samples on the bottom surface of chamber to avoid blocking the drain port and air suction port. Put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

7. Use of cable port (Connection of monitoring devices)

Use the port depending on your purpose.

The cable port 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°C → Recorder output : -15.0 ± 2.6 mV

Measured temperature : 85.0°C → Recorder output : 85.0 ± 2.6 mV

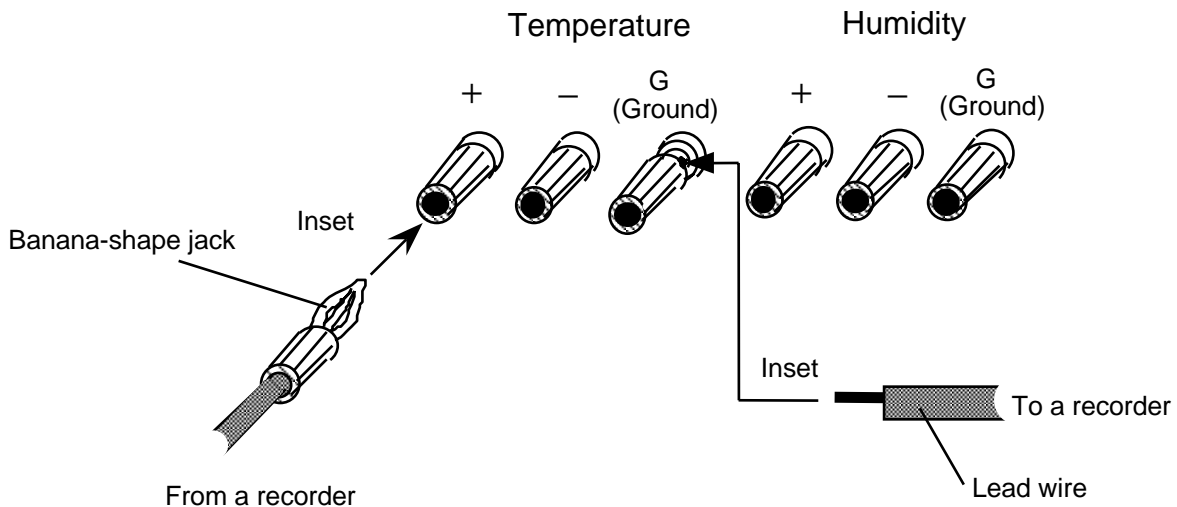
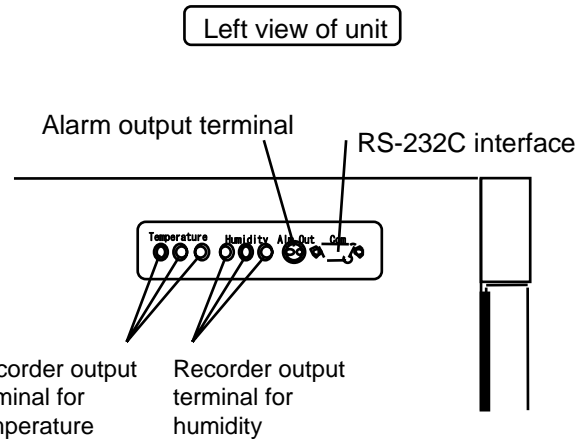
- Recorder (Analog) output terminal for measured humidity

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 ± 2.0 mV

Measured humidity : 85.0%RH → Recorder output : 85.0 ± 2.0 mV



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.

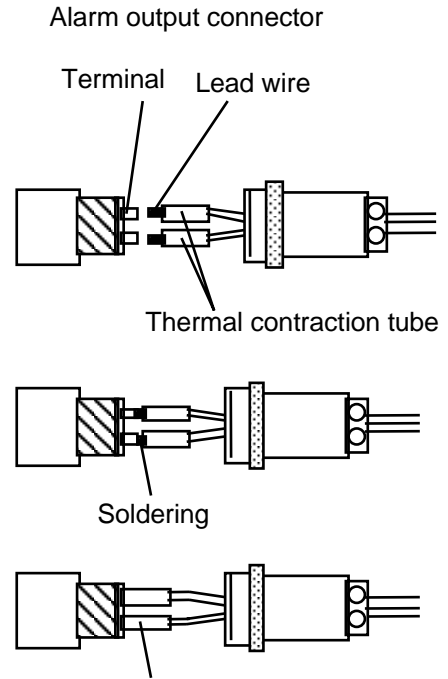
The communication speed is 9600BPS as fixed. Refer to the page 49 and 50 of the key operation manual.

10. Connection of alarm output terminal

Use the terminal depending on your purpose.

When a safety function is active, the contact output indicates the trouble of unit.
The contact capacity is AC250V, 5A with resistant load. When the unit is normal, it is OFF, and when abnormal, it is ON.

- (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 terminal, insulate the wire with each thermal contraction tube.
 - * Do not use without soldering.
- (2) Assemble the connector again.
- (3) Connect the alarm output plug to the port [Alm Out].



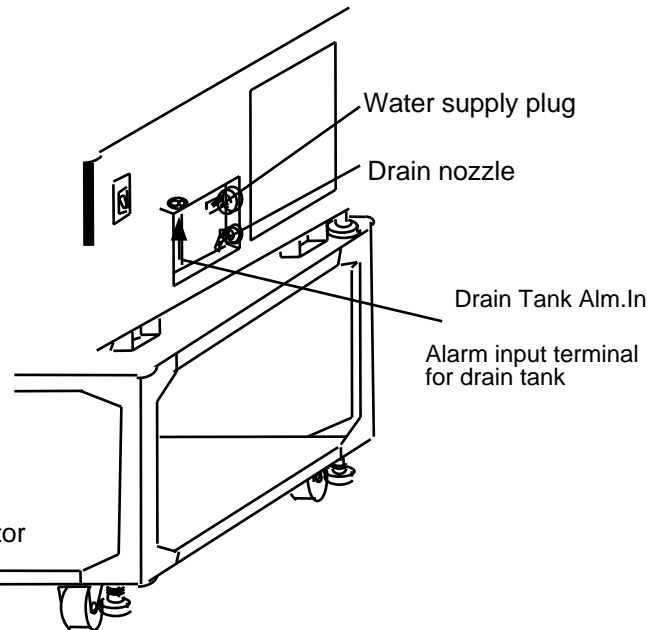
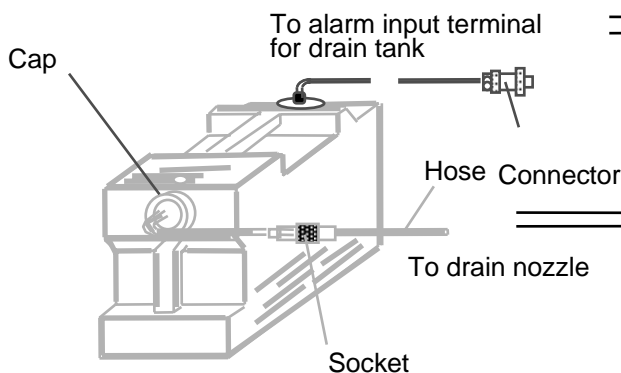
* Soft-solder lead wires, and contract thermal contraction tubes with a hair dryer.

11. Connection of an optional drain tank

Use the drain tank depending on your purpose.

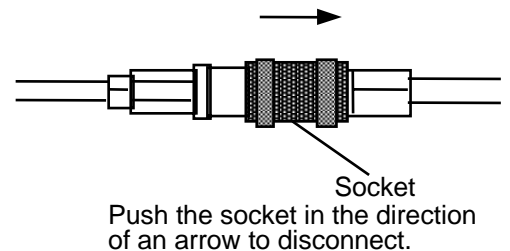
The capacity of drain tank is 10L, and it collects the drained water from the chamber. When the tank is full, the alarm [DTK] is indicated on the LCD panel of unit, and the humidification is stopped. Drain the water from the tank before the water level exceeds 10L on the gauge. Hold the tank with the 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 cannot be drained to the tank by resistance of level, or flows out to the chamber. Cut the hose proper length in accordance with the place of the tank.



When you drain water from the tank, remove the socket of drain tank hose. Receive the water from the chamber with a vat. 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.



12. Connection of mains plug

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

5-2 Operation



Caution

While operating at high temperature, do not open the door.

While operating the unit at a high temperature, you are in danger of burning by blowing of hot vapor although the fan stops. Sometimes it may lead to mechanical trouble of unit. Stop the unit, make sure that the chamber temperature is cooled down, and then open the door.

1. Setting of over-heat protector

Set the over-heat protector.
Turn the knob to set the upper limit temperature.

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.

* If the over-heat protector works, see the chapter [6. Trouble shooting] on the page 35.

2. Setting of temperature and humidity

Turn on the mains switch and the power switch.

The initial indication is displayed for about 5 seconds.

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

About 5 seconds after the mains switch is turned on, 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 of operational keys, see the key operation manual prepared as a separated volume.

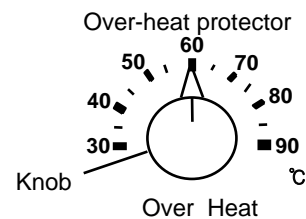
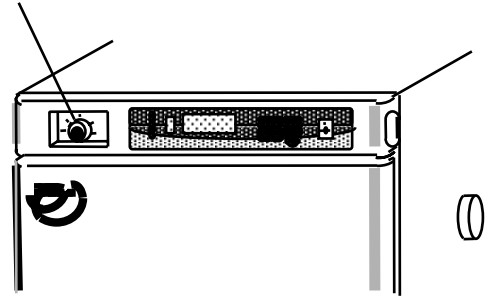


Caution

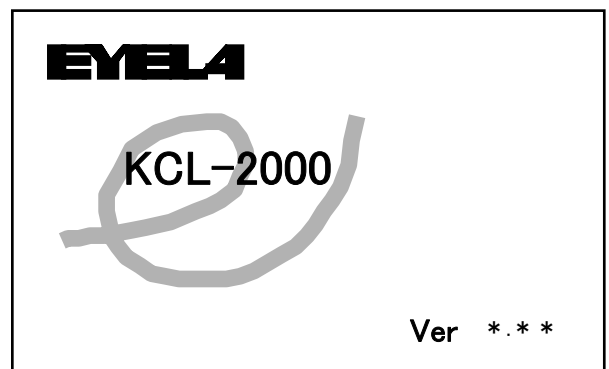
When some troubles occur, stop operating immediately.

When some troubles occur, turn off the mains switch immediately, and check the unit referring to the chapter [Trouble shooting].

Over-heat protector



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 attach dew condensation depending on the set temperature or the environmental temperature. It has no effect on the performance and functional capability of the unit.

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

Tilt the unit just a little back, the bottom puddle can be reduced. 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

Frost attaching

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 occur by attaching frost 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 set 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.)

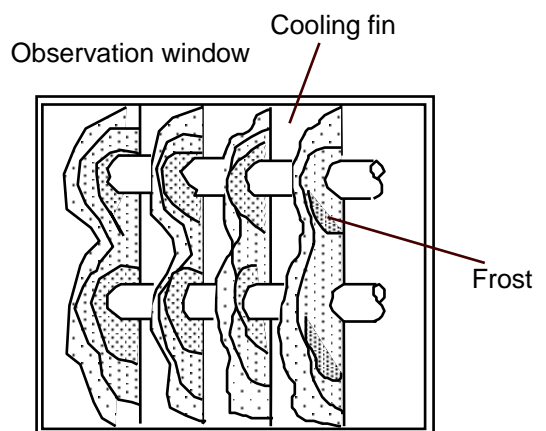
* Use this mode for the operation beyond 24 hours with 5~15°C of set temperature, or more than 1 week with 15~25°C.

* The performance of defrosting is reduced when you select interval mode in low ambient temperature.

(2) Manual defrost operation (Forced defrosting)

[Cooling alarm (COL)] or [Temperature/Humidity control fault] may occur by attaching frost on cooling part, in case of following conditions. Check attached frost through the observation window. Execute the forced defrost operation, if needed.

- 1) Temperature and humidity is controlled under 30~40°C or lower set temperature.
- 2) Interval defrost operation is executed when the set temperature is 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 attached frost on the cooling coil is dissolve in water drop and it flows and be collected into the bottom humidification vat. 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 operation, and turn on [Manual Drain] (forced draining) switch.

If you press [Defrost] key, the set temperature becomes 25°C regardless of operation mode, and start automatically the forced defrost operation.

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

2. Action of Defrost

Defrosting temperature is 25°C, and the operation is continued for 20 minutes. The operation quits automatically, and the chamber temperature returns to set temperature.

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

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

3. Manual stop of Defrost operation

If you 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. (10L)

(2) Check the 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 tank level reaches to Level 1 even if not full, the solenoid pump works and the water is supplied into the top and bottom humidification vat. and the wick holder.

* About 10 minutes after you turn on [Run Stop] key, the water is supplied into the top and bottom humidification vat. and the wick holder.

* While draining (Manual Drain key is turned on.) or when the set temperature is lower than 5°C, the water is not supplied into the top and bottom humidification vat. and the wick holder. Except above conditions and when the set humidity is 0.0%RH, the humidification control is not executed although the water is supplied into the top and bottom humidification vat. and the wick holder.

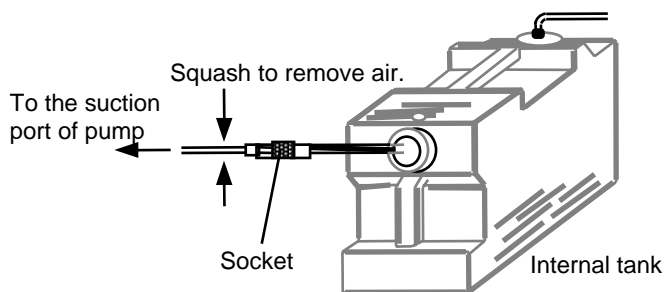
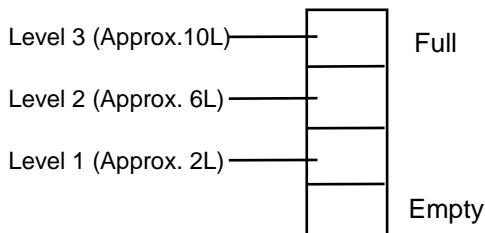
* If once the level reaches to 3 (or Full) and it lowers to the level 1, the water is supplied automatically from the external tank to the internal tank. If the water level raised to the level 3 (or Full) from 2, turn off [Water Supply] key once, and turn on it again.

The duration of time until the internal tank is full depends on the external tank is set which side (right/left) or layout of hose connection.

The duration of 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 water is supplied into the top and bottom humidification vat and wick holder, you will hear the working noise of solenoid valve. This is not a malfunction. And you will hear the operating noise of refrigeration unit, when defrosting operation is active.

(4) 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 vat 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 vat through the observation window for top humidification vat. And check that the heater goes under the water in the bottom humidification vat through the suction port.

And make sure that the water is not drained from the overflow port of the bottom humidification vat, and that the water surface is in parallel with the bottom humidification vat. 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 from cooling part is collected and overflowed.

* When you check 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.

(5) 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 mains switch in the last instance.

6. After operation

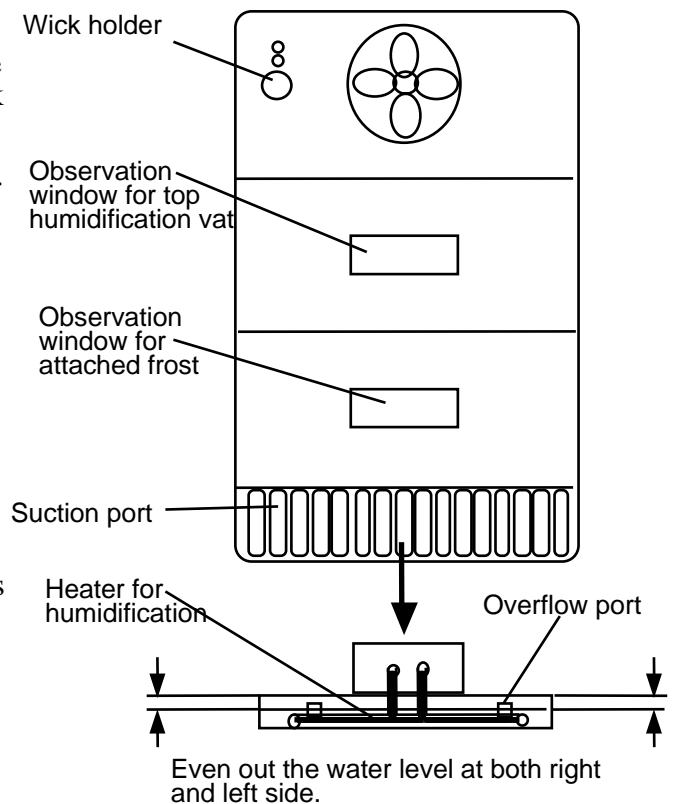
If you do not use the unit for a prolonged period, turn on the [Manual Drain] key to drain the water from the top and bottom humidification vat.

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 mains switch.

Additionally, disconnect the mains plug from AC outlet port.



- The refrigeration unit starts about 80 seconds after you turn 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 by attached algae.

6 Trouble shooting

Trouble	Cause	Measure
The mains switch is turn off even after turning on it.	Electric leakage occurs.	Stop operation immediately and call your service agent.
	Excess current occurs.	
	The mains plug is disconnected from AC outlet. Or it is not connected surely.	Turn off the power switch and the mains switch, and connect the mains plug completely to AC outlet port.
	The electric power is not supplied.	Turn on the switch board.
	The mains switch is not turned on.	Turn on the mains switch.
	The mains switch breaks down.	Stop operation immediately and call your service agent.
	The power switch breaks down.	
	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.	The set temperature is not suitable.	Check the set temperature.
	The refrigeration unit does not start.	Stop operation immediately and call your service agent.
	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.
	The air circulation in the chamber is not sufficient due to cramped conditions of sample.	Reduce the quantity of samples and vessels.
	Frost attaches to the condenser.	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.
	The air circulation in the chamber is not sufficient due to cramped conditions of sample.	Reduce the quantity of samples and vessels.
	The chamber circulation fan breaks down.	Stop operation immediately and call your service agent.

Trouble	Cause	Measure
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.	Reduce the quantity of samples and vessels.
	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 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 operation immediately and call your service agent.
	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 vat, 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 referring to P27.
	The wet-bulb wick is dried.	Refill the water or replace by new one. Refer to P.27.
	Water is not enough in the wet-bulb wick, and it is dried.	Adjust the unit horizontally referring to the chapter [Installation] on P20, and [Humidification] on P33.
	The temperature is set to lower than 5.0°C.	Set the temperature referring to [Humidity control range] on P4.

Trouble		Cause	Measure
Overflow water is not drained from the overflow port of bottom humidification vat, 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 receiver 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 by new one. Change it every 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 which voltage is stable.
		The ambient temperature fluctuates due to wind flow from an air conditioner.	Move the unit to some other place without direct wind of air conditioner.
You hear an abnormal noise.		The circulation fan of chamber breaks down.	Stop operation immediately and call your service agent.
		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 chamber temperature 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 operation immediately and call your service agent.
	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 operation immediately and call your service agent.

	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 operation immediately and call your service agent.
	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) breaks down which switches ON and OFF the heater for temperature control.	Stop operation immediately and call your service agent.
	SSR failure of humidification heater (top/bottom) is indicated. - Alarm message [HSSR] blinking All controls stops.	The SSR (non-contact relay) breaks down which switches ON and OFF the humidification heater.	Stop operation immediately and call your service agent.
	Disconnection of heater for temperature control is indicated. - Alarm message [HTR] blinking All controls stops.	The heater for temperature control is disconnected.	Stop operation immediately and call your service agent.
	Disconnection of humidification heater (top/bottom) is indicated. - Alarm message [HHTR] blinking All controls stops.	The heater for temperature control is disconnected.	Stop operation immediately and call your service agent.
	Dry-bulb temperature sensor fault is indicated. - Alarm message [SNS1] blinking All controls stops.	The dry-bulb temperature sensor is disconnected or causes short circuit.	Stop operation immediately and call your service agent.
	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 operation immediately and call your service agent.

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.	The overload relay of refrigeration unit works.	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 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 by attached algae.	Clean 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 vat (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 set 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. And 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"> - Alarm message [OVC] blinking <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 $\pm 1^\circ\text{C}$ range of set temperature. Wait awhile until the measured temperature reaches to $\pm 1^\circ\text{C}$ range of set temperature, immediately after you set temperature or defrost operation.</p> <p>And 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"> - Alarm message [OFF] blinking <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"> - Alarm message [HU1] blinking <p>All controls are continued</p>	<p>Although the normal humidity control is continued, the measured humidity exceeds $\pm 20\%$RH range of the set humidity during 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 vat (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"> - Alarm message [COL] blinking <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"> - Measured temp.: -5°C or higher \rightarrow 30 minutes - Measured temp.: less than -5°C \rightarrow 60 minutes 	<p>The alarm may occurs due to 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"> - Alarm message [PRG] blinking <p>All controls are continued</p>	<p>The measure temperature deviates from the $\pm 5^\circ\text{C}$ 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.)

If you press [Clear] key to cancel out the alarm message and 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 which 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 the page 48 of the key operation manual.)

If the alarm occurs none the more, it is presumable that some parts cause troubles. Call your service agent, and inform detailed status and the indicated alarm message.

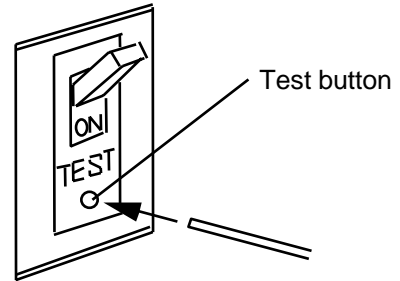
7-1 Test of Mains switch



Caution

Test mains switch on some regular basis.

If you use the unit with any trouble of mains switch, you may meet with an electric shock hazard.
Test once or more time in a month.



7-2 Cleaning and care



Warning

Do not take the unit apart.

There are heating part and electric parts inside of the unit. Do not take the unit apart 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, benzene 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 fin with your bare hand.

Do not touch the cooling fin with your bare hand.

As the cooling fin is very sharp, you are in danger of cutting your hand.

Clean or care the unit after turning off the power switch, the mains switch and disconnecting the mains plug from the AC outlet.

1. Cleaning of 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 of chamber interior

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.

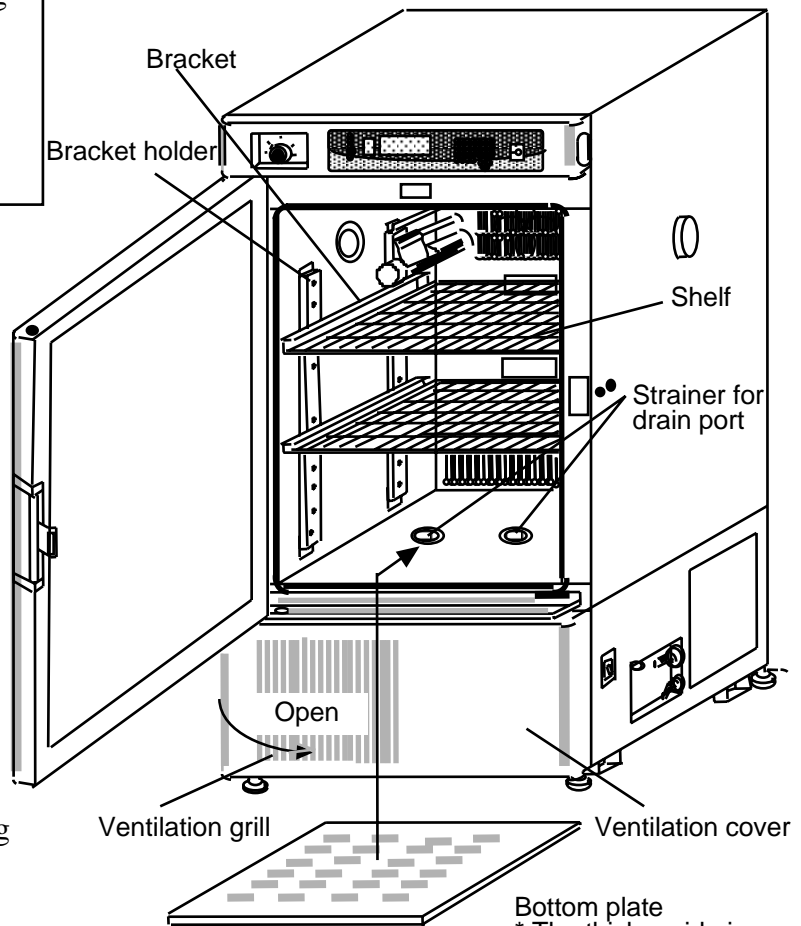
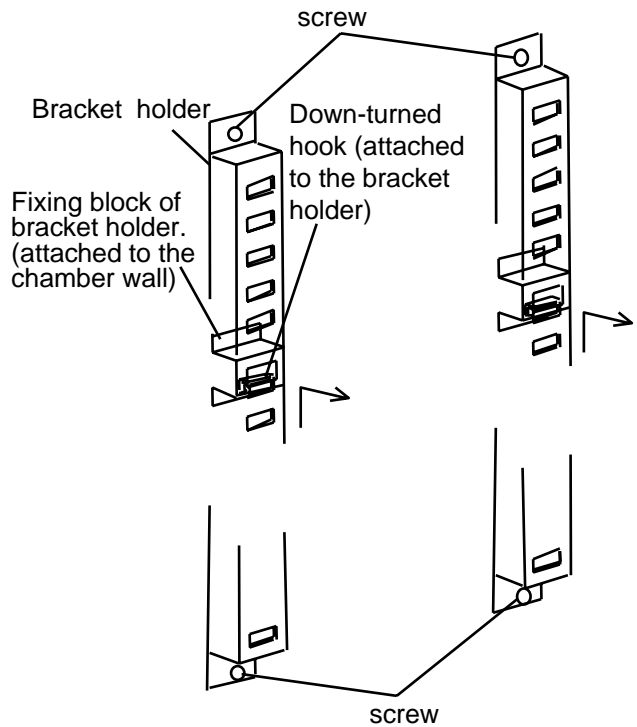
To remove the bracket holder, loosen both top and bottom screw of holder and slide the holder upward. Repeat the same step for other three holder.

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 *****
 This unit is used antibacterial silver stainless steel 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

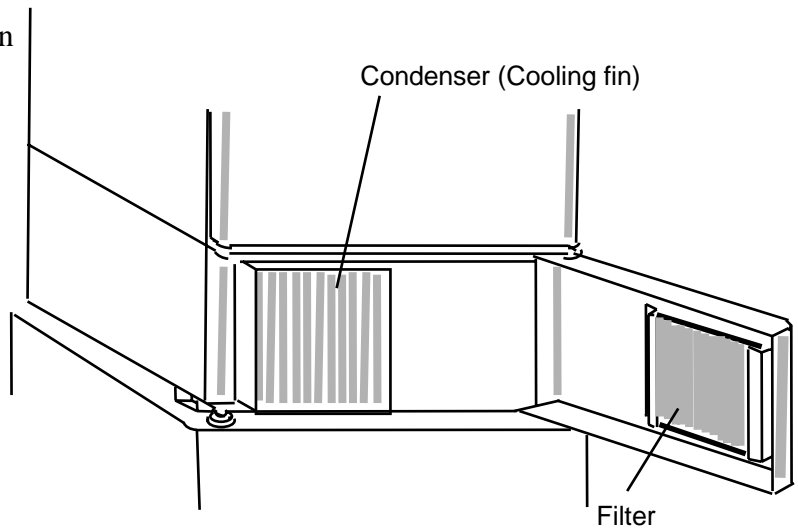
The operation with the clogged filter reduces the cooling performance. And some troubles are caused on the refrigeration unit.

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.

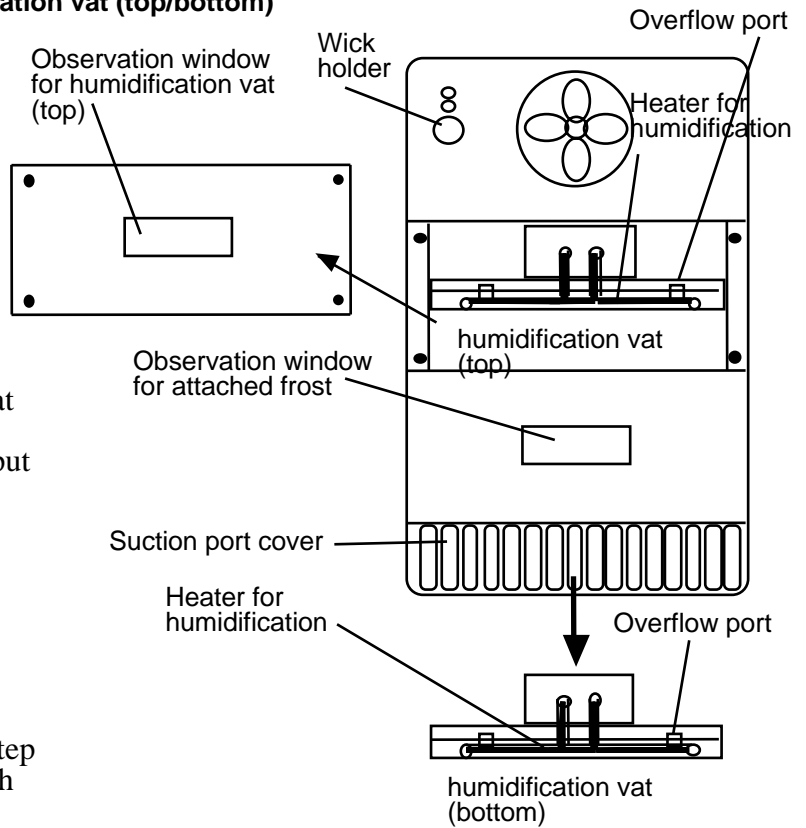
Bottom plate
 * The thicker side is set at front side of chamber.

- (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. (Do not use some hair dryer, due to the filter is made of heat-sensitive material.)
- (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 vat (top/bottom)

You can find the top humidification vat through the observation window. And the bottom humidification vat is put in the back of the suction port cover. Clean both humidification vat during periodic intervals.

- (1) Turn on the [Manual Drain] key to drain the water of wick holder and both humidification vat.
- (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 vat has a strainer, remove it to clean.

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

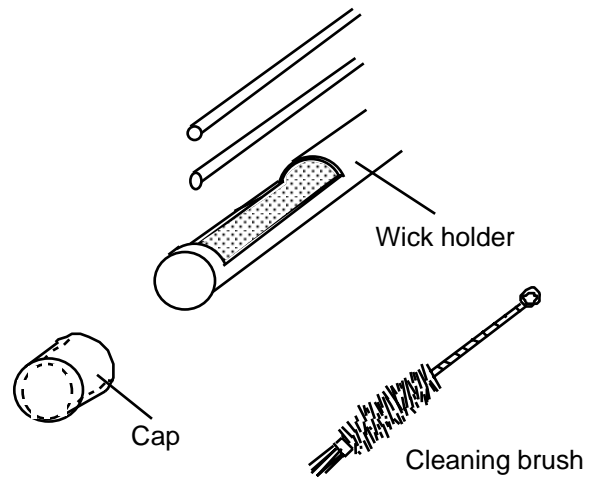
6. Check-up of wet-bulb wick

The wet-bulb wick is a consumable part accessory. Check it as needed depending on the operating condition. If it changes color, replace by 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.



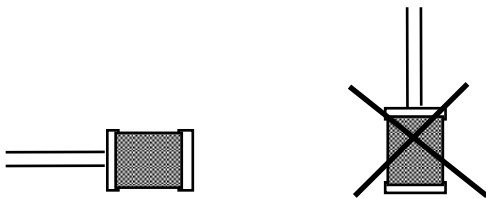
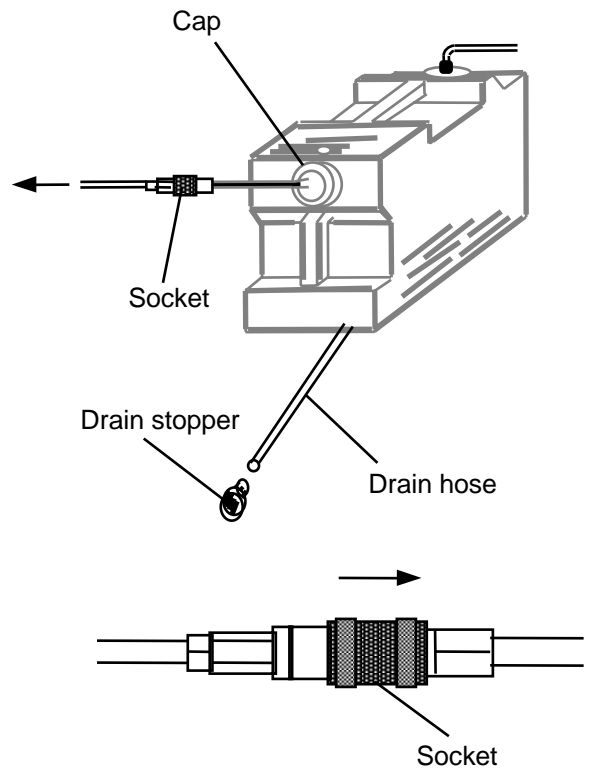
8. Check-up and cleaning of internal water supply tank and strainer for pump

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.



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

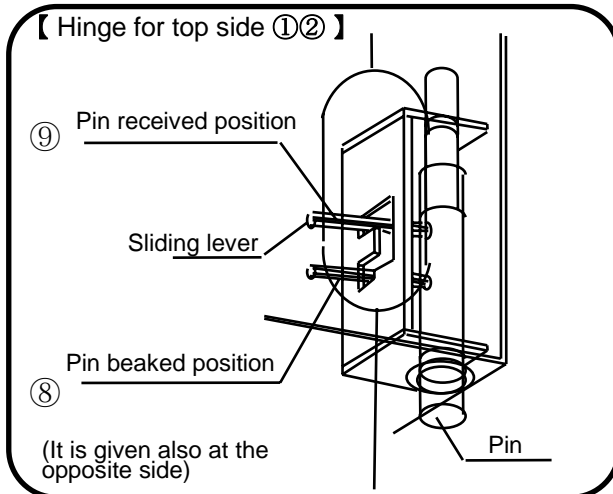
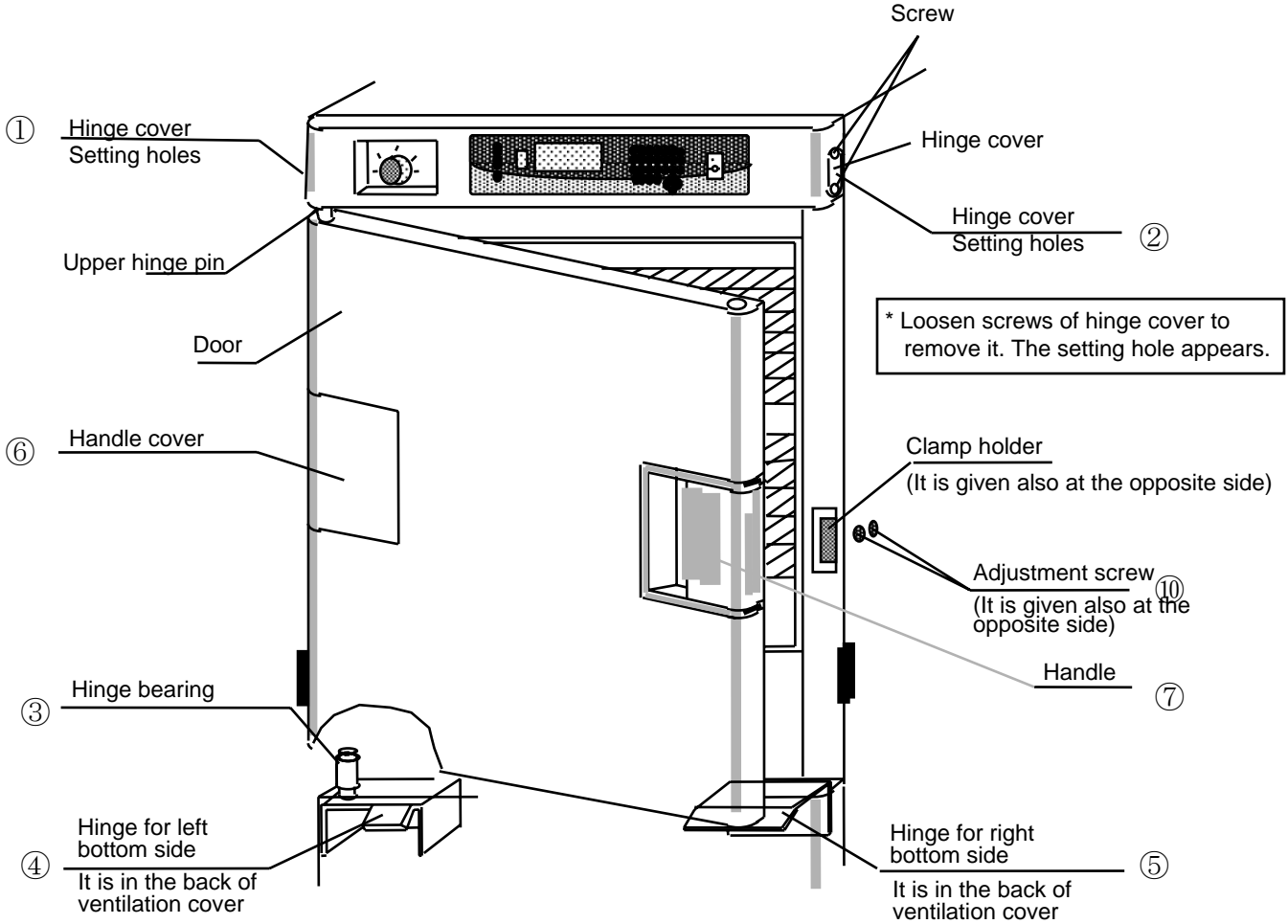
9. Check-up and cleaning of other flow lines.

Open the ventilation cover. If the internal water supply tank or connected flow lines are dirty, call your service agent.

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.

8 | Change of door opening side

8-1 Structure of door



8-2 Change of door opening side

Required tool is a + screw driver



Caution

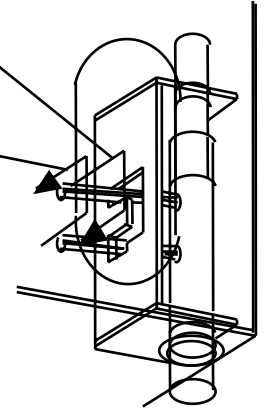
Do not work alone.

As the door is very heavy, you are in danger of the accident by dropping the door when it is attached or detached.

【 Hinge for top side ①② 】

The pin comes down and the door is locked.

The pin moves upwards and the door lock is released.

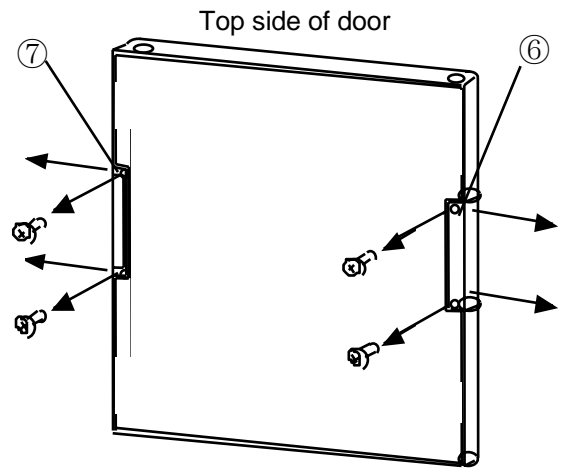


This door is changeable its opening side.
Read carefully the following procedure before operation.
It is assembled as left-hand door before shipment.

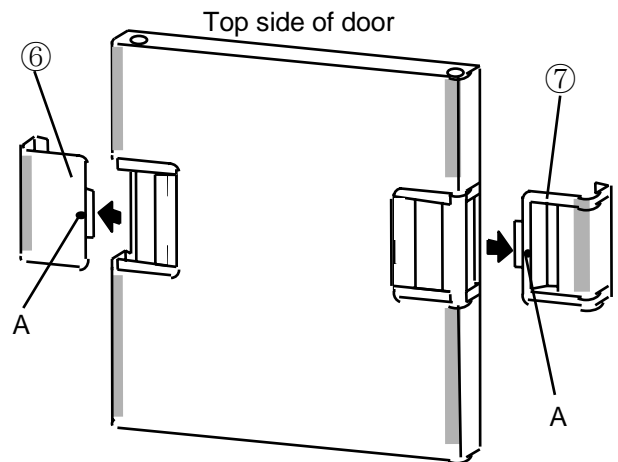
[Left-hand door → Right -hand door]

- (1) Loosen screws which fix both hinge cover ① and ② to remove them.
- (2) Pull the handle to open and hold the door. Move the hinge lever from ⑧ position to ⑨ by finger through the setting hole of ① with holding the door. The left top of door is free. Detach the door holding with both hands.

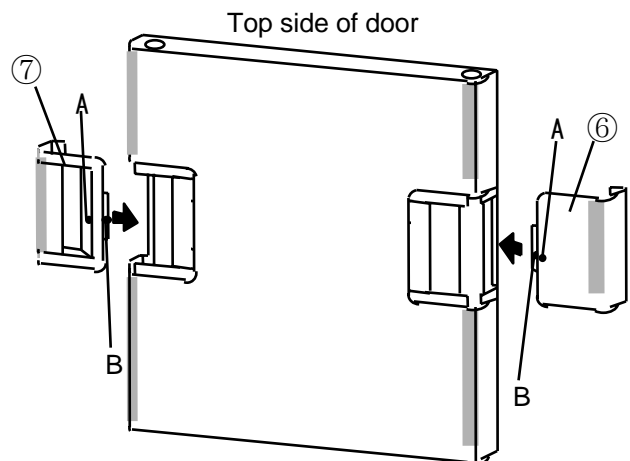
* Only the left bottom hinge is fixed, so the door may be dropped.
Hold the door with both hands.



- (3) Put the door turning upward its inside on some stable flat place, and loosen screws of handle cover ⑥ and the handle ⑦ by a plus screw driver.

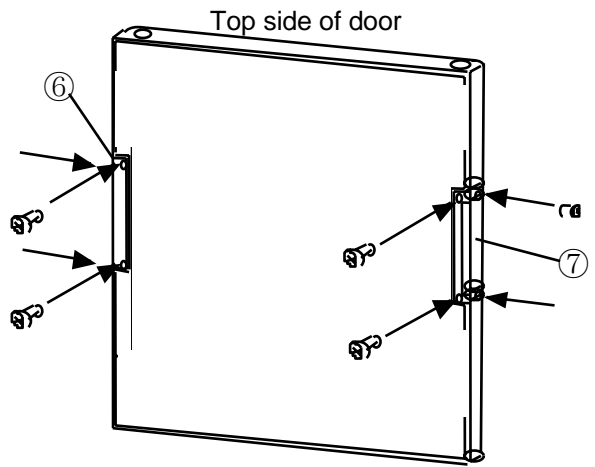


- (4) Overturn the door, remove the handle cover ⑥ and the handle ⑦. Push and hold the part A and slide in the direction of an arrow.

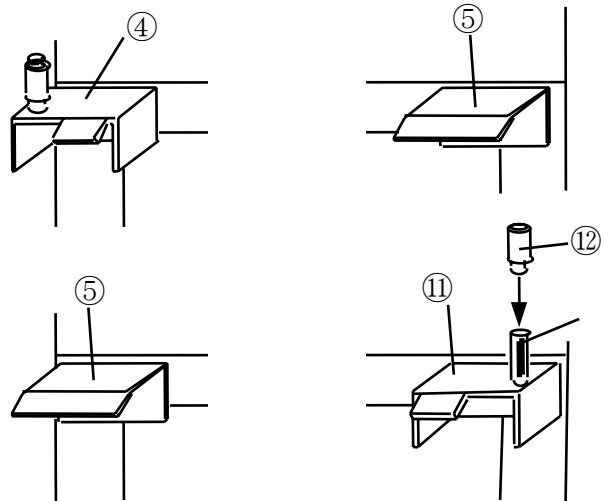


- (5) Switch around the place of handle cover ⑥ and the handle ⑦. Push and hold the part A and slide in the direction of an arrow until the part B is inset into the door completely.

- (6) Put the door turning upward again, and attach handle cover ⑥ and the handle ⑦ with six screws each.



- (7) Open the ventilation cover, and loosen each four screws of the left bottom hinge ④ and the guide plate for cover ⑤.



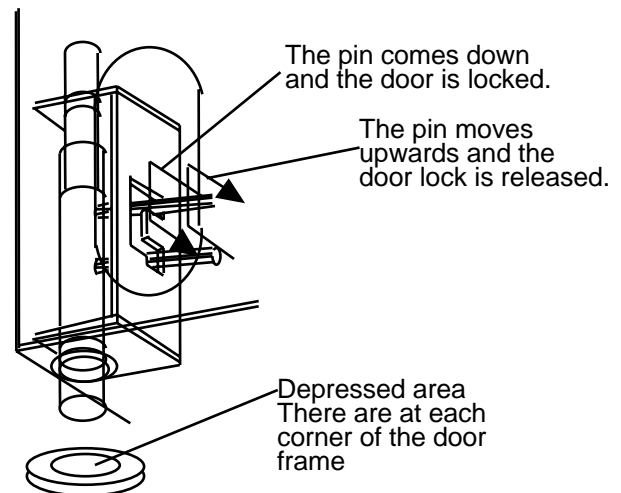
- (8) Attach the removed guide plate for cover ⑤ to the left bottom hinge ④ position and the supplied right bottom hinge ⑪ to the guide plate position with removed four screws each.

- (9) Put the right bottom hinge ⑪ into the right bottom dent of door frame, and hold the door horizontally.

- (10) Let down the slide pin of hinge ② from ⑨ to ⑧ to put the pin into the top dent of door frame.

【 Hinge for top side ①② 】

- (11) Check the door closing status, and attach the hinge cover.
If the door closing (locking) is wrong, loosen the adjustment screw ⑩ with a plus driver, adjust the clamp holder (left) back and forth, and then tighten the adjustment screw again.



- (12) Set the removed left bottom hinge ④ and the hinge bearing ③ aside for future use.

If the clamp holder is adjusted forth, door closing is loosened. Though if it is too loose, the sealing effect is reduced. When the door opening side is changed, make a test run to check the door sealing condition.

Follow the same procedure but opposite side to switch the opening side right to left and left to right.

Although the door opening side can be changed following another procedure, do not work alone to prevent an accident by dropping door.

8 Disposal of unit

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

	Model	Net weight	Overall dimensions
Main unit	KCL-2000A	119 kg	600W×751D×1285H mm
		26 kg	635W×755D×410H mm
Coolant	R-134a	245g	—

9 Service after sale

1. When the unit does not work well, please refer to the trouble shooting table and diagnose.
2. If you need the services, please get in contact with our service agent.
3. Within the warranty period, we will repair or replace subject to the warranty clause.