Vacc-Safe

OPERATING MANUAL

CO_2 Incubator

VSI-120 / VIS-180 / VIS-260

Congratulations!

You have made an excellent choice.
VACC-SAFE thanks you for the trust you have placed in us.
This operating manual has been designed to help you gain an understanding of the operation and possible applications of our instruments. For optimal utilization of all functions, we recommend that you thoroughly study this manual prior to beginning operation.

Unpacking and Inspecting

Please unpack the device carefully. Check that the package is right-side-up and then open it. Check that model of the product is one that you ordered. Check that there is no damage. If there is any damage, file a damage claim with the carrier. In the case of any damage a damage report should be requested immediately. These instructions must be followed fully for us to guarantee our full support of your claim for protecting against loss from concealed damage. The form required for filing such a claim will be provided by the carrier.

Important: keep operating manual for future use

CONTENTS

1. Safety and general precaution

1.1. General information on precaution

- Precaution is to prevent the possible accident or danger during operation. So, you must keep it.
- Precaution is divided into caution and warning. And, each of them has following meanings.

 Warning	If you don't keep this warning, you can get an accident or a fire.
 Caution	If you don't keep this caution, you can get injured as well as a property loss.

Safety warning symbols

1.2. Precaution for using the power cable

 Compliance	Do not make the power plug be pressed by back of the product. (A space between the product and the plug must be 30cm at least.)
 Compliance	The power outlet must be only for this product. (Using various products simultaneously can cause a fire) Clean the power plug with a dry towel and connect it properly. (Foreign substances or unsafe connection can cause a fire.)
 Prohibition	Do not bend the power cable hardly and do not make it to be pressed by heavy products. (When it is damaged, it can cause a fire.)
 Prohibition	Do not touch the power code with wet hands. (It can cause an electric shock.)
 Prohibition	Do not use the damaged power code and outlet.(It can cause an electric shock and a fire.)
 Remove plug	When you see smoke coming from the product or smell something is burning or see any other strange symptoms, you have to pull out the power code and stop using it. (It can cause an electric shock and a fire.)

1.3. Precaution for ground connection

 Compliance	Please ground before use the product, if you don't ground, you can get an electrocution when malfunction or an electric leakage occurs.
 Compliance	At the place where you can't ground, Please buy the equipment to prevent any electrical leakage. An electric shock, an electric leakage and a fire can be occurred without an electric leakage breaker.
 Prohibition	Do not ground to these places; Gas Pipe, water pipe, pipe, lighting rod, telephone wire etc. * Wrong ground connection can cause electrical leakage which eventually results in fire
 Compliance	If you don't have the outlet for AC 230V, then bury it under the ground after connecting the ground line to copper plate. No ground connection can bring an electrocution, an electric leakage and a Fire.

1.4. Precaution for use

 NO disassemble	You must not disassemble, fix and remodel the product by yourself. (You can damage the product throughout a fire and malfunction or get a property loss as well as experimental loss.
 Prohibition	Do not use the product for different purpose. (It can cause malfunction or poor function. Consequently, you will get a wrong result.)
 Prohibition	Do not use an inflammable spray near the product. (The switch and other electric connection parts can cause a fire.)
 Prohibition	When you use inflammable substances such as benzene, thinner, alcohol and LP gas, please be careful. (It can cause a fire and an explosion.)
 Compliance	To prevent water and experiment material from going into the control panel during the experiment, make sure to clean the control panel with a dry cloth. (It can cause an electric leakage and a fire.)
 Compliance	Do not wash the product with excessive quantity of water, thinner, benzene and Petroleum. (It can cause an electric leakage, and malfunction or damage on the surface.)
 Compliance	When you don’t use the product or clean it, please pull out the power plug. (It is to prevent an electric leakage.)
 Compliance	Open and close the door softly and please use a door knob. (A heavy shock can damage the product and breakdown the operating part. Also your hands can be stuck between the door and body.)
 Compliance	Do not detach the built-in lamp and electrical devices. (It can cause an electric shock and a fire.)
 Compliance	Please be sure to prevent foreign substances from getting into the sealing silicon of the door. (The inflow of open air can cause the change of temperature in chamber and discoloration of the packing part by a foreign substance.)

2. Transportation, storage and location of installation

2.1. Transportation

 Prohibition	DO NOT try to slide or tilt the unit
 Compliance	Lift the unit at its four lower corners with the aid of 2 people.
 Compliance	Permissible ambient temperature range for transport: -10℃ to 60℃.

2.2. Storage

 Compliance	Do not keep it at Place in High Humidity. Permissible ambient humidity: max. 70% storage in a cold location is the place you transfer the unit to the installation site for start-up, condensation may form. In this case. Wait at least one hour until the CO_2 incubator has attained temperature and is completely dry.
 Compliance	Please check the voltage & Hertz written on serial label. (Over-voltage, under-voltage can damage the product and poor performance.)
 Prohibition	Do not install at a humid place. (It causes an electric leakage accident and a corrosive of the product.)
 Prohibition	Keep this product out of the direct ray of sun and do not install at a hot place or a place that is near an electric heat. (The proper indoor temperature is 20℃ ~30℃ .)

2.3. Location of installation and ambient conditions

 Prohibition	Do not put inflammable substances near the product. (It can cause a fire)
 Compliance	When you install the product, you have to put the distance of at least 30cm from the wall. To completely separate the unit from the power supply, power plug must be disconnected. Install the unit in the way that the power plug is easily accessible and can be easily pulled in case of danger.
 Compliance	Install the unit at a flat surface, free from vibration and in a well-ventilated location. (If the ground is not flat, it can cause an excessive vibration of the product.)
 Prohibition	When you move the product, do not lay down to its side or reverse the head to bottom. (It can cause a malfunction.)
 Compliance	When you move the product, hold the door and other movable parts of the product with a tape. (When the product is moved, the movable door can cause injury of you and damage of the product.)
 Compliance	When you move the product, you must hold up the product. (Pushing or pulling the product can damage the bottom part of the product.)
 Compliance	CO_2, as well as O_2, and N_2 are harmful in human when in high concentrations. Any excess has to be led out via good room ventilation or by connection to a suitable exhaust system.

3. Prerequisite and configuration

3.1. Prerequisite

Inspection of Boxes

When you have received the instrument which is packed on pallet, inspect the box carefully for any damages that may have caused any damages to product during shipping. Please report any damage to the carrier or to your local VACC-SAFE distributor.

LOCATION

The incubator is designed to operate at temperature 5℃ above ambient, and recommended to operate at minimum ambient 15℃ Maximum Room Temperature is 32℃.

To avoid place for use this incubator is as below.

Near Heater or Freezer (if it may generate heat and affect temperature control of incubator)

Near Equipment generating heat or cold air to incubator.

Directly Sunlight Exposed to incubator

Uneven ground or table head

The place where is being vibrated

Too narrow to use lift handle (at side of bottom) and power cable of incubator.

Cleaning before use

Before conducting cell culture. It's recommended to clean up entire chamber and shelves, water tray by using at least 70% Ethanol mixed of 30% distilled water and soft clothes.

Inserting shelves

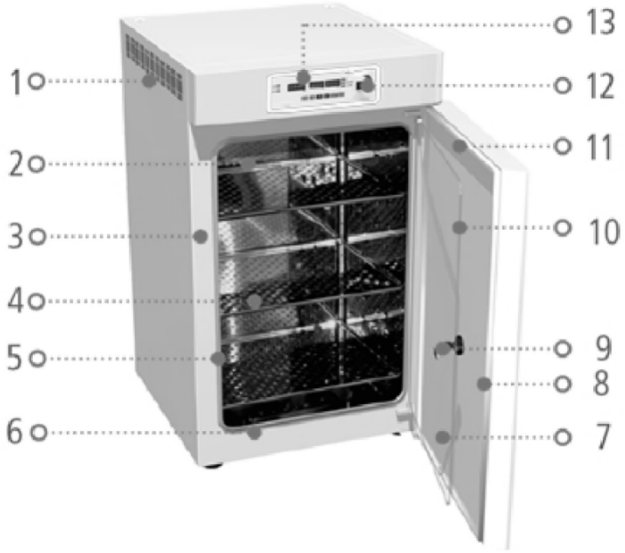
Shelves are mounted onto the shelf racks in such a way that the edge of shelves which is slightly bent up about 8mm goes to the back of the chamber until it is too close to the back wall. Basically, 3 shelve are provided. Insert the shelves from top to bottom.

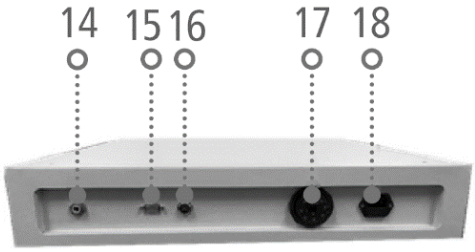
Level the incubator by adjusting feet. Place a small level on the second shelf of the incubator adjust the level feet until the incubator is level and stable.

After inserting the shelves, place humidity tray in the bottom of chamber if humidification is required for your application.

3.2. Configuration

Exterior Configuration of CO_2 incubator





1	Air jacket-6 side direct heating	10	Outer door
2	Ventilation fan	11	Magnetic door seal
3	Glass door heater-Prevent condensation	12	Power switch
4	Stainless steel shelve- Perforated to improve uniformity	13	Control panel
5	Inner door seal- Airtight to prevent CO_2 leakage	14	CO_2 inlet
6	Water pan-Heated by 6 sides direct heating for humidity	15	RS232 interface
7	Glass door	16	RS485 communication interface
8	Outer door heater-prevent condensation	17	Safety switch
9	Door latch	18	Power cord

NOTE

The diameter of blue PVC tube that we use for inflow of gas is 6mm. (total diameter 6mm, hole 4mm)

Connecting Power Cord.

1. Verify your supply voltage matches the voltage of your incubator.
2. Insert the power cord into its receptacle.
3. Plug the cord into power supply outlet.

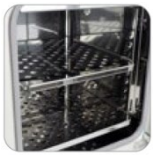
4. Features and specifications of the unit

4.1. Features

1. Excellent Uniformity of Temperature, CO_2.
2. 6 Sides Direct Heat for Temperature Uniformity and Fast Recovery.
3. IR CO_2Sensor detects precise density of CO_2.
4. Outer Heated Door ensures no condensation on glass door.
5. Max 125℃ Decontamination by hot air sterilization (Sterilization model).
6. Convenient Decontamination Process (Easy Preparation, Automatic Program).
7. Microprocessor PID control for Temperature, CO_2.
8. Natural Humidification System by water tray and circulation fan.
9. Special Air Jacket allows effective heat preservation between insulation and chamber.

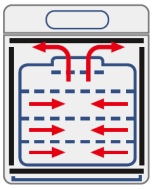
Alarm System

Buzzer to alarm low or high deviation of C02, Temperature.



Perforated Shelves

Perforated shelves are good for natural air flows and are made of stainless steel which is resistant to rust and contamination.



Gentle Air and Moisture Convection

Natural Air and Moisture Convection, Air and Moisture in chamber are distributed by 6-side heating and air circulation fan.

No Condensation

Heating by front door heater & frame heater prevents condensation in the chamber and on the glass door.

Easy to clean

Rounded corner allows easy cleaning. The entire chamber is made of stainless steel (SUS304)

Microprocessor PID Control

Intelligence Control for C02 density, Temperature, Alarm, Automatic Decontamination

Over Heating Limit

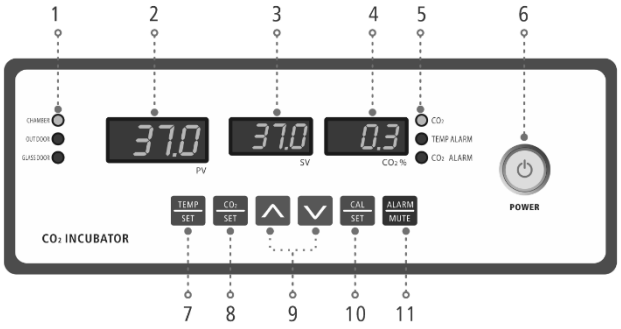
Heating is automatically cut by safety device when temperature control fails or there is excessive heating over set point.

A filtration of the chamber HEPA

4.2. Specification

Items	VIS-120	VIS-180	VIS-180E	VIS-260
Temperature Range	Ambient +5^{O}C to 60^{O}C			
Accuracy	±0.1^{O}C at 37^{O}C			
Uniformity at 37^{O}C / RT 25 ^{O}C	±0.3^{O}C	±0.3^{O}C	±0.3^{O}C	±0.4^{O}C
CO_2 Inlet pressure range	0.3~0.5bar	0.3~0.5bar	0.3~0.5bar	0.3~0.5bar
Controller	PID			
Humidity at 37^{O}C	70% ~ 80% at 37^{O}C（with water try）			
CO_2 Range	0% to 20%			
Accuracy at 5% at 37^{O}C	±0.1% at 5% at 37^{O}C			
Increment	0.1%			
CO_2 Sensor	IR CO_2 Sensor			
Control panel	LED Display			
Jacket type	Dry wall type (6 sides direct heating)			
Chamber material	Stainless steel (SUS 304)			
Outer door	Silicon Packing Magnet Door			
Inner door	Tempered Safety Glass Door			
Weight	70KG	82.5KG	82.5KG	122KG
Capacity	120Liter	180Liter	180Liter	260Liter
Perforated Shelve	3/8	3/8	3/8	3/8
Heating capacity（Max.）	320W	320W	320W	610W
Sterilization heating capacity	650W	650W	650W	850W
Chamber dimension(WxDxH/mm)	480x470x520	473x528x710	473x528x710	530x590x900
Overall dimension (WxDxH/mm)	580x560x765	560x620x945	560x620x945	630x680x1125
Standard UV	NO	NO	YES	NO
Standard dry heat sterilization	YES	YES	NO	YES
Power	220-240V 50/60Hz			

5. Control Panel



1	Heating Signal: To show status of heating activation at 3 parts where is controlled by 3 each sensor. Glass door means the heater around glass door.		
2	Temperature Display LED window.	7	Temperature set button.
3	Set temperature display.	8	CO_2 Gas Setting Button.
4	CO_2 Gas percentage in Chamber。	9	Adjustment button.
5	Pilot Lamp for CO_2 valve: Pilot lamp ON position means inflow of gas.	10	Calibration button.
6	Power on/off button.	11	Alarm Mute: Alarm ON/OFF switch.

6. Operation

Before Switch ON, insert water tray filling with distilled water (If necessary). Make sure connection of gas supply. And Open CO_2 gas cylinder or supply with the pressure of regulator set to 4.5~7.25Psi or 0.3~0.5 bar.

6.1. Turn on the power switch

The LCD screen readout of current temperature and density of CO_2 in chamber will be displayed.

6.2. Setting temperature

a. Press the "TEMP/SET" key, Then, LED screen will flicker continually.
b. Input the desired temperature by pushing UP (▲) and DOWN (▼).
c. Press "TEMP/SET" key again after input. “SAVE” is shown up on LED screen like below.

After set-up, LED screen will stop flickering.
* If you don't press "SET" key lastly after adjusting, the new set-up value will not be saved at all.
* Set-up Temperature range is Ambient +5℃ ~ 60℃ (Normal).

6.3. Setting CO_2 density

a. Press "CO_2SET" key. Then, LED screen will flicker continually.
b. Input the desired value of CO_2 density by pushing UP (▲) and DOWN (▼) key
c. Press "SET" key again after input. “SAVE” is shown up on LED screen like below.

After set-up, LED screen will stop flickering.
* If you don't press "CO_2 SET" key again after set-up, the new set-up value will not be saved at all.

6.4. Calibration of temperature & CO_2

Please follow up the procedure for calibration below in case of discrepancy between actual value (measured by reliable thermometer or device) in chamber and displayed value.

Conduct the analysis of CO_2 density and Temperature when incubator has been stabilized for more than 2 hours. Leave the incubator at least 2 hours (preferably overnight) to allow conditions to stabilize if incubator is just turned ON.
Consider that low deviation range (like ±0.1 ~ 0.3%) may not be corrected precisely by this calibration.

a. Press and hold “CAL/SET” for 10 seconds. Then, LED will be flickering with signal below.

Chamber’s Main Temp calibration➔ 1 Channel Sensor detects the temperature in chamber. The sensor is above of circulation fan.
Press “CAL/SET” key to enter Ch1 calibration which is purposed to adjust the value LED display to be shown in accordance with the actual value of Temperature in chamber. Available range of Calibration is ±5℃ .
Press UP (▲) the temperature value on LED as much as display difference between actual temperature and temperature on LED when actual temperature in chamber is higher than value of temperature display. On the other way, press DOWN (▼) the temperature on LED when the actual temperature is lower than display.
Press “CAL/SET” key again after input. “SAVE” is shown up on LED screen like below.

Caution	Shift channel to channel, press “CAL/SET” button. After calibration at 4Channel, the LED is back to Temperature Display. Press “CAL/SET”

b. Press UP (▲)and DOWN (▼)to switch to Ch2 calibration which is Outer door’s Temp calibration

Caution	Channel2 is purposed to remove water condensing on glass door caused by high temperature difference between chamber and outside. Recommend to use calibration at Channel 2 in case of water condensing on glass door.

Except for water condensing on glass door, calibration of 2 and 3 Channel is not recommendable. Check if the water condensing is removed in 3 Hours after calibration of CH2 is done. Press “CAL/SET” key again after input. “SAVE” is shown up on LED screen like below.

c. Press UP (▲) and DOWN (▼) to switch CO_2 density calibration

Push UP (▲) and DOWN (▼) to adjust CO_2% display. Before release of CO_2 incubator from VACC-SAFE factory, CO_2 density is calibrated optimizing at 5%. When using different density ofCO_2rather than 5%, this calibration is highly recommendable.
Press “CAL/SET” key again after input. “SAVE” is shown up on LED screen like below.

6.5. Alarm

Alarm Activation

Temperature

Temperature Alarm sensing program starts when chamber temp. maintains in ±1℃ from the set point for more than 3 minutes.

If temperature deviation is more than ±2℃ from set point for about 3 minutes, alarm starts ringing. So, temp. alarm tolerance delay is about 3 minutes.

CO2

CO_2 Alarm sensing program starts when CO_2 range maintains in ±1% from the set point from more

than 3 minutes.

If CO_2 deviation is more than ±1% from set point for about 3 minutes, alarm starts ringing. So, CO_2 alarm tolerance delay is about 3 minutes.

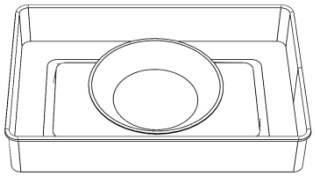
Door Open

The outer door is open for longer than one minute.

*When pressing the alarm mute button on the control panel will stop the alarm from activating. If the alarm was stopped by mute button, the alarm will be re-activated after 3 minutes.

6.6. Water tray

An additional water tray at the bottom of the chamber enables a high, uniform relative humidity while its special double-dish or dish tray design that creates cold point preventing condensation in other parts of the chamber. Perforated shelves are provided as standard to facilitate recovery of RH conditions in the chamber.



6.7. Hot Air Sterilization （Only for Sterilization model）

When CO_2 incubators are used in contamination hazardous areas, hot air sterilization can be used as an additional means of cleaning the inside of the chamber. Hot Air Decontamination uses 6 side direct heating up to 125°C. This makes chamber decontaminated destroying bacteria and germ. High Temperature (125°C) is maintained in chamber for more than 2 hours. After 8 hours sterilization program (including 2-3hours of warm up time depending on), the temperature in chamber decreases and recovers to 37°C or last programmed temperature. CO_2 gas is also re-set at 5% or last programmed point automatically. Hence, immediate cell culture is available after approximately 10 hours sterilization cycle.

 Caution	Caution for Hot Air Sterilization USE.

Before operating Hot Air Sterilization, ensure the following:

1. Removing CO_2 Sensor are not required as both sensors are located outside the chamber.

2. Seal access port with full silicon stopper (Use complete stopper without drilling hole.)
3. Empty the chamber except shelves and rack. Water trays can be left in, but without water.
4. Clean the inside of the chamber and dry thoroughly. Before starting this program, set the desired end temperature and CO2% values. Temperature and CO_2 will be reset to last programmed point automatically after sterilization is finished. Front outer door should be closed as normal.
5. During and After Hot Air Decontamination, ensure the following:

1. Do not open the door in the CLEAN mode.
2. Do not touch glass door or hot surfaces.
3. Always be careful for the injury from hot air.
4. Please let the incubator cool down thoroughly before using it again. Heat remaining inside the chamber can cause injury, even if the sterilization cycle is already finished.
5. Incubator should not be turned off during the sterilization

Caution	*Total sterilization program time is 10 Hours, but, heat up and recovery time to each temperature point may be vary depending on Room temperature or set point.
Caution	*To cancel the cycle, just turn the mains power off and on. DO NOT OPEN THE DOOR until the temperature on the display is lower than 50°C.
Caution	*Only the incubator with the function of dry heat sterilization has this function, ordinary incubator does not have this function.

How to start

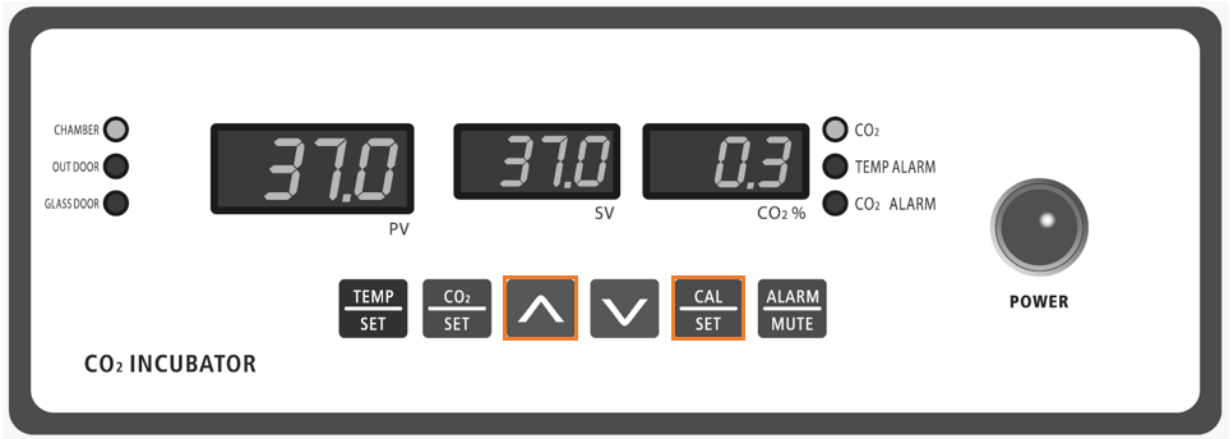


Figure 1: Example of the display of an incubator with the hot air sterilization option.

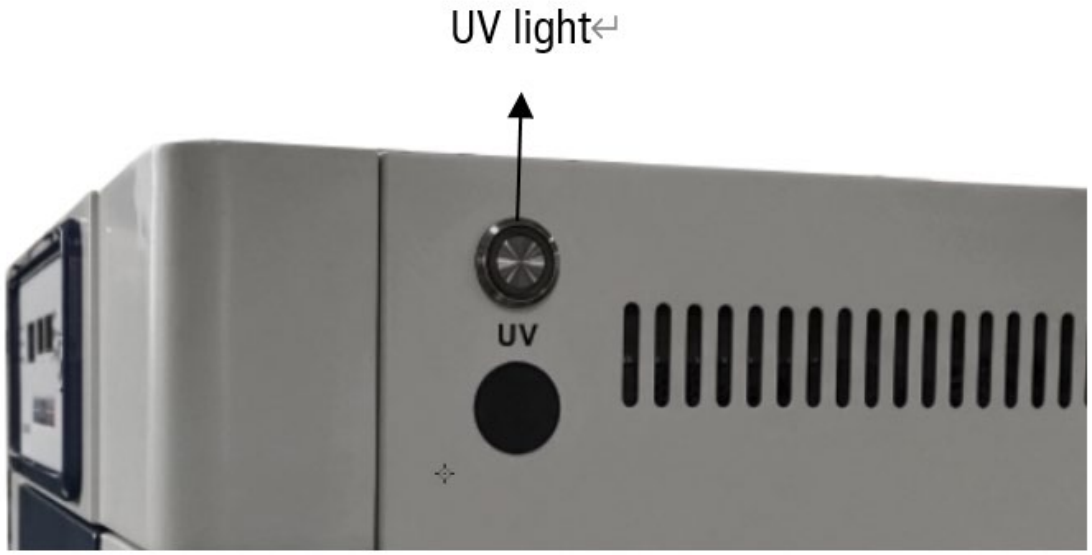
After conducting prerequisite, take the following steps:

Turning on the cycle: On the display of the incubator, press the two following buttons simultaneously

(& CAL/SET) which directed as CLEAN MODE.
At the same time long press two buttons to enter the dry heat sterilization process
The display should indicate the following:

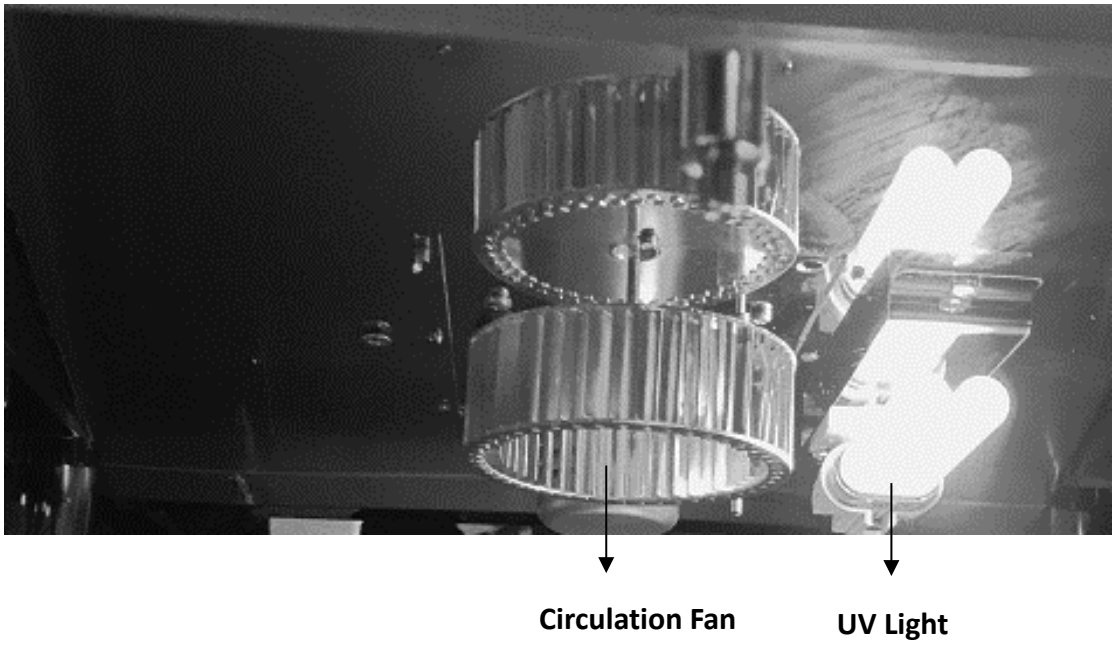
Figure 2: Display of the incubator indicating sterilization cycle
"CLEAN" is shown in temperature display and 600 is shown in CO_2 LED Window. CLEAN means the HOT AIR Decontamination program is now activated. The number 600 displayed in CO_2 LED is the time counted down from 600 minutes (10 hours). This show how many minutes are left until the program finishes.
If the temperature has reached at pre-set value；(Last programmed set point before hot air decontamination), the display will no longer show "CLEAN". It will in turn to the normal temperature and CO_2 values. This indicates the incubator is ready for normal use again.

6.8 UV decontamination



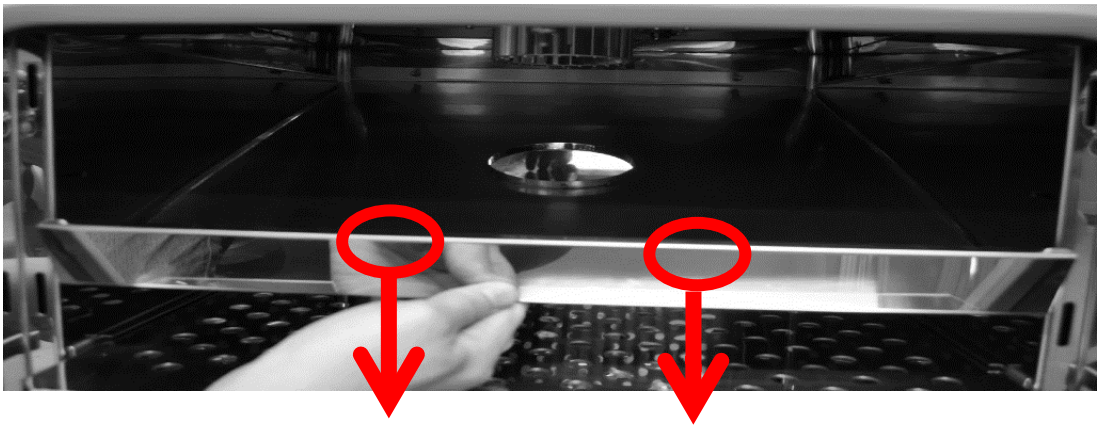
UV Lamp ON /OFF Switch UV

UV Lamp is located near circulation fan and above ceiling of chamber. It decontaminates circulation fan and in-air circulated from fan. Most light is blocked by ceiling.



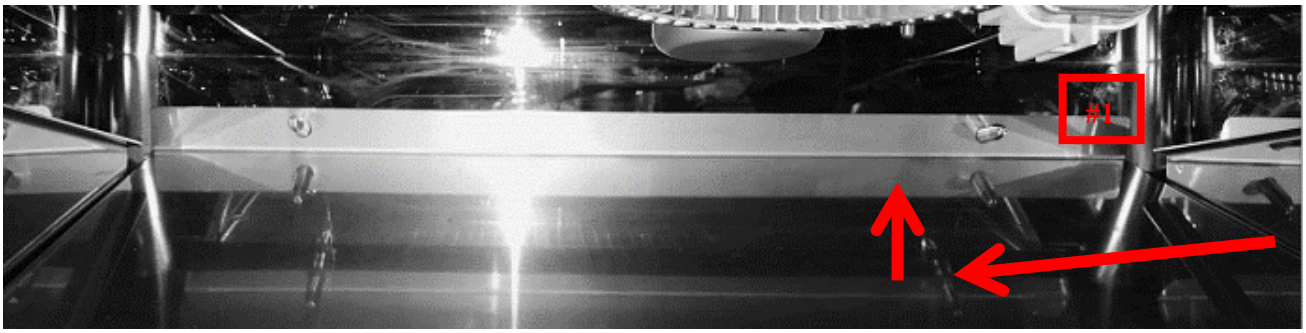
If UV needed to be exposed to entire chamber, follow the procedure below.
Find the bolt which holding the ceiling. That is in circle in below photo. Unscrew this bolt with supporting the ceiling by another hand so the ceiling will not fall down.

1. Carefully put ceiling down and pull it out from two hooks (in red circle) at back. See below.



Pull it out to direction as arrows are directed. After that UV light expose to more surface of chamber but, not completely entire chamber due to shelves. Final look is like below.
After the UV lighting without ceiling, ceiling need to be returned to its position. For that, follow below procedure.
Insert it until it is reached more than the part at top which bended to inside. At that point, lift the

edge of ceiling up and put two holes into its hook. Then, lift the front of ceiling up and screw up the Nut.



When inserting the ceiling, it should be going under the part bended (marked with red squire#1) until that part end. Do not attempt to put the ceiling above of that bended part. That part should be located above ceiling.

7. Safety Switch

It is the safety device to prevent the heater from overheating, when the temperature controller is malfunctioning. Set the Safety S/W higher than setting point.

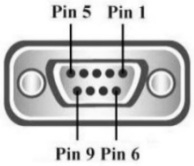
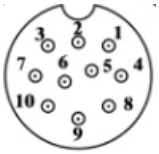
- The Safety S/W has wide deviation.
- Safety S/W is the safety device for preventing the heater to overheat when TEMPCONTROL is malfunctioning.

8. Interface of RS-232/RS-485

Communication with a PC or a superordinated data system allows the device's operating status to be viewed on the screen. The instrument can be connected to a PC through 9-pin port (DB-9), it can be plug directly to the PC's available USB connection. The RS-232 and RS-485 interface ports are available at the same time which provide a connection for the device to a personal computer or terminal.

Pin allocation

Pin

RS-232：		2:Tx
		3:Rx
		5:GND
RS-485：		8:A
		9:B
		10:GND

8.1. RS-232 interface

The RS-232 interface uses automatic identification. Parameter settings are as follows:

Baud: 4800~19200 bits/second

Data bits: 8

Stop bits:1

Handshake: None

Parity: None

List of commands

Item	Input / output	Content of "#"	Remarks
Set the equipment parameters			
Set temperature	out_sp_00 #### ↵	Decimal number	Unit:0.01℃
Set CO_2 density	out_sp_01 ### ↵	Decimal number	Unit: 0.01%
Timing sending once every 5 seconds			
Status	prs ## ## ## ↵	Decimal number	Eg: prs 2229 2220 111 means current chamber temperature 22.29℃ , door temperature 22.20℃ , CO_2 density 11.1%.

8.2. RS-485 interface

The modbus protocol uses 16-bit registers for data transmission with RS-485 serial port. Data that use more than 16 bits must be divided into several register. For values that are divided into several registers, the registers are arranged according to the Modbus format.

Function codes

Name	Code (Hex.)
Read Holding Registers	03
Write Single Register	06
Read Input Register	04

Holding register

Register address (DEC.)	Explanation	Data type	Remark	Read or write
40001	Baudrate	Int	0:4800 1:9600 2:19200 3:38400	Read and write
40002	Set temperature	Int	Unit:0.1℃	Read and

				write
40004	Set CO_2 density CO_2	Int	Unit:0.1%	Read and write
40005	Audible alarm	Int	0: Null 1: activate	Read and write

Input register

Register address (DEC.)	Explanation	Data type	Remark	Read or write
30001	Current chamber temperature	Int	Unit:0.01℃	Read
30002	Current door temperature	Int	Unit:0.01℃	Read
30003	Current sterilization temperature	Int	Unit:0.01℃	Read
30005	Current CO_2 density	Int	Unit：0.01%	Read
30006	Open door time	Int	Unit：1 second, MAX:240	Read
30007	Sterilization remaining Time	Int	Unit:1 second	Read
30008	Temperature deviates more than ±2℃	Int	0：Null 1：Activate	Read
30009	Chamber temperature sensor disconnection alarm	Int	0：Null 1：Activate	Read
30010	Chamber temperature exceeds 60.5℃ alarm	Int	0：Null 1：Activate	Read
30013	CO_2 density deviates more than ±1%	Int	0：Null 1：Activate	Read
300014	CO_2 sensor disconnection alarmCO_2	Int	0：Null 1：Activate	Read

9. Optional function

9.1. Printer

Printer can be connected to CO_2 incubator to print daily working status that contains information of setting temperature, present temperature and present CO_2.

Config the printer

Please contact Vacc-Safe or authorized service provider

10. Service and Check Point

WARNING: Technical service should only be performed by qualified service personnel.

When replace any electrical or mechanical components, the disconnect units should be far away from its electrical power source.

A. Electrical connection: Try to disconnect main power cable and connect again.

B. Voltage supply: Please check to voltage.

C. Fuse check C.

D. Verify voltage on unit D

E. Defective power switch (check voltage at switch) E.

11. Troubleshooting

Fault Description	**Possible fault cause**	**Required measures**
Heating		
Chamber heating permanently, set point not held	SSR relay defective SSR	Replace SSR relay
	Control panel display defective	Replace display screen
	Temperature sensor defective	Replace temperature sensor
Chamber does not heat up	SSR relay defectiveSSR	Replace SSR relay
	Power not supplied to heating circuit	Reconnect the power plug on the panel. Contact VACC-SAFE service
Unit does not switch on	The miniature fuse has blown.	Replace the fuse with type 5x20mm, 230V(5A),110V(7A). If the newly inserted fuse triggers again, there is short circuit: contact VACC-SAFE service.
	Switch defective	Replace the switch

Gas		
CO_2 concentration in chamber is too high/ too low.	Defective function of the CO_2 controllerCO_2	Reset the alarm.
	CO_2 sensor system defectiveCO_2	Contact VACC-SAFE service.
The concentration of CO_2 does not reach the adjusted set value.	Gas inlet defective	Replace the gas tube
	Gas leaking from inner tube connecting region.	Replace the inner tube.
	Solenoid valve defective.	Replace solenoid valve
Humidity		
Condensations inside the chamber	Fan defective	Replace the fan. (contact VACC-SAFE service)
Condensation on the door	Improper temperature distribution b/w the door and the chamber	Increase the value of door heating temperature. (Ch.2)
No or too low humidity inside	Water pan empty	Fill the water pan with distilled, sterile water.