LABDEX

Air Jacketed Co2 Incubator

LX302AJI

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Index

1. Safety Measures

The matters indicated here are of vital importance and you must comply with them earnestly.

Attention: You are requested to operate by the method indicated herein as any method against the instructions will result in safety risk!

Danger!

It may pose a hazard to property or cause casualties.

1.1 Safety Precautions

- The product must be earthed reliably and be far away from electromagnetic interference sources.
- Make sure before use that the voltage and frequency of the power source comply with the requirement of the product.
- A single-phase 3-wire power outlet should be installed for the product and make sure the outlet is earthed reliably.
- The outlet fitted for the power plug may be connected to the circuit breaker, which is easy to cut off, but the outlet or breaker should be located at a place easy to operate.
- It is not allowed to pull out or insert the power plug at will without turning off the power switch while the product is in operation.
- It is not allowed to lengthen or alter the power line supplied by the manufacturer.
- The self-contained CO_2 cylinder by the user is a pressure vessel, which must comply with relevant state regulations and administration norms.

Warning:

- The operational instructions must be read and understood fully, and operation can be done only after proper training.
- The stainless steel inner liner is not acid-proof and anticorrosion measures should be taken. Never use any acid medium in the incubator.
- No power line should be drawn directly while pulling out the power plug.
- The power plug should be pulled out in one of the following cases:
  1) When a fuse is replaced.
  2) When the product fails, wait for inspection and repairs.
  3) When the product is to be suspended from use for a long time to come.
  4) When the product is to be moved.

Caution!

- When the product is in movement, take care to avoid damage to the wearing parts such as the controller.
- The product should be placed on a solid plane and kept horizontal.
- Some room should be left around the product with no less than 50cm on its right side to cut off power with ease in an emergency.
- The product must be operated under the stipulated operating conditions.

- After each test, moisture in the work chamber of the product should be removed and made dry to avoid the growth of bacteria.
- The product should be put on the workbench with its legs fixed up to avoid damage to the product or casualties due to movement or fall.
- Never open /close the door heavily, otherwise the door will fall off and the product will be damaged, resulting in casualties.
- When the product is to be suspended from use for a long time, heating should be done regularly to remove its moisture and avoid damage to relevant parts.
- Never open the door at will in the mode of ultra-violet or high-temperature disinfection.
- Note the metering and calibration cycle of the pressure-release valve and pressure meter.
- When this product is to be moved, simultaneous operation by two workers is a must.

1.2 Symbols

Symbol	Description
	Ground terminal
	To cut off the power
	To turn on the power

2. Introduction

Air Jacketed CO2 Incubator LX302AJI offers outstanding temperature stability. Equipped with a colored touch screen controller for displaying temperature, humidity, and C02 concentration. It is available with a heat decontamination function and optional UV disinfection. In forced convection mode unit and offers a heating function that prevents condensation on the outer doors.

3. Features

- Air jacketed heater
- Standard sterilization method is 90° moist heat disinfection and UV
- Stainless-steel chamber, shelves and semicircular arcs
- Microorganism filter at inlet provides 99% filtration of bacteria and dust as well as supplies 7-inch touch screen with controller
- 72-hour machine operation record query function
- Infrared sensors can keep CO2 concentration stable and uniform when doors open frequently
- Stainless-steel chamber, shelves and semicircular arcs
- Auto-controller of fan speed to prevent sample damage
- Doors temperature controller prevents dewfall on the glass doors
- Separate temperature-limiting alarm system for safe usage
- Alarm function for temperature difference, over CO2 concentration, doors open time, UV working status, etc
- Options are available to connect printer and computer for data recording (Optional) via RS-485 connector

4. Specifications

Model No.	LX302AJI
Chamber volume	150 L
Shelves	3 Pcs
Heating method	Air-jacketed, PID Control
Temperature range	RT + 5 ~ 50 ℃
Temperature resolution	0.1 ℃
Temperature fluctuation	0.1 ℃
Temperature gradient	≤ ± 0.5 ℃
Temperature uniformity	± 0.3 ℃
Ambient temperature	RT + 5 ~ 30 ℃
CO2 Range	0 ~ 20 % V/V
CO2 Control resolution	±0.1% (IR sensor)
CO2 Deviation	≤ ±0.3%V/V
CO2 Recovery	(Door open 30 S, recovery to 5 %) ≤ 3 min
Temperature recovery	(Door open 30 S, recovery to 37 °C) ≤ 8 min
Humidity method	Natural vaporization > 90%
Voltage	AC 220 V / 50 Hz
Power consumption	700 W
Interior dimension (W × D × H)	480 × 530 × 610 mm
Exterior dimension (W × D × H)	670 × 770 × 880 mm
Packing dimension (W × D × H)	850 × 890 × 1070 mm
Gross weight	130 kg

5. Applications

Used in tissue culture, in vitro fertilization, Neuroscience, Cancer research, Stem cell research, Regenerative medicine, Mammalian cell research, etc.

6. Instrument Introduction

Figure-1

Structural function of the instrument:

CO_2 incubators are mainly used for the cultivation of cells, tissue and bacteria. It is mainly composed of a heating and temperature control system; a CO_2 concentration control system; a gas circulating device an incubator body and a work chamber (inner liner).

Before operation CO_2 cylinder and pressure release valve must be provided (CO_2 must have a purity of 99.99% and the release valve should be steady.)

1) The body is of bench frame construction with a plastic sprayed surface, bright color and attractive appearance. The control circuit and gas circuit are installed behind the CO_2 incubator, mains switch on the right side of the body and 156×89mm LCD 7" blue screen display in the front of the CO_2 incubator door with an attractive appearance and ease of operation.
2) The top of the inner liner is designed to be inclined with a high outside and low inside to prevent condensed water from dripping onto the culture, the bottom is designed to be like a water basin so that water may be directly filled into the inner liner by the inclination due to high outside and low inside, leaving out the need of placing an additional water plate with water evaporation from the biggest area to ensure a humidity of no less than 90%RH in the incubator.
3) The inner liner is made of stainless steel cloudy surface material with heat-insulating material filled into the body and inner liner for higher heat insulation performance. After improvement, the air duct and the four corners of the inner liner are of arc construction to ensure thorough cleaning without any dead space.

4) The man-machine conversation mode controller has multiple alarm and prompting functions: such as incubator door not closed tightly, over-temperature or under-temperature alarm, over- and under-concentration of CO2 alarm, high-temperature disinfection prompting, sensor fault alarm; the product is provided with RS485 communication function up to standard for realization of remote control.
5) The concentration of CO2 is controlled by input into the micro-computer controller through a gas sensor made on the principle of NDIR double wavelength detection so that CO_2 concentration in the work chamber may remain stable.
6) The CO_2 flows into the incubator through a high-performance microorganism filter (particles and bacteria bigger than 0.3um will be filtered) to keep pure CO_2; a window is opened at the back of the body for replacement of the high-performance microorganism filter.
7) Double door structure: The outer door performs the function of heating, and the door temperature is a bit higher than that of the incubator to ensure no formation of dew on the inner glass door for observation of the product. In addition, a door-controlled switch is installed on the back body of the glass door. When the glass door is opened, it can automatically cut off the fan blower of the heating and gas circulating device to prevent temperature and CO_2 concentration from being out of control.
8) The outer incubator door uses a magnetic door strip seal while the inner glass door and incubator body silicone rubber strip seal to ensure the airtightness of the product.
9) To provide convenience for the users, a CO_2 sampling monitoring hole is left on the glass door to monitor CO_2 concentration in operation.
10) The user has the option to the function of relative humidity but note that there is the display of relative humidity only without control of relative humidity.
11) The machine has the function of ultraviolet disinfection or high-temperature disinfection over 90℃.

7. Installation

7.1 Operating environment

1) Indoor use.
2) **Ambient temperature:** (15 to 30)℃
3) **Relative humidity:** No higher than 85% RH
4) **Atmospheric pressure:** (80 to 106) Kpa. Normal operation under an elevation not higher than 2000 m.
5) **Power source:** Voltage of AC 220V Frequency of 50Hz.
6) Around the incubator there is no strong shock or effect of a strong electromagnetic field.
7) Around the incubator there is no heavy air current effect. When the air around must flow compulsorily, the air current should not blow onto the incubator body directly.
8) Around the incubator there is neither corrosive substance nor dust of high concentration.
9) The incubator should avoid direct sunshine or the effect of other cold and heat sources.

7.2 Transport and storage

1) After packing the product can be transported by the common means of transportation, but exposure to rain or snow and mechanical collision should be avoided.
2) The packed incubator should be kept in a well-ventilated room without any corrosive gas or chemicals.

8. Operations

8.1 Layout drawing of the operation panel of the product

Figure-2

In the unlocking state, click the set value of temperature or set value of CO2 on the right side of **Figure 2**. In **Figure 3**, you can set up the required temperature and concentration respectively and confirm by pressing ENT.

Figure-3

8.2 Method of operation

8.2.1 Installation and connection to a CO_2 cylinder (refer to Figure 4)

The pressure release valve provided along with the machine is mounted onto the CO_2 cylinder and no gas should leak from the connection and the cylinder is not to be opened for the time being. The outlet of the valve is connected to the CO_2 inlet of the incubator with the silicone rubber hose provided by the machine and no gas leak is allowed.

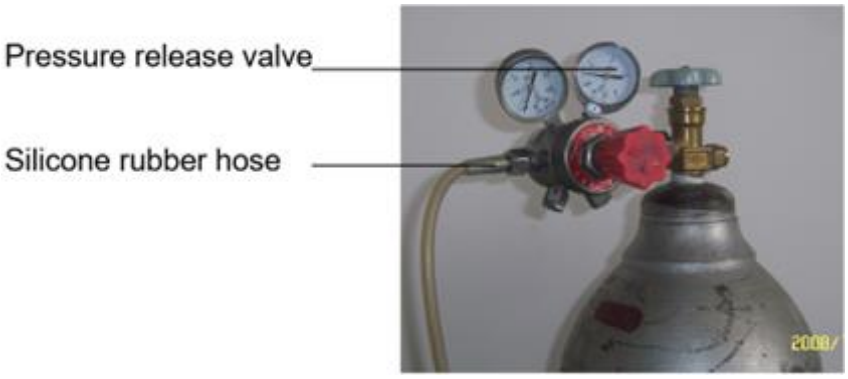


Figure-4

8.2.2 Cleaning and disinfection

1) Take out all the incubator studio and its indoor accessories, including the movable parts in the working room, such as shelves, shelves, shelf brackets, etc., and carry out cleaning and disinfection treatment: spray the surface of the studio and its accessories with 75% concentration of medical alcohol, and then scrub with a clean, soft cotton cloth (preferably soak, scrub).
2) Schematic diagram of high-efficiency filter installation.

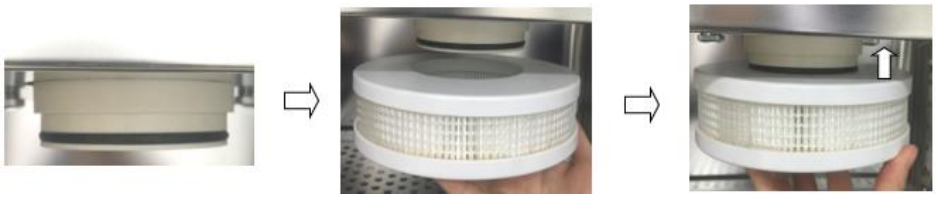


Figure-5

3) High-temperature sterilization (**Note:** The high-efficiency filter device needs to be removed before high-temperature sterilization.
   a. Clean and disinfect the incubator studio and its indoor accessories and put the movable parts after cleaning and disinfection back into the studio, and then directly inject 300m of pure water be filled in (no running tap water) into the bottom of the studio, otherwise impurities in the water will cause Rust spots to appear in the studio.
   b. Turn on the power switch, namely, to the “I” position (POWER), and click the graph in **Figure 2** to enter the disinfection setup interface.
   c. Click the "Temperature" window to set 90°C and press the **"ENT"** key to confirm; click the **"Time"** window to set 540 minutes and press the **"ENT"** key to confirm. Open the glass door! Click **"ON"** to turn red (you must open the glass door and click **"ON"**, otherwise the high-temperature sterilization cannot be started), then close the glass door, and count down automatically after the temperature in the box rises to the set (sterilization) temperature, see **Figure 6**.

Figure-6

4) **During sterilization, it is forbidden to open the door! Prevent hot hands.**

Note

Users can regularly clean and disinfect the inside of the incubator according to their daily cleaning and disinfection habits. To improve the cultivation effect and prevent the expansion of pollution, it is recommended that users perform high-temperature sterilization before the start of each test.

8.2.3 Startup

1) Screw off the valve on the cylinder counterclockwise first and open the CO_2 cylinder (Before starting, screw off the pressure-release valve as much as possible to prevent the bursting of the silicone rubber hose due to excessively high output pressure of the valve), so that the CO_2 pressure in the cylinder as indicated by the inlet gas pressure gauge on the valve is ~ 5MPa (cylinder should be replaced when its pressure is lower than 1MPa)
2) Then screw off the valve knob slowly clockwise so that the outlet pressure becomes 0.05MPa.
3) Turn the power switch to "I" position (POWER), turn on the power and then the LCD screen lights up, showing the information about incubator temperature and CO_2 concentration, indicating energization of the product, beginning of heating and provision of gas (**Delivery setup:** 37.0℃,5.0% concentration).
4) For about ten minutes the LCD screen shows respectively that the measured temperature in the incubator is equal to the set temperature (delivery setup of 37.0℃) and the measured concentration of CO_2 is equal to the set value (delivery setup of 5.0%, user can set up the concentration of CO_2as required for cultivation), indicating CO_2 incubator is in the operation state.
5) When the temperature of the incubator is approaching the set value, the blower fan will be run from high speed to low speed automatically.
6) At the end of the test turn the power switch (POWER) to the "O" position, cut off power, open the door take out the test piece and do a good job of sorting out, cleaning and drying.

8.3 Operation of over-temperature protector

The over-temperature protector is an independent protective system. When the temperature is out of control due to a controller fault and the temperature in the work chamber reaches the limiting set value of the over-temperature driver plate, the over-temperature protector will cut off heating automatically and give off an alarm sound (as shown in **Figure 6**) when the temperature in the work chamber is lower than the limiting set value, the protective system will be cancelled and the instrument will resume work. This cycle will go on till the fault is removed.

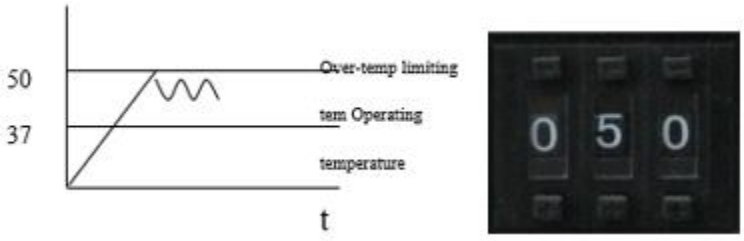


Figure-6

Note: The over-temperature limiting setup of this machine is locked at 50°C and the user is not allowed to alter it.

8.4 Function of relative humidity

1) The humidity function of this machine can be selected, but only display relative humidity without control of relative humidity.
2) The base of the work chamber is designed like a basin and pure water can be injected into the chamber with a maximum capacity of 2500mL.
3) Pure water must be filled in the work chamber. Otherwise, impurities in water may cause rusty stains in it.

9. Maintenance

1) The machine should be installed in a small room where the air is clean without direct sunshine, strong electromagnetic field and radiation energy with small changes in ambient temperature. To ensure the accuracy of CO_2 incubator control, it is suggested the machine be used in an environment under a temperature of 20℃ ~ 25℃.
2) Before startup the operational instructions should be read well to command the correct method of operation. Special attention should be given to seeing that before opening the cylinder, the pressure release valve must be screwed off first to prevent the rubber hose for air from bursting.
3) The CO2 inlet must be kept clean without any foreign matter; when not in use, it should be plugged with a special cork.
4) It is suggested that after use for one year or so the high-performance filter of microorganisms be replaced (open the window at the backside seal plate for replacement with ease) otherwise clogging with dirt will affect the air inlet.

Figure-7

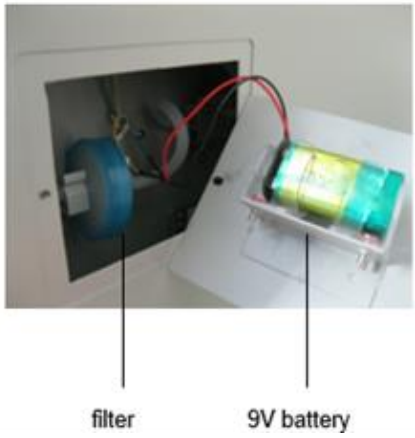


Figure-8

5) The battery should be replaced once every three months. If the power interruption alarm is given in use, the battery must be replaced.
6) When the difference between the ambient temperature and set temperature is less than (room temperature+3℃), the air-conditioner should be put into use to reduce the ambient temperature to guarantee the accuracy of temperature control. In the whole process of cultivation, no noticeable change in the ambient temperature will take place, otherwise, temperature control in the CO2 incubator may become inaccurate.
   Kindly reminder: Particular attention to ambient temperature! The operating temperature must be over 3℃ higher than the ambient temperature (the bigger the difference, the better), otherwise it's impossible to control the temperature. When conditions are not met, the air conditioner should be put into use.
7) When the pressure of a cylinder is less than 1MPa, it should be replaced promptly. When replacement is done, the valve on the cylinder should be turned off first and the worm shaft of the valve screwed off and then the valve is removed and reinstalled on the cylinder filled with CO2.
8) When the machine is not to be used for a long time, the power switch (POWER) should be turned on and switched to the "1" position so that the CO_2 incubator may be started for two hours under a temperature of 50℃ to dry the work chamber. At the end, the power switch (POWER) should be put into the "0" position and then pull out the power plug.
9) During disinfection, opening the door is prohibited to prevent hands from being scalded or eye cornea injury from UVR.
10) The single-layer mesh shelf can carry a load of 5 kg, and overload should be avoided.

10. Troubleshooting

Symptom	Cause	Solution
No power is available after startup.	The power outlet is not energized and the display screen not lighted up.	Check the power outlet and repair it.
	The CO2 incubator power lead-in is not connected properly.	Repair, and check power lead-in and connector.
	The mains switch not turned on or is out of order	Put the main switch to the “I” position or make a change.
	The fuse is broken.	If the fuse is burned still after replacement, check if any part of the CO2 incubator is damaged before replacement.
The power failure alarm won’t work.	Too small capacity of built-in 9V replaceable battery	The battery is replaced from the small window at the backside seal plate.
Lower deviation alarm of temperature	The door switch is out of order	The door switch is not turned on or out of order. Adjust the door lock switch distance. The Glassdoor is not closed tightly.
	The controller is out of order.	The control board is replaced.
	The heater is in an open circuit, or the joint is loosened.	Replace and repair.
Temperature lower deviation alarm /upper deviation alarm	The blower fan does not work or at a slow speed	Adjust the speed or replace the fan.
	The ambient temperature is too high.	(set temperature − RT) ＜ 3℃ RT (room temperature) should be reduced.
	Pt100 is in poor contact.	Check Pt100 wiring and replace it.
Temperature overshoot	RT is too high.	(set temperature − RT) ＜ 3℃ RT (room temperature) should be reduced.

	System parameters must be adjusted.	
Sensor fault	Pt100 of Incubator temperature /door temperature/over-temperature is out of order or in an open circuit.	Replace the sensor
No rise in CO2 concentration	The CO2 cylinder is not opened.	Open the cylinder.
	The output pressure of the CO2 cylinder is too small or the filter bursts or gas leaks from the pipeline.	Replace the cylinder, rubber hose and high-performance filter of the microorganism.
	The Solenoid valve is out of order.	Replace the solenoid valve.
	CO2 sensor fails.	Replace the sensor.
	The high-performance filter of microorganisms is clogged with dirt.	Replace the filter from the small window at the backside seal plate.
CO2 incubator leaks	All the connectors	Kindly repair it.
	Gas leaks from the door strip seal.	Replace the door strip seal.
CO2 concentration deviates greatly	System parameters must be adjusted.	

Fault alarm and prompting

Name of fault alarm	Explanation
Power failure alarm	Power supply from the net fails.
Over-temperature	Temperature value is shown bigger than (set value +upper deviation value)
Under-temperature	Temperature value is shown smaller than (set value +lower deviation value)
Over-temperature alarm	The temperature value shown is bigger than the set over-temperature value
Independent limiting alarm	The temperature value shown is bigger than the limiting set temperature value.
Incubator temperature sensor fault alarm	The incubator temperature sensor is short-circuited or broken.
The door temperature sensor fault alarm	The door temperature sensor is short-circuited or broken.
Over-temperature sensor fault alarm	The over-temperature sensor is short-circuited or broken.

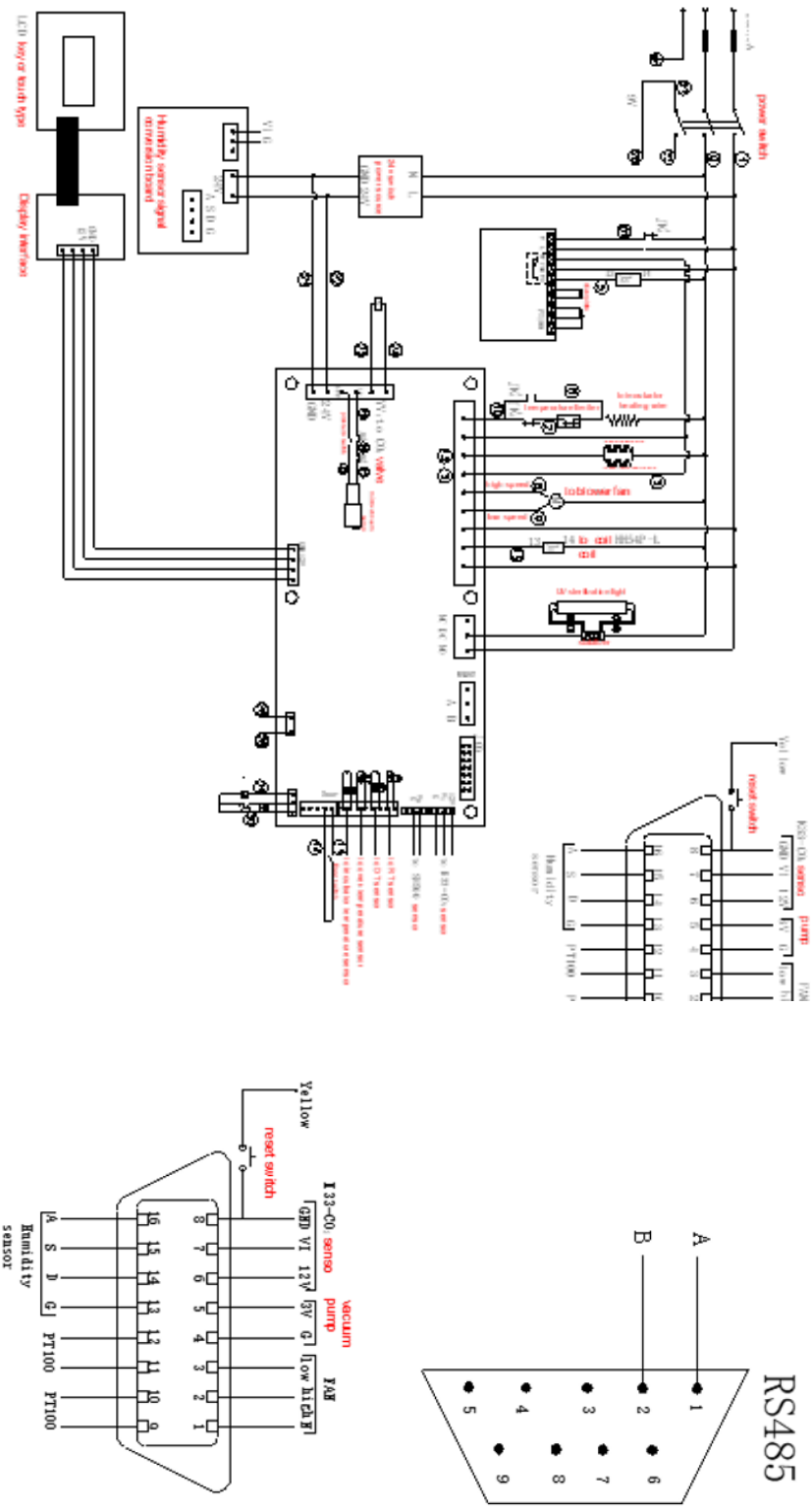
High CO2 concentration alarm	The concentration value shown is bigger than (set value +upper deviation value)
Low CO2 concentration alarm	The concentration value shown is smaller than (set value + lower deviation value)
Reminder of in-disinfection	Prompting that disinfection is being carried out.
Reminder to open the door	For over 90s, the acousto-optic alarm will be given with prompting words.

11. Accessories

Optional Accessories

S. No	Accessory Name
1	Humidity display
2	RS485 connector
3	CO2 pressure-releasing valve
4	HEPA filter
5	Printer

12. Circuit Diagram



13. Appendix

Guide to the schedule of wearing parts and components.

Serial No.	Name of parts	Specification & Model
1	Controller	
2	Blower fan	
3	Temperature sensor	Pt100
4	Infrared CO2 sensor	
5	Humidity sensor	
6	Fuse	φ5×20
7	Solenoid valve	DC24V
8	High-performance filter of microorganisms	
9	Air pipe	Φ8

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