

Operation Manual



BSBT-101

Benchtop Shaking Incubator

Thank you very much for Choosing Biolab products. Please read the "Operating Instructions" and "Warranty" before operating this unit to assure proper operation.

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01 Safety Instruction

! Safety Instructions

Instructions set forth herein are critically important and must be complied with conscientiously.

I. Safety Precautions !

! Danger (It may cause serious loss in property or injuries and deaths)

1. This product must be earthed reliably and kept far away from electromagnetic interference source (Zero line or neutral line should never be used as earth wire).
2. Make sure before use the voltage and frequency of power meet the requirements of the product.
3. The product should be connected to a separate power outlet and both the plug and outlet are earthed properly.
4. It is not allowed to pull off or insert the power plug wantonly without turning off the power switch while the product is in operation.
5. It is not permissible to lengthen or shorten the power line at random.
6. No repairs may be done without permission and the equipment must be maintained by an trained electrician.

! Caution (It may cause serious loss in property or injuries and deaths)

1. Operation shall be done only after the directions for use are read and understood fully.
2. As 304 SS inner container is not acid-resistant, anti-corrosive measures should be adopted and acidic medium should never be used in the incubator!
3. The power line should never be drawn directly when pulling off the plug.
4. In one of the following cases, the power plug must be pulled off:
 - 4.1 Replacement of fuse;
 - 4.2 Under inspection and repair when the product fails;
 - 4.3 Suspension from use for a long time;
 - 4.4 In movement;

! Caution (Otherwise its service life may be affected, resulting in its inability to work regularly)

1. When in movement, the product should have a tilt angle of not bigger than 45 degrees to avoid damage to the refrigerating system.
2. When put into position, the product should stand for one day or two before startup to ensure normal operation of the refrigerating system and prolong service life.

3. The product shall be mounted on a solid and firm plane, keeping it horizontal.
4. Some space shall be left around the product.
5. The product must be put into use under given working conditions.
6. Never open/ close the box door with a force, otherwise the door will fall away and the product injured, causing casualties.
7. In case of suspension from use for long, the product should be dehumidified regularly to avoid damage to relevant devices.

02 Brief account of the product

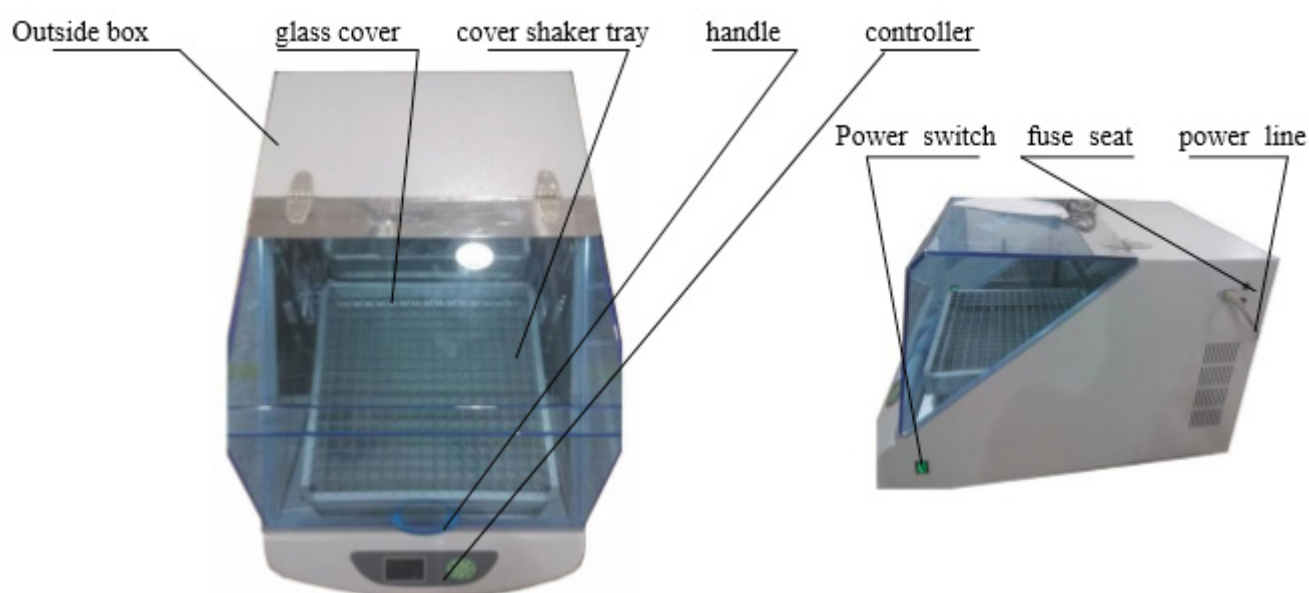


Fig 1: BSBT-101 Benchtop Shaking Incubator

2. Brief account of structure and function

thermostatic incubation shaker is of bench structure with the box shell made of engineering plastics, SS thin plate-lined cavity, flap-type box door, built-in oscillating tray. The oscillating speed and temperature of the shaker are controlled by LCD controller:

▲Box body—Its shell is made of engineering plastics through molding with a mechanical oscillating tray driven by a motor fitted at the bottom.

The oscillating locus is circular. The duct plate behind the working chamber is SS thin plate and all the operating keys on the LCD screen are on the front side of the box.

▲Box door—Is of a big flap structure made of formed glass or transparent plastics to facilitate

observation, removal or placement of cultures.

▲Control——Closed-loop control of temperature and speed is effected with microcomputer electronic controller using PID regulation mode and the LCD screen can display multiple data and relevant words with simple operation.

▲Circulation——Hot and cold air stream is circulated through a blower behind the duct plate in the working chamber, thereby improving the uniformity of temperature in the working chamber.

▲Protection——Multiple start of compressor in a short time (product with "C" added to the model) is prevented and the controller performs the function of prolonged start before compressor is started.

——When the measured temperature is in excess of the set temperature by 3°C, the buzzer will give an over-temperature alarm and simultaneously the heater will be shut down.

——When the box door opens, the door switch can cut off the power to stop the heater, blower and rotating pan from work and the operator can remove or place the cultures safely.

03 Operation of the product

1. Preparation before operation

1.1 Room temperature: 15°C~35°C, RH not more than 85%;

1.2 Power supply: (220±22) V (50±1) Hz;

1.3 Atmospheric pressure: (86~106) Kpa;

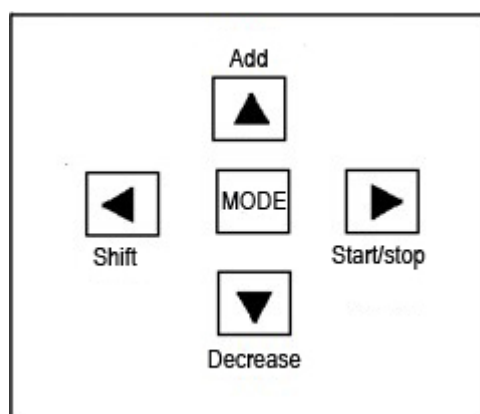
1.4 Elevation not higher than 2000 m;

1.5 No intense shock source and strong electromagnetic field around;

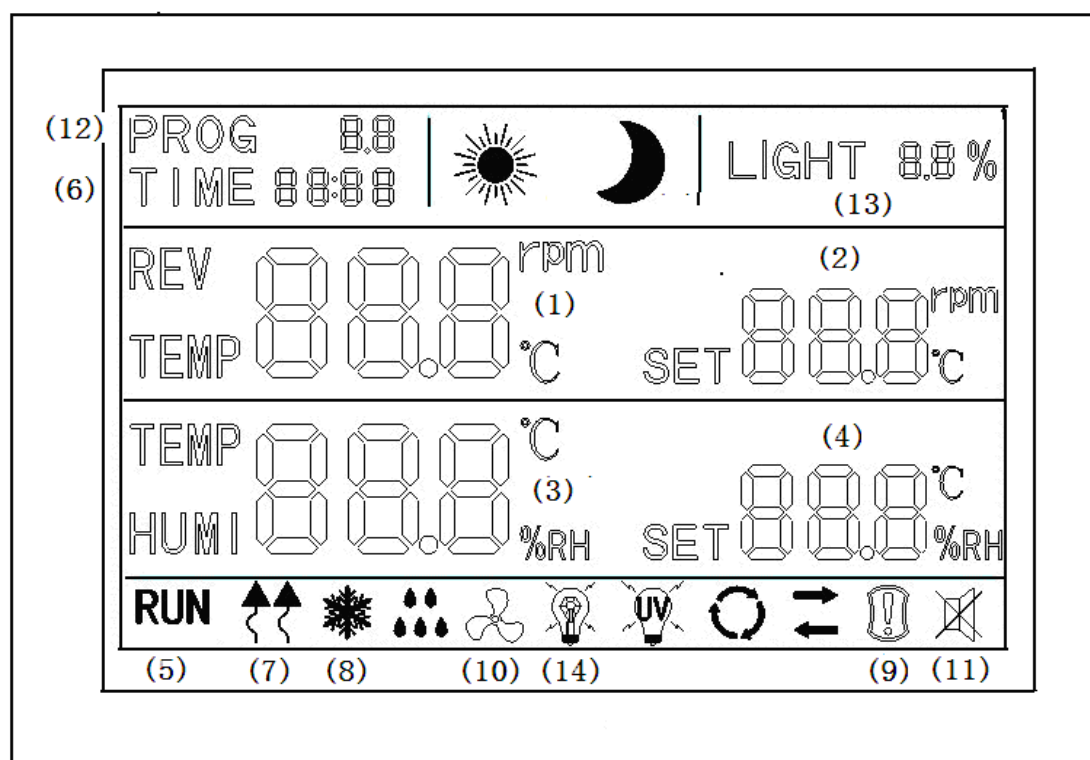
1.6 It should be placed on a steady, horizontal and solid bench or ground without direct sunlight with its four feet fixed up. No heavy dust or corrosive gas in the room;

1.7 A space of not less than 50cm should be left around the product (front, behind, left, right and top).

2. Energization for startup and operation



2.1 Operating panel of the product is shown below:



1. Description of pilot lamp

- 1) PV display;
- 2) PV1: Showing measurement speed;
- 3) SV1: Showing set speed;
- 4) PV2: Measured temperature;
- 5) SV2: Showing set temperature;

- 6) Pilot lamp for operation (RUN) : Indicating the state of the controller, it lights up when the controller is running and it is put out when the controller stops;
- 7) Heating lamp: It lights up when the heating output;
- 8) Cooling lamp: It lights up when the cooling output;
- 9) Alarm lamp: It lights up when alarm light;
- 10) Pilot lamp for blower: It lights up when the blower works;
- 11) Mute indicator lamp: It lights up when the alarm and press any key mute;
- 12) Program display: when a program section, PROG light
- 13) Circulating fan: when fan light is flashing at low speed, and the lamp is going on a long time at high speed.

2. Description of keys

1. Add key: Under the set mode, click this key and one number will be added, pressing this key without stop the number will be increased continuously.
2. Mode key: It is used for changing the set value, calling out parameters or confirming the change in parameters.
3. Start/stop key: Pressing this key for over 4 seconds will control start /stop of the program.
4. Decrease key: Under the set mode, click this key and one number will be decreased pressing this key without stop the number will be decreased continuously;
5. Under the set mode, clicking this key will effect nothing and under the standard mode.

3. Operating procedures

- 1) timing function: When "TIME" is flashing, we can set timing. Timing function to cancel; when time is set as 0, timing function will be cancelled; if time is not set as 0, the controller will perform the timing function;

When the set time is up,"END" will be displayed on SV screen. When the buzzer sounds, it can be silenced by pressing any key.

- 2) speed setting: If you click and press MODE twice, "SV1" character will emerge, indicating the speed can be set as required. Using the add key, decrease key or shift key, you can set required speed. If you press MODE once more, you can set timing.

- 3) temperature setting: Clicking and pressing MODE key once,"SV2" is flashing, indicating temperature can be set as required. Using the add key, decrease key or shift key, you can set required temperature. If you press MODE once more, you can set speed.

Note:

I. For each change of a parameter, it is necessary to press "MODE" key for confirmation to validate the change.

II. After all the parameters are set, press "START/STOP" key for about 4 seconds restart the controller running the new parameter.

4. Alarm function

I. When the measured temperature is in excess of the set temperature by 3°C, the instrument will buzz and cut off heating automatically. The buzzer can be silenced by pressing any key.

II. When the motor overloads for more than 10 seconds due to excessive oscillating load, the instrument will give a buzzing sound. When oscillation stops, the buzzer can be silenced by pressing any key.

III The fixed run time is count down. When time is set as "0", it is long-term operation. After fixed-time run is over, it will stop automatically. the instrument will give a buzzing sound. The buzzer can be silenced by pressing any key.

IV. When such faults as wire-break and short-circuit occur to Pt100 and the measured temperature is higher than 60°C or lower than -1.0°C , "-----" will be shown in the LCD screen.

5.Setting of upper deviation alarm

Good setting of upper deviation can protect the system from out-of-tolerance temperature control or control and must be put into use when the instrument works.

Example: If AL=3.0 when the product leaves the factory, this means the alarm temperature is (set temperature value +AL) °C

6.Calibration of temperature control accuracy

6.1 The 0.1°C-graduation mercury thermometer (or digital thermometer with a resolution of 0.1°C) is placed in the working chamber of the product; The mercury temperature-sensing head of the thermometer should be in the geometrical center of active space in the working chamber.

6.2 Any point within the scope of temperature control of the product is chosen When the measured temperature value is equal to the set value, keep it thermostatic for another hour and make sure the difference between the measured value from the mercury thermometer and that shown in the temperature controller should be $\leq \pm 0.5^{\circ}\text{C}$.

7. Method of improving temperature control accuracy

7.1 After the product is used for some time, temperature control accuracy should be calibrated as described in 2.5.If the error is in excess of $\pm 0.5^{\circ}\text{C}$, correction should be made by the following method:

7.2 Go in for parameter setting and look for character of "PE"

$$\text{According to } PK = 4000 \times \frac{(\text{measured value} - \text{mercury value})}{\text{mercury value}}$$

After calculation by the following formula, revision is made on the basis of PK value set in the factory (Note: If one revision is inaccurate, it should be repeated till requirement is met):

04 Maintenance of the product and Precautions

1. Essentials of maintenance

1) Storage conditions

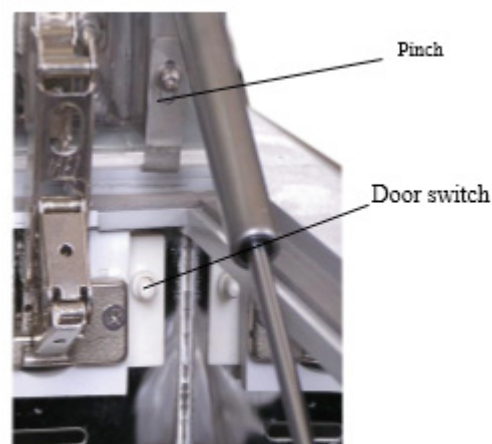
- I. Room temperature: (+5~+55°C) ;
- II. Relative humidity not more than 95%;
- III. Atmospheric pressure: (80 ~106) Kpa;
- IV. Elevation not higher than 2000 m;
- V. No corrosive gas nearby.

2) Moisture absorption

- I. After each use the box should be wiped dry with a clean cloth to avoid rust.
- II. If the product is to be suspended from use for long (over one month), it should be energized for heating to 40°C regularly at a speed of 50r/min for five hours to remove moisture and prevent rust. After heating is over, the power line should be pulled out.

3) Defrosting (Product with "C" added to the model)

- I. The product should be defrosted when it is used at a lower temperature for long or refrigeration becomes poor (generation of static difference)
- II. After the instrument works for (3~5) hours at a set temperature of 40°C, operating temperature should be resumed and speed enters operating state.



4) Corrective action for non-heating or non-shaking

First check if the pinch plate of the door switch is in position and the plate should be flat as shown in the right figure:

2. Precautions

1. Temperature control accuracy should be calibrated if the product remains unused for some time, in intermittent operation for over half a year or its technological parameter (temperature) undergoes some change.
2. Except for temperature, speed, time, zero and full scale correction, correction of other parameters should obtain the consent of our service center or adjustment should be made by professionals.
3. For low-temperature product with "C" added to the model, its tilt angle should not be bigger than 45 degrees in movement to avoid damage to the refrigerating system.
4. After the product with "C" added to the model is put in position, it should stand for a day or two before startup so that the compressor in the refrigerating system may operate normally and prolong its service life.
5. When the equipment works on the bench, a crowning barrier should be built at the edge to avoid shifting of the oscillating box due to long-time work and falling from the bench.
6. After the equipment is upright, the rough ground should be leveled up by placing some filler piece and operation with a tilt is not advised. A space of over 50cm should be left around the equipment, especially the product with "C" added to the model (with refrigerating system). If the equipment is to be used at a room temperature of over 30 °C, it is suggested that more ventilation measures should be taken at its back and room temperature should be lowered to guard against compressor crash due to overheating.
7. The equipment should be far away from electromagnetic interference source and be equipped with good earth lead.

05 Appendices

1. Technical indicators

Item /Model	BSBT-102 / BSBT-101	BSBT-104	BSBT-105	BSFT-101 / BSFT-102
Input power	500W	600W	1100W	750W
Range of temperature control	(RT+5) °C~50°C		4-50°C	(RT+5) °C~65°C
Resolution	±0.1°C			
Fluctuation in temperature	±0.5°C			
Uniformity in temperature	±1.0°C			
Timing range	0~99h:59min			
Speed of tray	(40~300) r/min			
Amplitude of tray	20mm			
Load of tray	≤10kg			
Size of tray (mm)	350×350 / 280×220	450×450	920×500	400*300

Note: RT-Room temperature

2.1 Setting of internal parameters

Under the standard status click and press the function key for long time, when the screen displayed LK, enter password enter into the set menu. Every function parameter will be change the control effect. When you one minutes press "👉" key, return to the standard mode, may be some function parameter are not changed :

1. when the screen PV displayed LK, press add key or shift key, make LK=3, Click the function keys can be used into the user parameter class set:

Table 1:

Prompting character	Name	Set range	Description	Value set at factory
/FN	fan control	0~100	When PV is at the range of SV+2.0C, the fan motor will run at lower speed, otherwise the fan will run at a high speed	2.0
KA	Boot mode	0~3	1. when KA=0, after open the power, the controller in a stopped state, by long press star/stop key is up and running 2. when KA=1, after open the power, the controller will be running ; 3. when KA=2, running from last power began to run 4.when KA=3, make an appointment to boot.	1
Pb	Zero adjustment (intercept)	-100.0~100.0	When the zero error of the instrument is greater and the full scale error is smaller, the value should be adjusted. As a rule with Pt100 the value is seldom adjusted	
PK	Adjustment of full scale (slope)	-1000~1000 S	When the zero error of the instrument is smaller and the full scale error is greater, the value should be adjusted. PK=4000× (specified value - actual display value) /actual display value and as a rule with Pt100 the value is adjusted first.	

2). Click and press function key. When LK shows up in PV area of LCD screen, make LK=68 and enter into setting of temperature regulating parameter hierarchy by pressing the function key for long;

Prompting character	Name	Set range	Description	Value set at factory
Pr	proportional speed	2-999	Pr is smaller, easy to shock	
Ir	Integral for speed regulation	2-999	To reach the set speed quickly, increase Ir, otherwise decrease Ir.	
rA	Start output regulation	0~50	For over control in speed start, decrease rA; if speed can't be started, increase rA.	

rn	Maximum speed	40-300	Setting of maximum speed	
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3. Click and press function key. When LK shows up in PV area of LCD screen, make LK=18 and enter into setting of speed regulating parameter hierarchy by pressing the function key for long;

Prompting character	Name	Set range	Description	Value set at factory
AL	Alarm setting	0.0~full range	When temperature exceeds SV+AL, alarm pilot lamp lights up and buzzer sounds, cutting off heating source.	
CL	Setting of cooling control	0.0~full range	When temperature exceeds SV+CL and complies with time delay in cooling by the compressor, the cooling pilot lamp will light up and cooling junction will be switched on to start the compressor.	
Ct	Delay in cooling control	0~3600 (s)	Delay time required for start of the compressor for the two consecutive times Ct=0 function of the compressor is cancelled.	
P	Proportion belt	1~full range 1.0~full range	Regulation of the proportion action. The bigger P, the weaker the action will be and the lower the system gain will become; P=0 for bit type control 0.4 for non-sensitive region	
I	Integral time (readjustment time)	0~3600 s	The greater the integral action time constant I, the weaker the integral action will become. I=0, d=0 for time proportion control.	
d	Rate time (pre-adjustment time)	0~3600 s	The bigger the differential action time constant d, the stronger the differential action will become and overshoot can be removed. I=0, d=0 for time proportion control.	

Ar	Overshoot inhibition (resetting of ratio)	0~100%	When 2-bit PID is in operation, Ar is determined to 1.5~2 times the stable output space ratio. When time proportion works, Ar is determined to be (revised) / (proportion range P)	
T	Heating cycle	1~300 s	Relay output, 20s,SSR and thyristor switch, 2s, continuous output T is 1s, acting on the heating side only.	

A change in each functional parameter may lead to varied control effect. If "MODE" key is not pressed within one minute, it will return to the standard mode automatically as possibly some functional parameter has not be change.

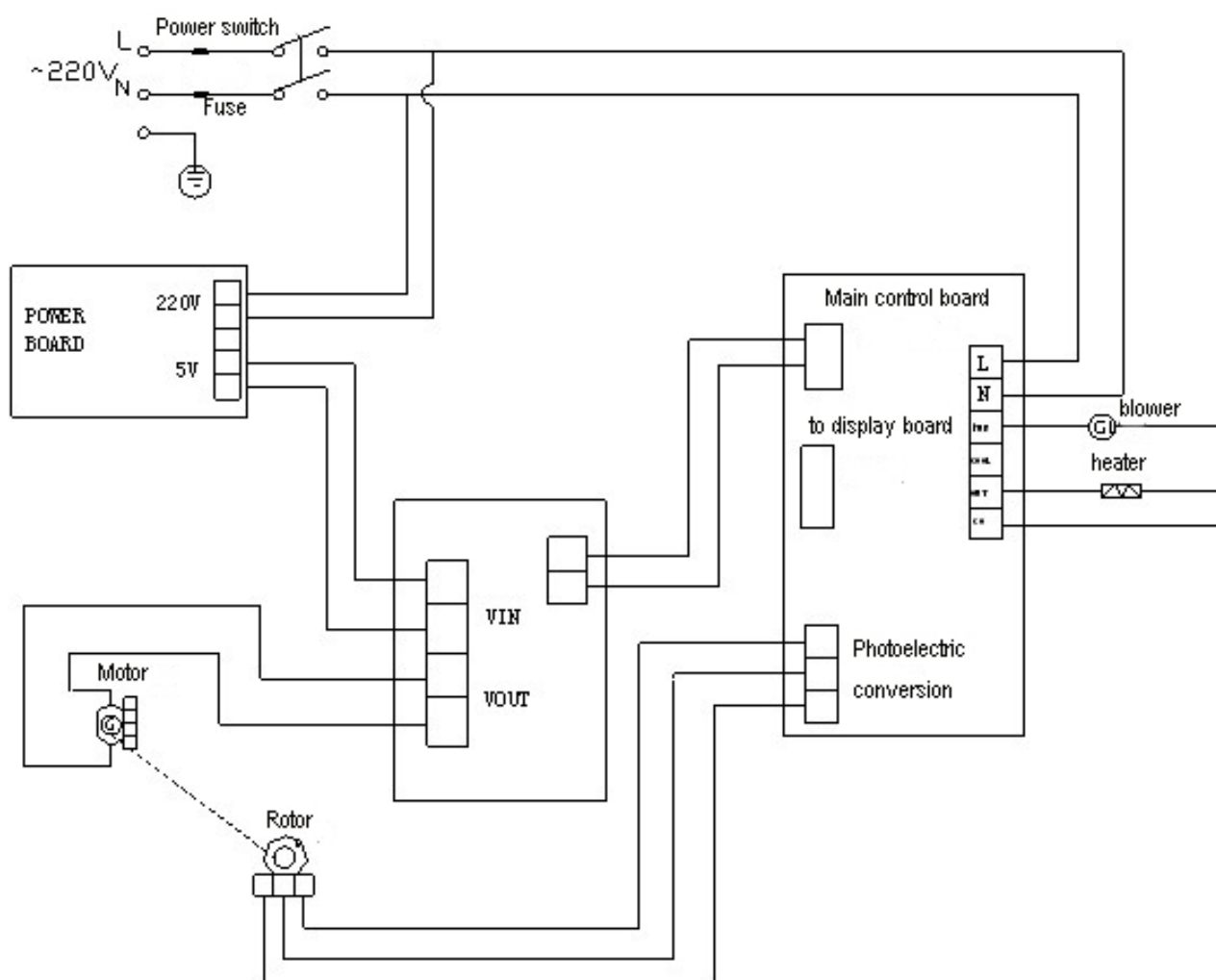
3. Potential source and corrective action

Serial No.	Symptom	Potential source	Corrective action
1	Power fails after startup	No power in the outlet or poor contact	Check and repair
		Power lead broken	Replace
		Power switch not turned on or broken	Turned on (off) or replaced
		Fuse not fixed or burnt	Usable fuse tube fixed, find out the cause and start after repairs
2	No operation after startup	Power of controller not turned on or run key not pressed	Do as shown in the directions
		Parts of controller or motor are out of order.	Replace
3	"-----" shown on the screen	Sensor Pt100 out of order	Repair. Pt100=0°C, 100Ω about 0.3Ω is increased for

4	No heating up or no heating up after heating up a little while	Set temperature lower than RT (Room temperature)	Resetting
		Start timing function $St \neq 0$	Insufficient timing. Resetting enough time or let $St=0$ $T=0$
		No voltage output from controller	Controller out of order. Replace or repair.
		Voltage available at both ends of heating pipe	Connector of heating pipe separated or out of order
		Door switch fails	Adjust hasp position or replace the broken switch
5	Great error in actual temperature	Accuracy is out of tolerance	Zero or full scale correction
6	Static difference or overshooting	Improper set parameter	Set temp. value $\square$ ($RT \square 5$) $^{\circ}\text{C}$ (model 300) and change P,I,D and power attenuation parameters
7	Temperature out of control	Heater out of order	Replace
		Controller out of order	Replace
		Blower doesn't turn and lower temperature in the working chamber	Repair and replace
8	Much noise (with refrigerating blower)	Not placed steadily and screws that fix blower pallet and flask clip are loose.	Repair

9	Shaker doesn't work or out of control	Light-on is out of order or connecting wire is in poor contact	Replace light-on and repair.
		Control panel out of order	Control panel replaced.
		Motor doesn't turn,	Motor out of order or overload, poor contact of door switch or broken. Replace and repair.
		Door switch fails.,	Adjust hasp position or replace the switch
10	It doesn't turn.	Mechanical transmission device got stuck	Hand-propelled test
		Start torque too small	Do as shown in the directions with increased rA

4. Elementary Diagram



Information in this document is subject to change without notice

Packing List

Serial NO.	Category	Title	Unit	Quantity	Remarks
1	Document	Operating Manual	copy	1	
2	Document	Packing list	copy	1	
3	Spare part	Fuse core	pc	2	
4	Spare part	Power line	pc	1	



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