



VL 150 DES CO2 Incubator

Instruction Manual

Read these operating instructions carefully before using the unit.

This manual is used only for instruction. The manufacturer declines all and any responsibility for possible inexactitudes due to typing errors contained in this manual and reserves the right to modify his products without changing their main characteristics, if he considers such modification necessary or useful.

Simple Start-up Procedure for the VL 150 DES CO₂ Incubator

Default setting: temperature at 37.0°C , percentage CO₂ at 0 %

Please do moist heat disinfections at 90°C before first using the equipment.
The subsequent procedures should be strictly followed whenever you use the equipment:

1. Open the outer door and the glass door and infuse distilled water (3 litres) into the pool. Close the doors after doing so.
2. Connect the connecting piece to the source of CO₂.
3. Connect the power and switch on.
4. The equipment will do self-checking automatically. The display windows of [%CO₂] and [°C] will display [888] and a version number. The procedure will be terminated after 40s, and the display windows of [%CO₂] and [°C] display the current data of the equipment.
5. Press [auto-start] for about 10s and the “auto-start” light will be on.
6. Please open the glass door according to the hints of the [%CO₂] and [°C] display windows.
7. Close the class door after 1 minute, and the equipment will do the auto-start.
8. Wait for 16 to 24 hours.
9. The temperature of the equipment will display 37.0 ± 0.1°C , and CO₂ will display 0 ± 0.1%CO₂, and use [▼] or [▲] to set the “°C” value to 3 while pressing the [cal] key. Release the two keys, and press [cal] and [i] key one by one, and the CO₂ display window displays [.0] .
10. Adjust the export point of CO₂ to 1bar (0.1MPa)
11. Use [▼] or [▲] to set the CO₂ value while pressing the [%CO₂] key.
12. The equipment will continue to put in gas until reaching the set value.
13. The equipment can now be used for incubating work.
14. You must set the CO₂ value to [.0%] according to the “Step 10” after operating and before switching off.
15. Open the glass window, let out the gas, and dry the inner chamber.

Control Panel

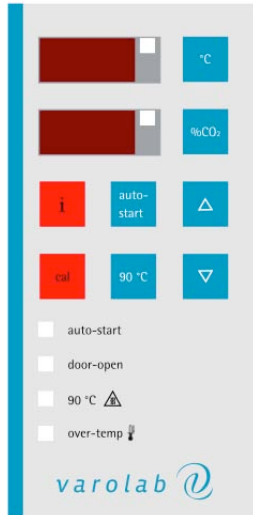


Figure 1: Display panel

Simple Introduction to the Display Panel:

1. “°C” Display Window

Displays the actual value at normal condition. The set value can be displayed by pressing the `[[°C]]` key. The code of temperature malfunction can be displayed by pressing `[[i]]` key; you can also switch to the special function mode by pressing `[[cal]]` key (See Function Select).

2. “%CO₂” display window displays the actual value of CO₂ concentration; the set value can be seen by pressing `[[%CO2]]` key. The code of CO₂ malfunction can be displayed by pressing the `[[i]]` key; you can also switch to the special function mode by pressing the `[[cal]]` key (See Function Select).

3. Press `[[i]]` key to display the malfunction code.

4. Press `[[cal]]` key to enter the adjusting mode. Select special functions together with the `[[▲]]` and `[[▼]]` key.

5. “auto-start” light will lighten up when the equipment begins the auto-start.

6. “door-open” light will show when the glass door is open

7. “90 °C” light lights up when the equipment begins disinfections at 90 °C .

8. “over-temp” will lighten up if the temperature is over the set value and the heating progress will be terminated.

9. Press `[[90 °C]]` key for 10s to enter the disinfections at 90 °C

10. `[[▼]]` is used to reduce the value.

11. Press `[[auto-start]]` key for 10s to enter the auto-start mode.

12. `[[▲]]` is used to increase the value.

13. `[[%CO2]]` is used to set concentration of CO₂

14. “gas” light will lighten up when the gas comes in.

15. `[[°C]]` is used to set the temperature.

16. Heating light will lighten up in heating progress.

Introduction

The VL 150 DES Incubator is a delicate lab equipment mainly used in medical areas and in the incubation of cells, tissues and bacteria.

There are new functions like disinfection at 90 °C, the control of CO₂ concentration, and the Micro Control System, which improve the incubation of cells, tissues and other materials. It is an important equipment for high-level biological and medical experiments.

Please, read this manual carefully before using it in order to prevent the inconvenience of damage to the equipment.

Only the personnel authorized by varolab can do the necessary tests or maintenance work to keep the incubator work normally and in accordance to the corresponding safety standards.

Please note the nameplate No. when handling the malfunction report or call for components.

Only authorized or trained personnel can operate the equipment.

Please keep the incubator in steady environment without acute change of temperature, which is helpful to the incubation.

The equipment is in accordance with the following standards:

⇒ DIN 58945

⇒ DIN 12880 Part I

⇒ DIN VDE 0700 Part I; IEC 335-I

Equipment model and its meaning:

VL ----- Varolab

150 ---- inside volume is 150 litres

DES --- moist heat disinfection system at 90 °C. Sorts of equipment:

Common equipment Class I .

The important part is labeled



Application

The incubator can simulate the natural data of cells and tissues.

The equipment CANNOT be used to incubate flammable materials.

Equipment Description

⇒ Fabric Shell

Electrolyzed galvanization steel (RAL 9002), door (RAL 5024).

Control parts are made of plastic.

Stainless steel is used in inner chamber.

⇒ Inner Components

The insert shelves are shake resisted, and can be adjusted at 50mm height. You can remove the shelves and support frame simultaneously without any additional tools.

⇒ Heating System:

The heating system is spreaded on the surface of inner chamber to heat it. The heating system is normally placed at the top, back, front, left, right sides of the pool and the front of the outer door.

The condensed water will not appear because the outer door is also heated so that it will keep clear. On the contrary, there will be condensed water on the outer door. The main heating system allows the equipment to run at the temperature 8 °C above the Room temperature. If you hope to operate

at a lower temperature, you can switch off the door heating to make the equipment work at the temperature 5 °C above the surrounding. There will be condensed water formed at the corner of the glass door. The door-heating switch is "ON" at normal condition, and the additional heating system is always on. The new added slowly heating and normally heating mode could make the incubator work at the different temperature. Anyway, normal heating mode is suggested.

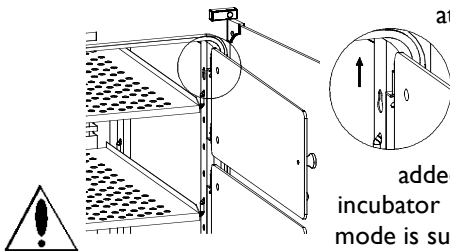


Figure 2: (small glass door)

⇒ Humidity:

The distilled water in the pool vaporize and humid the air inside the chamber, and the humidity at normal condition is $\geq 95\%$

The condensed water will not appear at the top of the chamber and on the door because the particular heating system is used. Instead, it will gather at the other sides of the inner chamber.

The container of the pool: 3L distilled water

Please ensure that there is no chemical material in the water or it will canker the pool.

You'd better pour 50ml CuSO_4 liquor into the equipment to prevent the growth of mildew.

Each incubator is equipped with an electric suction pump.

Steps of using:

※ Take out the draining pipe in the bag.

※ Remove the lower shelf inside the chamber.

⇒ Connect one point of the pipe to the discharge port of the electric suction pump.

⇒ Put the other point into the bucket.

⇒ Install the four osculums onto the back of chamber (below the wind channel) and put the bottom into the water.

⇒ Educe the plug and put it into the AC 220V power jacket.

⇒ The pump begins to work until the chamber is dried.

⇒ Take off the plug and remove the pump from the chamber

⇒ Dry the pump.

⇒ Dry the pool.

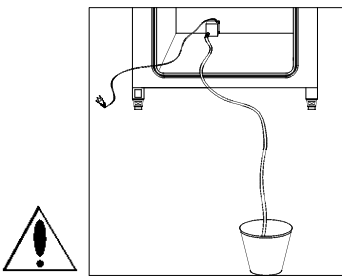


Figure 3: Draining

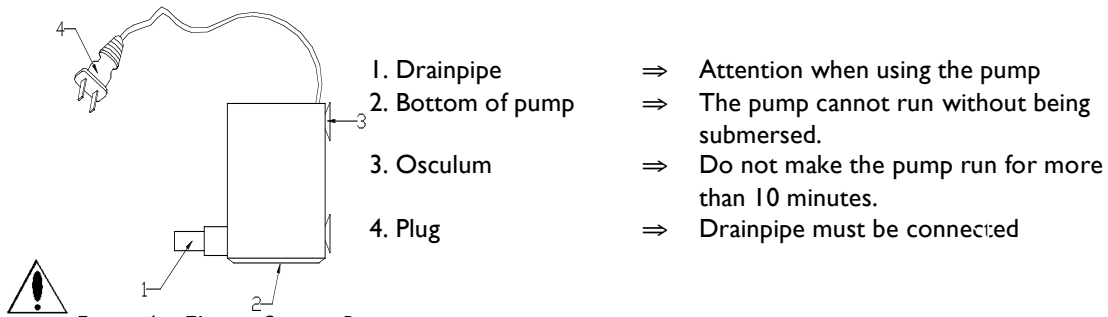


Figure 4: Electric Suction Pump

- ⇒ Attention when using the pump
- ⇒ The pump cannot run without being submersed.
- ⇒ Do not make the pump run for more than 10 minutes.
- ⇒ Drainpipe must be connected

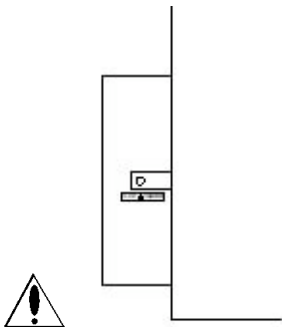


Figure 5: CO₂ Entrance

⇒ Gas Source
 The joint of the gas entrance is at the back panel of the equipment
 The max input pressure is 1 bar
 Please, carefully check the connections at the gas entrance!
 The gas will pass a filter and enter the chamber after the grain larger than 0.3µm is being sieved. The sieving ratio is 99.998%, and the blower mixes the incoming gas and air inside.

⇒ Door Switch:
 There is a switch at the back of the glass door. This switch will cut the gas supply and the heating system to prevent incoming gas and overheating. All the display will show until the door is closed. If the door remains open for 5 minutes, the equipment will give out an alarm. The outer door can only be closed when the glass door is shut and gastight.

⇒ Pressure Compensation:
 The pressure compensation hole prevents the abnormal pressure when the gas enters and the assimilation of air when glass door is open.

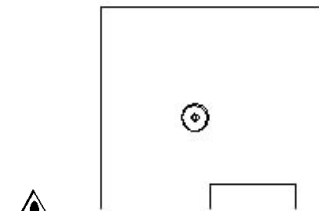


Figure 6: Pressure Compensation Hole

The equipment should be placed with good moving space to ensure the gas letting by valve can be cleaned in time.

Micro Control System

The system includes the following separate control functions:

a) Data Control:

set range:

- o temperature : 5.0°C ...50.0°C
- o CO₂ : 0.0%...20.0%

b) CO₂ reset to zero

adjust the CO₂ testing system

c) Supervisor:

- o door control
- o wrong message
- o malfunctions restoration
- o malfunction codes

d) Special Functions

- o buzzer: On/Off
- o gas supply: On/Off
- o CO₂ adjusting
- o set point: lock
- o heating mode: slowly/normally
- o door heating: On/Off

a) Data Control

⇒ temperature

A Pt1000 resistance of the micro control system controls the chamber temperature.

⇒ CO₂ control:

In order to keep the pH value of the samples stable, the concentration of CO₂ in the chamber should be controlled. The concentration of CO₂ depends on the expected pH value and the content of the buffer solution of NaOH in the incubation medium. The measurement of CO₂ is a continuous process based on the thermal conductivity of the inner chamber. Thus the input of CO₂ will cause the change of the thermal conductivity inside the chamber and form a signal which indicates that there is a direct ratio between thermal conductivity and concentration.

b) Self-adjusting of measuring system

Regular auto-start function

The measuring system needs adjusting before operating or modifying the set temperature. It will be preceded when auto-starting.

The equipment will self-adjust to the measuring system when the temperature and humidity both reach steady state. The process takes 15 hours if it is started at the room temperature. Please, make sure that the chamber is only filled with air. *Suggestions: Do "auto-start" every six weeks or whenever the temperature is changed!*

c) Supervisor function:

⇒ door control:

All the current values displayed will show until the glass door is closed. If the door is open for more than 5 minutes it will be considered a malfunction and a malfunction code will be given out.

⇒ Malfunction identification:

The Micro Control System supervises all the data and possible malfunctions. All the set value has a range, and the equipment will give an alarm together with the wrong message if the actual value is out of the range.

⇒ Error Range:

- Temperature: $\pm 0.5\text{ }^{\circ}\text{C}$

- CO₂: $\pm 1.0\%\text{CO}_2$

⇒ Wrong message:

Each malfunction identified by Micro Control System has a special code that will help you recognize the reason of malfunction.

The radiation digital tube will show when a malfunction occurs to inform you about the situation, and if the buzzer is connected, you will also hear an audio signal. If you keep pressing the **[[i]]** key, you will get the code of malfunction on the display, and if there are no faults, it will display **[[- - -]]**.

⇒ Attention:

Please press **[[i]]** key to get the code first when a malfunction occurs.

Following actions may interrupt wrong message:

- Change of the set value
- Switching equipment on/off

⇒ Table for all Codes of Malfunction:

<i>Code of Malfunction</i>	<i>Possible Reason</i>	<i>Solutions</i>
99 Glass door is open	Glass door is not closed	Close the door
100 temperature too low (Set point)	Door heating is switched off	Switch on the door heating (Function 5)
101 temperature too high (Set point)	Surrounding temperature too high	Switch off the door heating (Function 5)
200 CO ₂ too low (Set point)	CO ₂ not connected CO ₂ is used up Low pressure of CO ₂ entrance	Connect the gas Replace the CO ₂ bottle Adjust the pressure to 1bar
201 CO ₂ too high (Set point)	High pressure of CO ₂ entrance	Adjust the pressure to 1bar

d) Special function:

For adjusting choose the following functions by **[[cal]] + [[▲]]** or **[[▼]]** ;

⇒ Buzzer: On/Off

⇒ Function 1:

You will hear a audio signal when malfunction occurs if the buzzer is on.

Switch off the buzzer: "Silent" .

Default set: Buzzer is on

⇒ Gas supply On/Off

⇒ Function 2:

The gas source will be cut off if you choose "Gas OFF" , and the green diode "Gas" will go out.

Default set: "Gas On"; the green diode "Gas" lights up when the gas enters.

⇒ Setting CO₂ to zero

⇒ Function 3

If the warp of CO₂ display is too large, the function allows manual zeroing of CO₂.

⇒ Lock the set point:

⇒ Function 4:

This function allows you lock the set point of temperature and CO₂ set value – and these points will not change when the equipment is wrongly operated.

Default set: Unlocked

⇒ Door Heating: On/Off

⇒ Function 5:

The main heating system allows the equipment working at a temperature 8 °C higher than the surrounding. If you want to operate at the temperature 5 °C higher than the surrounding, you can simply switch off the door heating system. But condensed water will form on the glass door.

Default set: Door heating system On.

⇒ Way of heating: Normal/Slowly

⇒ Function 6:

The two different way of heating ensure the equipment working normally at different temperature. The Slowly Heating way is suitable for high-temperature situation. Normal Heating way is suggested.

Default Set: Normal Heating

⇒ Operational Way: Default Set

⇒ Function 7 :

This set id is meant to test the function of the incubator, please set to 1.

Default Set: 1

⇒ Operational Way: Monitoring the surrounding temperature

⇒ Function 8 :

Monitoring the surrounding temperature is to make the temperature inside the chamber steadier.

Default Set: Monitoring the surrounding temperature

Overheat Protection

- ⇒ Temperature Limit Controller (TLC):
There is a separate TLC to protect the incubator.

When the temperature control circuit is out of control, the TLC will control the power in case it is 1.5°C higher than the set value.

The red light will lighten up when the TLC responds.

If the TLC is charged with the controlling, please look at the code table of malfunction to find out about the reason.

Placing Position and Installation

Open the box and take out the components.

- ⇒ Positioning:

The incubator must be put at the irremovable place.

Avoid direct irradiation from the sun.

The placing position should keep dry and the surrounding temperature cannot be higher than 30°C (18°C to 30°C is the most suitable)

Keep the equipment at a level place and the bracket should be shake resistant and apyrous.

CO₂ is needed when the incubator is working while CO₂ is also harmful to health, so the placing position must be good ventilation. The gas discharged from the back panel must be immediately carried off.

The equipment cannot work without ventilation device, thus, if several equipments are in the same room or the equipment is placed at the bottom of the lab, additional ventilation device is needed.

The detail of gas letting is introduced in appendix.

- ⇒ Space:

There should be some space left between the equipment and the wall or other instruments.

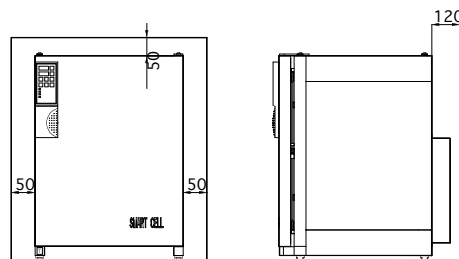


Figure 7: Space between the incubator and the wall in mm
The pressure compensation hole at the back panel should not be jammed.

⇒ Stacking: (See Figure 8)

⇒ Installation and connection of gas source:

The corresponding connecting piece is at the back of equipment (See Figure 5, P.8)

The gas entering the equipment should first pass a reduction valve (prepared by customer) to reduce the pressure to 1 bar.

The pressure of 1 bar cannot be changed for safety reason.

⇒ CO₂:

Connect the reduction valve to the equipment again.

⇒ Attention:

**The purity of the gas must be at least 99.5%.
Only bottles without go-cat can be used.**

The sensor with high sensitivity is used in this incubator, and it cannot be used under electromagnetic interference (e.g. mobile phone).

⇒ Putting the main power through:

Please ensure the power supply matches the power written on the nameplate before putting through the power.

There is a grounded power cable provided with the incubator.

Two 6.3A fuses are needed for main power.

Startup

The surrounding temperature must be at least 8°C lower than the set value.
Keep the outer door and glass door open.

⇒ Using distilled water:

Pour the distilled water into the pool (approach the room temperature)

Input quantity: 3 litres

Avoid overflow during the input.

Ensure the humidity inside the chamber will not change.

Only closed incubators can be used.

⇒ Open the cutoff valve of the bottle

⇒ Switch on the main power

The green light is on

[[888]] will be displayed for about 40s.

Regular Self-checking

Actual value will be displayed after Self-checking.

⇒ Adjust the set Point:

Keys used: [[°C]], [[▲]], [[▼]]

Keep pressing [[°C]] key to adjust the [[°C]] value:

Keep pressing [[%CO₂]] key to adjust the [[%CO₂]] value:

Display the value being set last time

The last number of the display shows

Set the expected value by [[▲]] or [[▼]] key, and the value will be stored after releasing the set keys and the actual value will be again displayed.

⇒ Default Set:

Temperature: 37.0°C

CO₂: 0.0%

Attention!
Only gas can be filled in the chamber.

o

To start

⇒ Keep pressing the [[auto-start]] on the control panel for 10s.

“open door”: The temperature display panel will show [[opE]], “%CO₂” display panel will show [[dor]], and open the outer door and glass door for about 60s.

The Auto-start mode is activated and the “%CO₂” display panel will show [[0.0]] and the “°C” display panel will show the actual value after closing the doors.

“gas” light is off and “auto-start” light will be on.

⇒ Close the doors

⇒ Attention:

Heat the equipment to the set value and establish the relative humidity.

After regular autostart

“auto-start” light will be off
 Actual value is displayed
 The equipment will continuously input gas until it reaches the set value that has been set.
 The equipment can now be used for incubating work.

⇒ Special functions:

[[cal]] and [[▲]] or [[▼]] keys

You can choose and set the special function by the [[▲]] and [[▼]] keys by keep pressing the [[cal]] key. “ °C ” will display the function code [[I]], and pressing [[cal]] again after releasing it, the “%CO₂” display window will show the actual mode. The mode can be changed by pressing [[cal]] plus [[▲]] / [[▼]].

Function Name	“ °C ” Display Window	“%CO ₂ ” Display Window	Function	Default Set
1 - Buzzer	[[I]]	[[A I]] [[A 0]]	On Off	On
2 - Ventilation	[[2]]	[[G I]] [[G 0]]	On Off	On
3 - CO ₂ set to zero	[[3]]	[[.0]]	CO ₂ set to zero	
4 - Opening set	[[4]]	[[S 0]] [[S I]]	Not opened / opened	Opened
5 - Door heating switch	[[5]]	[[d I]] [[d 0]]	On Off	On
6 - Heating	[[6]]	[[h 0]] [[h I]]	Slowly Normally	Normally
8 - Monitor the surrounding temperature	[[8]]	[[P I]] [[P 0]]	Not monitoring / monitoring	Monitoring

⇒ Temperature:

Please restart the equipment according to the guide to make the

temperature detector work properly when you change the temperature set value over 1 °C.

⇒ CO₂ Comparison

If the CO₂ concentration gained by other equipment is different from the actual one, you can adjust the testing system of the equipment without restarting.

⇒ Example for reference:

CO₂ display value: 7.0% CO₂

CO₂ actual value: 6.2% CO₂

Choose function No. 3 by the `[cal]` key and `[▲]` key.

Release the `[cal]` key

Press the `[cal]` key again

The temperature display window displays `[3]` and glisters.

“%CO₂” display window shows `[.0]`

Input the actual CO₂ concentration value into the temperature display window by `[cal] + [▲] / [▼]` .

Release the `[cal]` key.

Press `[i]` to confirm.

The “%CO₂” will display the modified concentration. If the actual value is higher than the set one, please, keep the door open for one minute to let the extra gas out.

⇒ Important:

Please pour out the water in the pool and dry the chamber if the equipment is not used for a longer period of time.

Do not continuously switch the equipment on and off.

Please keep the door closed and try to shorten the opening time to ensure the best situation for the chamber.

⇒ `[i]` key

If any malfunction occurs during work time, the corresponding display will glister, and if the buzzer is connected, you will hear an audio alarm at the same time. You will know the reason of the malfunction by pressing the `[i]` key – the display will show the code of malfunction.

(Refer to the table of malfunction code)

Table of Malfunction Code

Please check the following to solve the problem more quickly.

<i>Code of Malfunction</i>	<i>Reason of Malfunction</i>	<i>Solutions</i>
99 Glass door is open	Glass door is not closed	Close the door
100 Temperature too low (set point)	Door heating is switched off	Switch on the door heating (Function 5)
101 Temperature too high (set point)	Surrounding temperature too high	Switch off the door heating (Function 5)
200 CO ₂ too low (set point)	CO ₂ gas not connected CO ₂ bottle is used off CO ₂ entrance pressure too low	Connect the gas input Replace the CO ₂ bottle Adjust the entrance pressure to 1 bar
201 CO ₂ too high (set point)	CO ₂ entrance pressure too high	Adjust the entrance pressure to 1 bar

⇒ Please contact the maintenance engineer if the table above cannot solve the problem.

⇒ Malfunctions that cannot be shown by the equipment

<i>Malfunction</i>	<i>Way of Checking</i>
Equipment does not heat	Check the set value
No gas entrance	Check the gas diode. Check if the input is switched off. Check the set value
Buzzer does not give out alarm when malfunction occurs.	Check if the buzzer is switched on. Please check the special function.
Set value cannot be changed	Set point is locked. Please check the special function.
There is plenty of water on the glass door.	Check if the door heating is switched on.

To switch off:

- ⇒ Switch off the main power
- ⇒ Switch off the gas reduction valve

Disinfections, Cleanliness, and Examination

You need to do once a week:

- * Check the water level of the pool.
- * Check if the entrance pressure is 1 bar.

⇒ Disinfect and clean the chamber:

- * Switch off
- * Open the glass door
- * Dry out

⇒ Way of disinfections at 90 °C :

⇒ Open the outer door and glass door, *and take out all the materials inside the incubator!*

⇒ Dry and clean the incubator, and input 300ml distilled water.

⇒ Close the glass door and outer door.

⇒ Keep pressing the `[[90 °C]]` button on the display panel until the green light “90 °C” on the display panel lightens up.

⇒ Wait for about 10s, the “°C” display window will show `[[OPE]]` and the “%CO₂” display window will show `[[dor]]`. *Please check if there is anything left inside the incubator!* Please do this after opening the outer door and glass door.

⇒ After keep opening for one minute, the “%CO₂” window will show `[[-25]]` and the “°C” window will show the actual value of temperature and glisten, which indicates the disinfections procedure will last for 25 hours. Please close the doors!

⇒ The equipment now begins the disinfections at 90 °C.



⇒ Explanation of disinfections at 90 °C

The whole procedure is divided into three phases:

- ① *Heating* ---The heating procedure will increase the temperature to 90 °C, and the procedure will last for 2 hours (based on surrounding temperature)
- ② *Sterilisation* ---The temperature has arrived at 90 °C, and the sterilisation will last for 9 hours.
- ③ *Recovery* ---The equipment will return to the incubation mode (the temperature decreases) – the procedure will last for 14 hours. Insert 3 litres of distilled water and do “auto-start” after disinfection! Incubation can only be started after “auto-start”!
The “°C” window displays the actual value of temperature while the “%CO₂” window has three displays showing the remaining time and reminding you of the current phase.

The cursor of the “%CO₂” window is climbing in ①.

E.g: `[[.25]]` →→ `[[-25]]` →→ `[[-25]]` ;

The cursor of the “%CO₂” window is at the middle and showing in ②.

E.g: `[[-23]]` →→ `[[-23]]` ;

The cursor of the “%CO₂” window is descending in ③.

E.g: `[[-14]]` →→ `[[-14]]` →→ `[[-14]]` .

⇒ **Warning:**

Please do the cleaning and disinfecting before informing the maintenance engineer.

⇒ Maintenance

We can only assure the normal condition of the equipment when it is maintained or improved by engineers authorised by varolab. The equipment should be overhauled at certain times to ensure the normal condition!

⇒ **Suggestion:**

The equipment needs an annually check to keep working properly. Each Incubator is strictly checked before being putting into use, and it can suit your daily needs. Please contact the engineer of varolab if you want to keep it at top precision.

⇒ **Condition for Normal Use:**

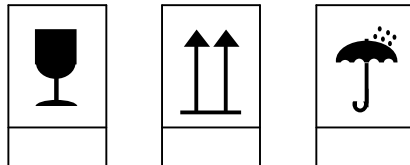
- Ambient temperature: 18 °C to 30 °C
- Relative humidity: < 80%
- There is no violent shake or corrosive gas near the equipment.
- No effects from sunshine or other heat or cooling source.

⇒ **Varolab reserves all rights of updating and improving the product at any time without special announcement!**

Warranty

- ⇒ The warranty period is one year after purchasing.
- ⇒ Our company will not take responsibilities if the malfunctions are caused by improper use even it is within the warranty period.
- ⇒ Our company will responsible for the maintenance after the warranty period, but a certain amount of cost will be provided.
- ⇒ Please show the related materials to the authorised staff.

⇒ Protection Signals:



Avoid shaking, knocking and water during the transport.

Condition of transportation and restoration :
temperature: -40 °C ~ +55 °C, humidity: ≤ 95 %

Adjustment

Adjust the data:

The equipment should be adjusted regularly to ensure the best working condition. The user can adjust the equipment with the help of professional staff at least once a year.

Condition of Temperature Adjusting:

Put a thermometer with the minimum scale of 0.1 °C into the center of the incubator. Wait for another 2 hours after the temperature value is steady, and note the actual value.

Way of temperature adjusting:

- ⇒ Open the outer door, observe the temperature inside the chamber and take a note.
- ⇒ Close the outer door and keep pressing the `[cal]` key for more than 5s.
- ⇒ Release the `[CAL]` key when the showing "cal" appears on the display window.
- ⇒ The "%CO₂" window will display the temperature value if you press the `[°C]` key.
- ⇒ Adjust the temperature according to the noted actual value by pressing the `[▲]` / `[▼]` key.
- ⇒ Confirm by pressing the `[i]` key.

Condition of %CO₂ adjustment:

Hold the temperature and humidity of the incubator steady and keep the situation for more than 2 hours. The concentration of CO₂ should be 0%.

%CO₂ zero adjusting:

- ⇒ Press `[%CO2]` and `[▼]` to set "%CO₂" to "0"
- ⇒ Press `[cal]` key for more than 5s
- ⇒ Release the `[cal]` key when "cal" is showing in the temperature display window.
- ⇒ Press `[auto-start]` once to make "0.0" appear in the window.
- ⇒ Release `[auto-start]` and press `[i]` until the "0.0" is showing in the window.
- ⇒ The procedure will be completed after two or three minutes.

Adjust the concentration of %CO₂:

(The concentration should be higher than 2%, usually is 5% to 7%)

- ⇒ Press `[cal]` for more than 5s
- ⇒ Release the `[cal]` key when "cal" is showing in the temperature display window.
- ⇒ Press `[%CO2]` once and the concentration will be displayed in "%CO₂" window.
- ⇒ Adjust the concentration by pressing `[▲]` / `[▼]` according to the actual value.
- ⇒ Confirm by pressing `[i]` key.
- ⇒ Repeat the steps above until the value is according with the precision.

Technical Data

	Power AC 220V	unit
<i>Size</i>		
Shell width	637	mm
height	897	mm
depth	762	mm
Chamber width	470	mm
height	607	mm
depth	530	mm
<i>Capacity</i>	15 litres	L
<i>Shelf</i>		
Number of Shelves standard	3	Floor
at most	10	Floor
<i>Size</i> width	423	mm
depth	445	mm
<i>Net Weight</i>	85	kg
<i>Electric Data</i>		
Rated Power	0.60	kW
Rated Power Sequency	50/60	Hz
<i>Digital temperature control</i>		
Range	+5 to 50	°C
Power Cost at 50 °C	0.1	kW
Chamber Deviation (DIN 12880)	±0.4	°C
Transient Deviation (DIN 12880)	±0.1	°C
<i>Digital CO₂ Control</i>		
Set Range	0 to 20	%CO ₂
Set Precision	±0.1	%CO ₂
Recovery Time	About 1	%CO ₂ /min
Gas Source	About 3.7	L/min

Humidity <i>Relative Humidity</i> Coat body Coat door	>95 9002 5024	% RAL RAL
<i>Data of Gas Source</i> Filter Ratio Grain Strained Purity Ratio At Least Entrance Press	99.998 >0.3 99.5 l	% µm % bar
Yawp	< 60	dB (A)
Capacity of distilled water	3	L

Appendix

- ⇒ The stacking of incubators (refer to Figure 8).
- ⇒ Capacity of gas under normal and abnormal condition.
- ⇒ Appendix of CO₂ aeration (refer to Figure 9).
- ⇒ PH value based on the concentration of CO₂.

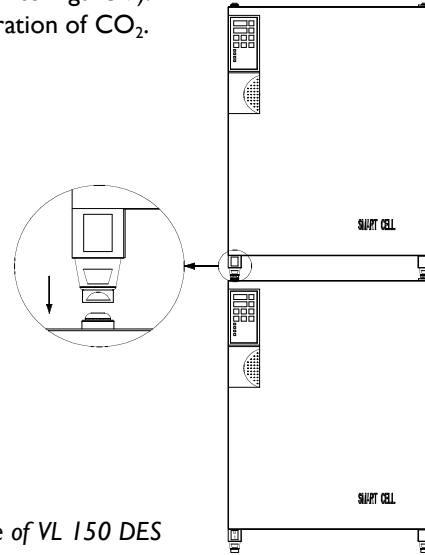


Figure 8: Stacking figure of VL 150 DES

Additional aeration is needed if there are several pieces of equipments in one room or the equipment is installed at the ground floor of the lab.

e two pieces can be stacked together by the piling feet, which are riveted on the top of the equipment.

- ⇒ Capacity of gas under normal and abnormal condition.
- #1 Gas required: the necessary gas quantity for set point
- #2 Gas cost: the gas quantity at maximum set point
- #3 Malfunction: gas output at the maximum set point and in case of audio and light alarm (2h with malfunction).
- #4 Runoff the gas: The max gas input through the capillary per hour when the valve is open

Type of Gas	Entrance pressure	Capillary	Excretion of Gas (#4)	Requirement of Gas (#1)
CO ₂	1 bar	0.65mm	222L/h	~ 50L

Type of Gas	Cost of Gas (#2)	Excretion of Gas when Malfunction (#3)	High-point
CO ₂	~ 0.52L/h	444L	5L/m ³

- ⇒ **We reserve the rights to improve the capability, manual and relative files of the equipment without particular informing.**
- ⇒ **Please immediately contact our nearest service center in case of any malfunctions, and you will certainly get satisfied service.**



varolab GmbH
Industriehof 5
D-31180 Giesen / Germany
info@varolab.de
www.varolab.de



+49 (0)5121 2080 990



+49 (0)5121 2080 999