CO_2 Cell Incubator

（Water Jacket）

User Manual

DRAWELL
Artist of Science

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I. Application range

The CO_2 incubator is used for incubation of biology cells, tissues, bacteria in modern medicine, pharmacy, biochemist try, agricultural science research and industry.

II. Features

1. The equipment adopts high-quality insulation materials insulation and jacket type, the tank is equipped with air duct. In the chamber it's equipped with electric fan for forced air convection which improves the temperature uniformity and CO_2 concentration uniformity.
2. The proportion of CO2 gas and air can arbitrary choice based on demand, using direct reading type belt needle valve type glass rotameter, Small beautiful and accurate calibration.
3. In order to avoid contamination effectively, gas into the box body internal filtering and sterilizing, and the is a germicidal lamps in the chamber at the same time.(Don't open the germicidal lamp when cultures inside). The air by the electromagnetic pump gas
4. When the door is opened, the fan automatic shut-off, and the heat will stop. Reduce the amount of pollution caused by the entering air. In order to reduce the over temperature, shut the door after about 10 min (time can be used according to actual situation set) start heating.
5. Temperature use by microcomputer system of data analysis and intelligent PID control, high precision, strong anti-jamming capability. Using three probe to control, temperature、 water and door, which can let the studio's temperature have high precision small fluctuation
6. Light touch switch, portable and flexible.
7. Individual door temperature control to reduce the influence of changing ambient temperature on the chamber thermal system and to avoid the frost of outer glass door.
8. Natural vapor humidifying system to keep ideal humidity.
9. The inner temperature and set parameters, all adopt digital display. Door heating, water heating, lighting, germicidal lamp, air pump, high water level, water shortage has LED indicates intuitive, clear
10. Multiple protection function for overheating, gas stopping, etc. to ensure the safety operation of the equipment

III. Main technical parameters.

Items		DW-WJ-2	DW-WJ-2-160
Volume (L)		80	160
Temperature range(℃)		RT+5～60	
Temperature fluctuation (℃)		≤±0.2	
Temperature uniformity (℃)		≤±0.3	
Timing Range		1～9999min or no timing	
Flow range	Air ml/min	160～1600	
	CO_2 ml/min	10～100	
Power supply		AC220V 50Hz	

Power consumption(W)	600	900
Chamber size （cm^3）	41×40.3×51	50.5×45.3×70
Outer size （cm^3）	57×65.5×88.5	68.5×69.5×107.5
N.W./G.W. (kg)	60/90	80/115

IV. Installation.

1. The equipment should be placed in a dry, even environment without toxic gas. Direct sunshine should be avoided. Enough room is spared around the equipment for maintenance.
2. The 99.9% high purity CO_2 cylinder with pressure reducing valve should be equipped for the working of this incubator. (Cylinder and valve are prepared by the users) The cylinder should be placed near the incubator and be connected with a silicon soft tube to the "CO_2 inlet" on the back of the incubator.
3. The ideal ambient temperature is 20～25℃. The lowest ambient temperature is 5℃.
4. The power outlet should be well earthed and be compatible to the incubator plug.

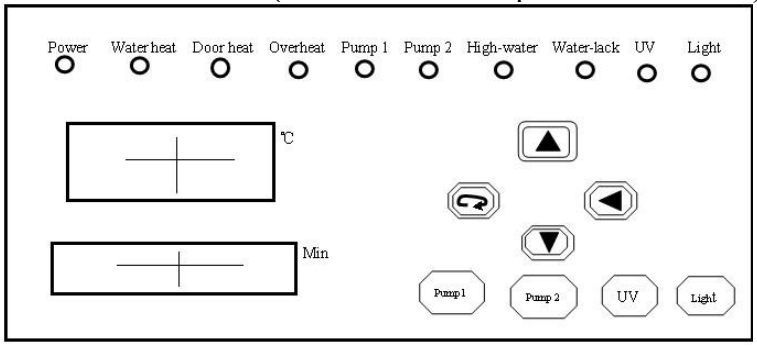
V. Operation procedures.

After installation of the incubator, follow the procedures below to operate.

1. Open the door and clean the inner chamber. Mount the shelves.
2. Fill water to the humidifying to 2/3 level and place it to the bottom of the chamber when humidifying is needed.
3. Turn on the switch on the back of the incubator. The temperature will be displayed.
4. Press "UV"key to disinfect the chamber. (Do not press it when there's incubation samples inside!)
5. Set the required temperature. (Refer to the attached controller manual)
6. When the temperature is stable, put the sample in.
7. Turn on the CO2 cylinder switch and adjust the pressure reducing valve to get 0.06～0.1Mpa on the second pressure manometer. If the CO2 pressure is too high then the rise of CO2 concentration is too quick and the gas fluctuation will be high too. But if the CO2 pressure is too low it will trigger the alarm. In 1 minute you can see the CO2 concentration is increasing and in 10 mins it will reach 5.0% (if set to 5.0%).
8. Refer to the controller manual for detailed operation methods.
9. When stop using the incubator please follow the procedures below:
   1) Turn off the CO_2 Cylinder valve and the pressure reducing valve.
   2) Turn off the controller of the incubator.
   3) Open the door and get the humidifying plate out. Press the door switch to make it continue working for several minutes with the door open to dissipate the humidity in the chamber.
   4) Close the door and keep it heating for about 10 minutes then turn off the power switch and clean the inner chamber.

VI. Controller operating instructions

1. Panel to reference chart (With the CO2 temperature controller)



2.Panel has a set of buttons on the right，functions as follows:

1)  button: After power-on, press this button to enter the temperature setting state; Press this button 5s to enter the other parameters setting state; When the instrument enter the set state, digital tube bottom flicker.
2) Pump 1: Press this button, the pump 1 through, push once more, the pump 1 disconnects.
3) Pump 2: Press this button, the pump 2 through, push once more, the pump 2 disconnects.
4) Sterilize button: Press this button to open the interior sterilization lamp, push once more, The sterilization lamp go out.
5) Light button: Press this button to open the light, push once more will turn off the light
6)▲ key: Press this key in the set status to increase the set value.
7)▼ key: Press this key in the set status to decrease the set value.
8) ◄ key: Press this key in the set status to shift to required digit which will flicker. In the state of power-on, press the key, you can view the temperature.

Remark: After setting parameters, only press  **key you can set parameters into the memory.**

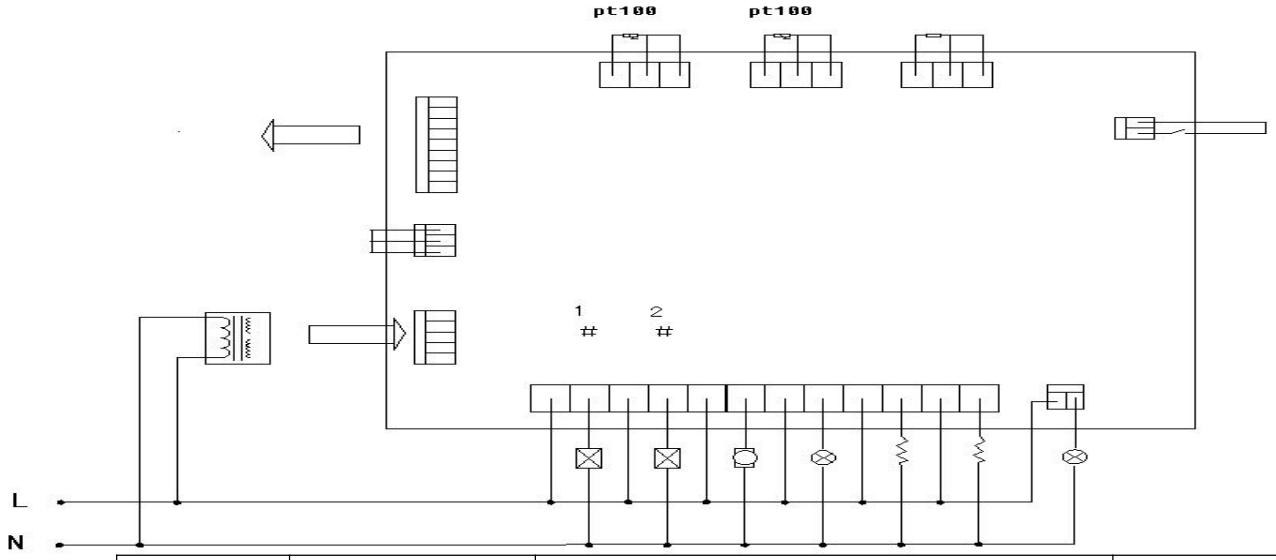
3. Operating instructions
1) Runtime, temperature window (top) shows the temperature in the cabinet. Time window (bottom) shows the remaining time (time setting to 0, window display set temperature), when the remaining time down to 0, display end, the end of the run. At the end of the run, click the start running again.

2) Set the temperature in the cabinet, runtime, the steps are as follows: ①press  button, the above digital tube display set temperature, the bottom in the flashing state ②Modify parameters by ▲、▼、◄ key ③ And then press  key, discharge digital tube display setting time ④ Modify parameters by ▲、▼、◄ key ⑤ And then press  key to set parameters into the memory, exit the set state, returns the running state.

3) Setting the other parameters are as follows: ①press  button above 5s, enter the other parameters setting, the above digital tube display each parameter symbols, discharge digital tube display parameter settings, the bottom in the flashing state ② Modify parameters by ▲、▼、◄ key ③ And then press  key, save the current modification parameters, and adjusted the next parameter, recycle like this ④After setting, press  button above 5s to exit the set state, returns the running state.

4) Set the PID parameters as below: ① press  button above 5s, enter the other parameters setting, and then press ◄ key above 5s to enter the PID parameters setting, the above digital tube display set temperature each parameter symbols, discharge digital tube display PID parameters, the bottom in the flashing state

②Modify parameters by ▲、▼、◄ key ③ And then press  key, save the current modification parameters, and adjusted the next parameter, recycle like this ④After setting, press  button above 5s to exit the set state, return the running state.
5) Check the door temperature: in the running state, press ◄ key, temperature window blinking gate and display door temperature , three digital tube flashing at the same time , press ◄ key again, return to display the temperature inside the box.
6) Other parameters' definition and description:



character	scope	instructions	The factory setting
AL	0～10.0℃	over temperature alarm	1.0℃
SC	-10.0～10.0℃	Measurement error correcting	random
Td	-10.0～10.0℃	Temperature difference of the oven and door	random
TS	0～10.0℃	The difference temperature of water temperature and in the oven	random
TT	0～300S	Closed heating delay time	random

PID parameter symbol definition and description

character	scope	instructions	The factory setting
P1	0～50.0℃	The temperature in the cabinet control proportional limit	random
I1	1～2500S	The temperature in the cabinet integration time	random
D1	1～1000S	The differential time of temperature in the cabinet	random
P2	0～50.0℃	Temperature control proportional limit	random
I2	1～2500S	Door temperature integral time	random
D2	1～1000S	Door temperature differential time	random

To the display panel
Door switch
Mainboard
Door heat
Pump
Fan
Light
Heater
Transformer

4. Wiring diagram

Cabinet temperature Door temperature Resistance/100Ω

5. Remark:
1） When the box sensor wire break or short circuit, temperature display ER1; Door sensor wire break or short circuit, temperature display ER2 , Water sensor wire break or short circuit, temperature display ER3 ,Water level detection error, display ER4,continuous alarm buzzer;
2) Measuring temperature > set temperature + AL, the buzzer alarm intermittently, When measuring temperature < set temperature + temperature alarm value, the buzzer closed alarm, press any key cancelable over temperature alarm sound.

VII. Use

1.**Watering:** Connect the rubber hose with the inlet and outlet which back of the equipment, the other end connected to the water, open the inlet-outlet valves. Using water pressure to force water injection water jacket. When the injected water more than 12L (water level above the electric heat pipe), can power-on and continue injected water, viewing water level lamp (may be water shortage alarm at that time) until the high water level indicator light green to stop water, close the inlet-outlet valves.
2.In order to prevent the water jacket in scale, please use pure or distilled water when filled.

3. The configuration of the PH liquid and washing liquid

According to the following mixing PH liquid and washing liquid, and inject in PH and washing bottles respectively.

A. Washing liquid - copper sulfate solution CuSO2 / 5H2O 0.7～1.4g

H2SO4 0.25ml

Musk toppings (little)

Distilled water 500ml

B. PH liquid - liquid phenol red According to the room temperature , changing it about two months

Redistilled water 1000ml

0.2% phenol red 3ml

NaHCO3 following table

Temperature(℃)	14	16	18	20	22	24	26
NaHCO3(g)	1.87	1.80	1.73	1.67	1.61	1.54	1.48
temperature(℃)	28	30	32	34	36	37	38
NaHCO3(g)	1.43	1.38	1.33	1.28	1.23	1.21	1.18

VIII. Use operations sequence

After incubator installing, follow these steps
1. Open the door, and clean indoor, put shelf.
2. Set to 2/3 water in humidity when need, place it at the bottom of studio and then close the door.
3. Open the power switch which behind the control box, incubator should be displayed temperature and WH indicator is bright.
4. Push the "UV" button, sterilization for workshop. (Notice: Please do not click this button when there are incubation samples inside of the chamber!!!) After the sterilization pressing the "UV" button to close the germicidal lamp.
5. Set the required temperature first, and then heating incubator, (see the five, the controller instructions)

6. At constant temperature, open the door and put the culture in.
7. Press “pump1”or “pump2”button to open the pump1 (or2), adjust air flow valve slowly (counterclockwise), the ratio of CO2 concentration usually 5%, air flow can be adjusted to 760 ml/min.
8. Open the CO2 gas cylinder valves, regulating CO2 PORV, the pressure output is 0.06 Map (about 0.6 KGF/cm2),open the regulator valve (clockwise) general factory has opened, then slowly adjust CO2 flow meter to 40 ml/min (counterclockwise). (CO2 concentration = 40/ (760 + 40) = 5% V/V).
9. Once that is done, let the temperature stabilize, the device can develop into automatic control state.
10. If want to see the washing bottles and PH solution, press "light" key to open the lamp.
11. When the incubator stops working, please follow these steps:
1) Turn off the CO2 cylinders and PORV
2) Shut off the pump power to stop working.
3) Open the door and remove humidity. Open the door and let it work a few minutes to disperse the moisture in the cabinet.
4) Close door and heat ten minutes, turn off power, clean inside.

VIII.Important information.

1. The equipment should be installed in a clean and temperature-stable place.
2. Read the manual carefully and master the correct using methods before turn the power on.

3.  There’s fuse in the equipment. If the equipment is not electrified, please check the fuse. When checking or changing the fuse, please turn off the power supply. Only same style fuse is allowed.

4.Cannot power-on when there has not water ,to avoid damage internal parts
5. When there are incubation samples inside of the chamber, do not open the UV light, otherwise the samples are damaged. Please shut off the power when replace tube.
6. Should be send air first, then CO2, before this, should tune the flow meter knob to the minimum (clockwise), or it will cause the washing-up liquid and PH liquid out due to the large flow rate, on the other hand, should close CO2 first, then turn off the air
7. Washing liquid and PH liquid in use will be concentrated and pollution, should be open and exchange, but must pay attention to, add or change should be cut off the air and CO2 gas source. Shut off the pump and CO2 pressure reducing valve.
8. Should ordinary observation regulating flow meter is accurate or not, in order to ensure the stability of the CO2 concentration. (Especially ， pressure and flow will influence each other at the start-up.
9. CO2 gas cylinder pressure is too low for generate flow instability, should transfer or inflatable before using
10. In order to save electricity and prolong the life of fluorescent lamp, lighting switch can switch when need
11. The equipment should be well earthed. Check the earth wire carefully before using.
12. This machine is equipped with air pump to maintain flow accurately, should often adjust the flow meter. Please shut off the power when you change the pump.
13. In order to reduce the closed form difference, influence the uniformity,
so began to heat when closing the door after 10 min(According to actual usage set delay time).Please do not open the door regular.
14. please let the water in the jacket go if not need for a long time .

IX. Malfunction handling.

Malfunction		Cause	Handling
1.Alarm when turning on.		Sensor error.	Refer to malfunction 2
		Not filled with water	Continue inject water to WH light
2.Errol display	ER1	Chamber sensor error or short circuit.	Check the wire or change the sensor.
	ER2	Door sensor error or short circuit.	Check the wire or change the sensor.
	ER3	Water sensor error or short circuit.	Check the wire or change the sensor.
	ER4	Water level detection error	Check the wire or change the sensor.
3. No power		Not plugged or wire broken.	Plug it or check the wire.
		Fuse open circuit.	Change the same type fuse.
4. No heating.		Preset temperature too low.	Reset the temperature.
		Door open or door switches error.	Close the door or replace the door switch.
		Heater error.	Replace the same type heater.
		Temperature control error	Replace
5.Temperature demonstration inaccurate		Is not correct	According to the instruction manual revised SC value

X. Storage and transportation.

The incubator should be stored in well ventilated room with the RH no more than 80% and without erosive gas. Shockproof, moisture proof and other protection measurements should be taken during the transportation.

IX. After-sales service.

We guarantee free repairs, changing and returning back in one year period (except for heating units). In the guarantee time if the equipment is not valid due to quality problems, we will fix or change parts for free. After one year's guarantee time, we will try to help with the customer service first spirit.

Packing list

Item	Description	Category	Quantity	Notes
1	CO_2 Incubator	Main equipment	1	
2	Humidifying plate	Part	1	
3	Shelves	Part	2	160L:3
4	Silicon soft tube for CO_2	Part	1	
5	Fuse	Spare part	1	
6	This manual	Document	1	
7	Certificate	Document	1	
8	Guarantee card	Document	1	

The parts listed above are in accordance with the actually packed goods.

Equipment commissioning requirements:

1. Customer-provided 40L CO_2 cylinder with the CO_2 concentration of 99.9%.
2. Customer-provided pressure reducing valve (output pressure is about 0.1Mpa).

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