Service manual

Product type: Biosafety cabinets
Product model: HR1200-IIA2-D

Issued by

Haier Medical and Laboratory Products Co., Ltd

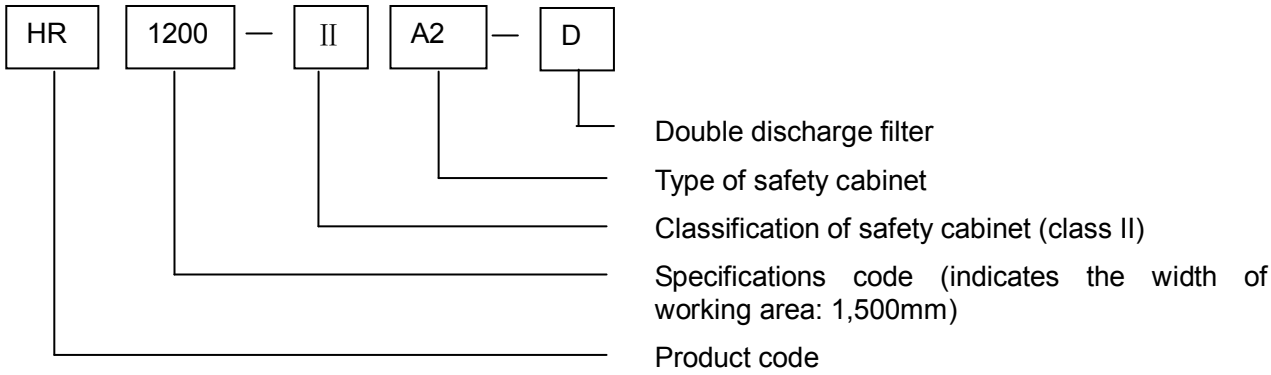
Contents

Chapter 1 Product Information

1.1 Overview of model nomenclature

HR in model represents Haier; 1500 is the worktable width of biosafety cabinet, 1,500 mm; II represents the class of safety protection as class II; A2 represents the biosafety cabinet specified in Standard EN12469-2000 in the form of 70% airflow circulation and no exhaust pipeline for 30% exhaust; and B2 represents the biosafety cabinet in the form of having ventilation pipeline for 100% exhaust.

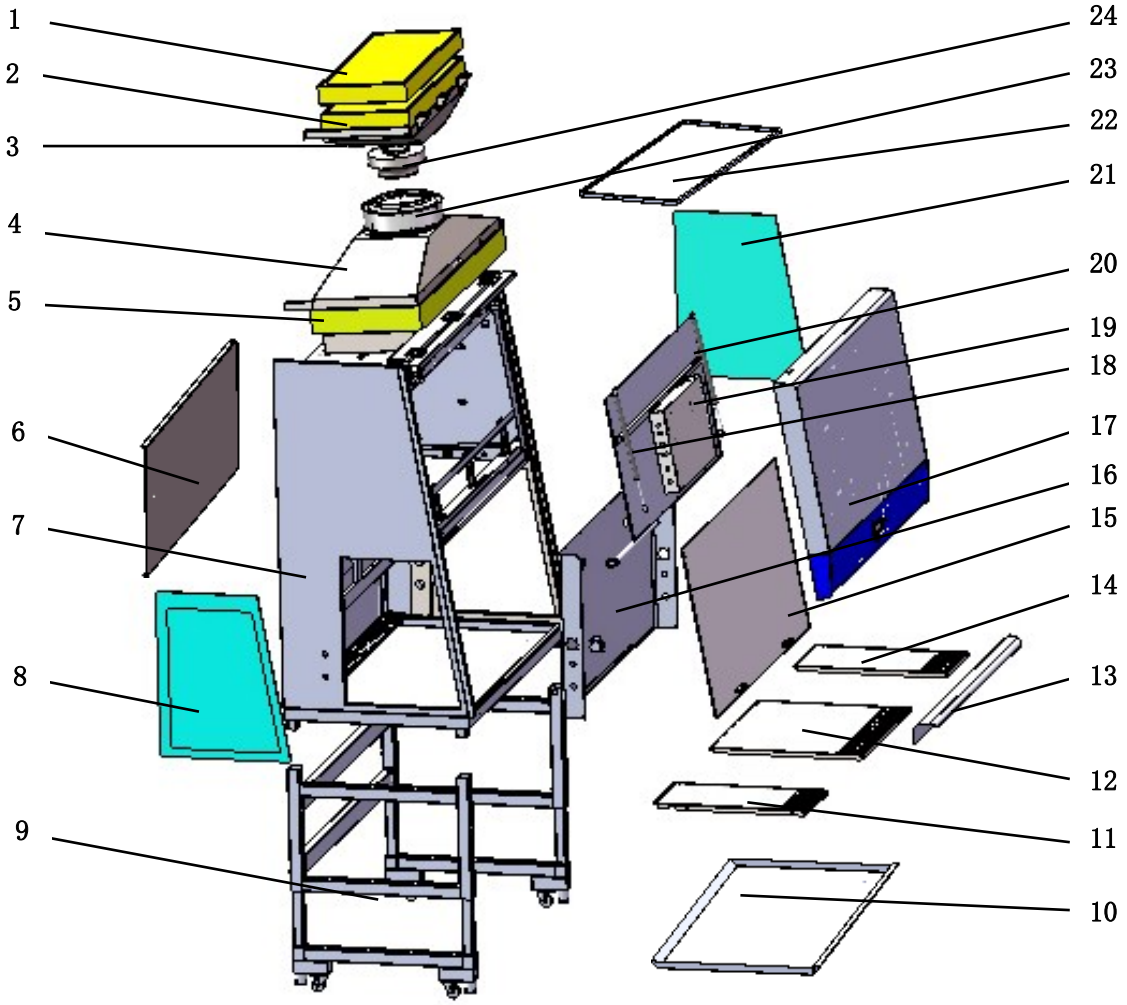
For example:



1.2 Introduction to main structural components of product

The product mainly consists of the main body and the underframe.

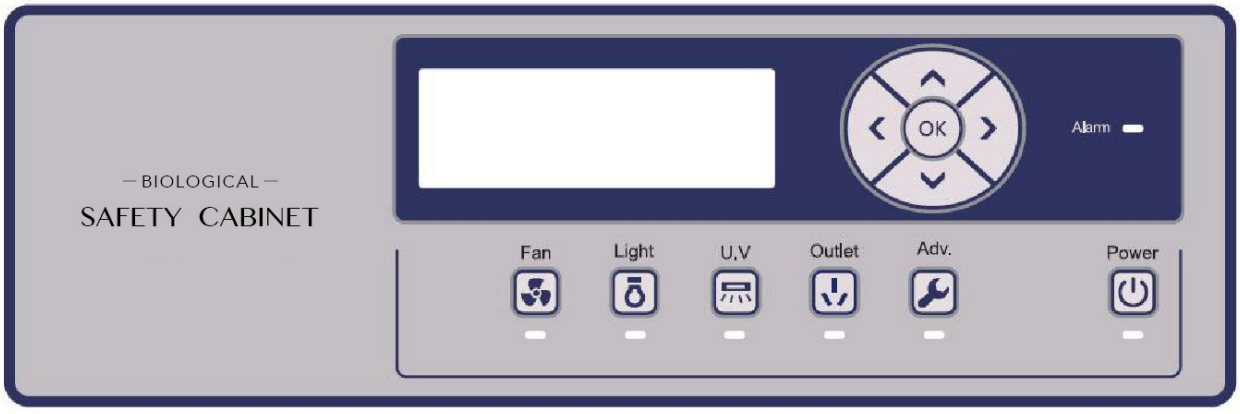
The diagram of main structural components:



No	Name	Part no.	No	Name	Part no.
1	Upper exhaust filter	**0270300195**	**13**	Hand support	0270103218
2	Down exhaust filter	**0270300195**	**14**	Right working table	0270103223
3	Exhaust cowl	**0270103208**	**15**	Front window glass	0271400021
4	Down-flow cowl	**0270103209**	**16**	The liner plate	0270103220
5	Down-flow filter	**0270300196**	**17**	The front cover	0270103214 0270103213
6	Counterweight	**0270103217**	**18**	Nitrogen strut	
7	Main frame	**0270103227**	**19**	Electric control box	0270101512 0270101455
8	Left glass	**0271400022**	**20**	Front cover plate	0270101912
9	Adjustable chassis	**0270102700** **0270102701** **0270102702** **0270102825**	**21**	Right glass	0271400023
10	Water receiver box	**0270103215**	**22**	Laminar flow plate	0270103210
11	left working table	**0270103221**	**23**	Down-flow Fan	0274000431
12	Middle working table	**0270103222**	**24**	Exhaust Fan	0274000432

Chapter 2 Introduction to the Control System and Computer Board

2.1 Definition of Control Buttons and interface to the computer board



(1)  Fan button: turn on/off the fan;

(2)  Illumination button: turn on/off the illuminating lamp;

(3)  UV lamp button: turn on/off the UV lamp; the UV lamp can only be used after the glass door is completely closed since the glass door may prevent the UV light from causing harms to users.

(4)  Socket button: turn on/off the socket button; the maximum rating of all power sockets in the biosafety cabinet is 2A, or the fuse will be shutdown automatically.

(5)  Settings button: control the head-line of options in the control menu, turn on/off the appointment of UV lamp

(6)  Up button: roll the option cursor and the figure upward, move the electronic control door upward

(7)  Down button: roll the option cursor and the figure downward, move the electronic control door downward

(8)  Right button: shift current option and turn the page rightward

(9)  Left button: shift current option and turn the page leftward

(10)  Power button: turn on/off the product, turn on/off the machine by pressing and holding the button for 2s

(11) 

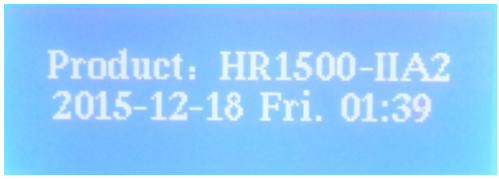
OK button: confirm settings, return to original pages and mute the alarm

2.2 Introduction to display

2.2.1 Welcome page

Display conditions: the page will be displayed by pressing and holding the button  for 2s.

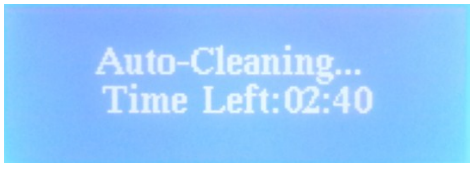
2.2.2 Standby page



Display condition: the page will be displayed after the glass door is completely closed

Display contents: model name of the product, date, week and time

2.2.3 Auto-cleaning page



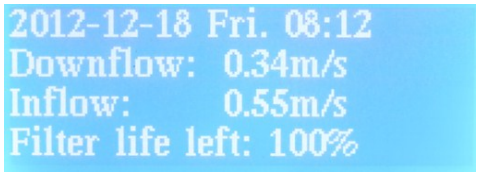
Display conditions: the page will be displayed when the glass door is opened to limit height from complete closed status.

Display contents: count down of auto-cleaning

The operator may turn pages at will to view other pages in this page. The alarm information will be displayed with the highest priority in cases of “abnormal height of the door”, “please close the door” and “hardware failures”.

In this page,  can be turned on/off at any time.

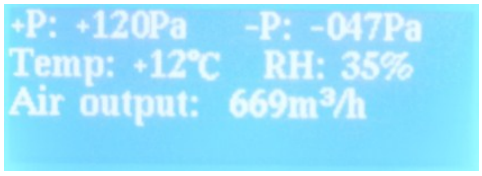
2.2.4 Running page



Display conditions: the page will be displayed from the time when the glass door is located at operating position without any alarms till the end of auto-cleaning count down.

Display contents: date, week, local time, flow rates of downflow and inflow, filter life left

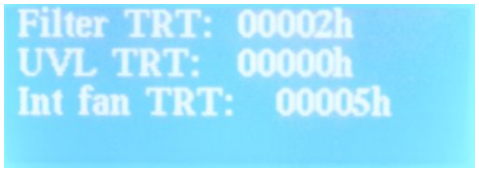
2.2.5 Parameter display page



Display conditions: the page will be displayed after the button  is pressed in “running page”.

Display contents: positive pressure, negative pressure, temperature, humidity, air output

2.2.6 Total running page



Display conditions: the page will be displayed after the button  is pressed in “parameter display page”.

Display contents: filter TRT, UVL TRT and int fan TRT

The information displayed in this page is mainly for the data reference for after-sale product maintenance through informing after-sale personnel the status of cycle of operation of main and button components.

2.2.7 UV lamp appointment time set

Display conditions: the page will be displayed after the button  is pressed in “total running page”.

Display contents: set for the appointment time of UV lamp.

Operating instructions: after moving to the option to be set by pressing the button  , the user may set the appointment time by pressing buttons  and  . If “confirm” is selected, the corresponding row will be valid after the appointment being launched and not be valid if “cancel” is selected. After the appointment time is set and “confirm” is selected, press the button  to start the appointment function of UV lamp. Slow flash of the UV lamp means that the appointment is completed successfully.

Precautions:

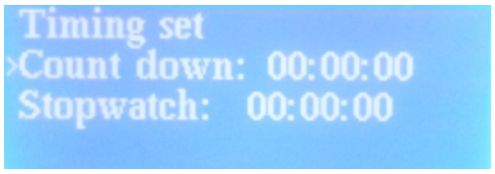
A. When the user start the appointment function, if the UV lamp is not of relevant conditions at the appointed time, the appointment function will not be valid and the UV lamp will not be lighted. However, the appointment instructions will not disappear during standby, and the appointment function will still be valid at the appointed time of the next day (i.e. after a delay of 24 hours). The test above will be conducted every day as long as the appointment function is not canceled, and the UV lamp will be lighted if relevant conditions are met;

B. The UV lamp will be turned on automatically at appointed time, and the interlocking relation between the UV lamp and the illuminating lamp will still be applicable

C. The appointment will be regarded as being canceled when rebooting after the shutdown (by holding the button ) or power failure of the product. The appointment of UV lamp will be valid permanently in the standby page.

D. “Confirm” and “cancel” indicate whether the time is available

2.2.8 Timing set page



Display conditions: the page will be displayed when  is pressed in the “UV lamp appointment time set”.

Display contents: count-down time, stopwatch, the timing unit is: “HH:MM:SS”, it will return to “running page when there is no operation and the stopwatch is not in count-down status in 30s.

Operating instructions: when the default status of the cursor is in the first row, the cursor can be moved by  and the figures can be adjusted by pressing  and  .

When the cursor is in the second row, the start point of timing can be set by pressing  and the timing will be started by pressing  after the setting is completed.

No setting is available during the process of count down. The buzzer on display board will buzz for 2s after the count down is completed. If it is shifted into other operating pages during the count down, it will return to this page automatically 30s before the completion of count down

When the cursor is in the third row, the count down will get started after  is pressed and stop after  is pressed again. In this page, the page will be shifted by pressing  or  and the timing will stop and be reset; the count down will be canceled automatically after shutdown

2.2.9 Socket run time set

Display conditions: the page will be displayed after  is pressed in “timing set page”.

Display contents: the socket SPC is on/off, the socket RT and the socket RT left

Operating instructions:

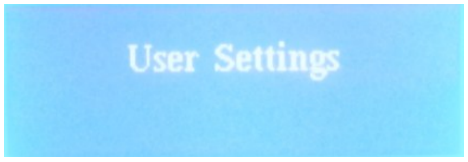
A. In default status, the cursor is in the first row. If the option “on” is selected, contents in the third and fourth rows can be selected. Time sets in the third and fourth rows are common ones, i.e. the cursor can be moved by pressing  and  and the figures can be adjusted by pressing  and  .

B. If the option “on” is selected and the socket is in operating status, “00:00:00” in the third and fourth rows will be displayed as actual sets; if the option “off” is selected, “00:00:00” in the third and fourth rows will be replaced by “------”

C. The buzzer on the display board will buzz for 2s in the last 30s during the operation of SPC, and it will jump to this page automatically

D. During the operation of SPC, the time left will be reset after shutdown automatically

2.2.10 User settings page

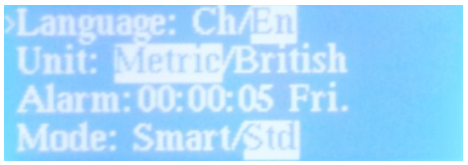


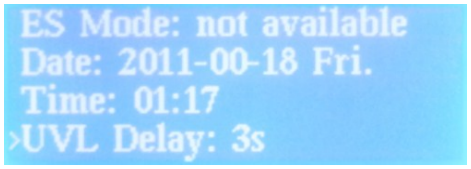
Display conditions: the page will be displayed after  is pressed in the “socket run time set page”.

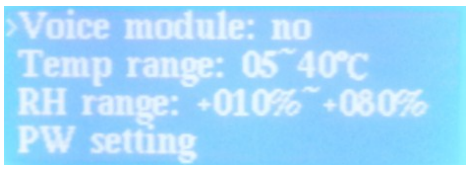
Display contents: user settings

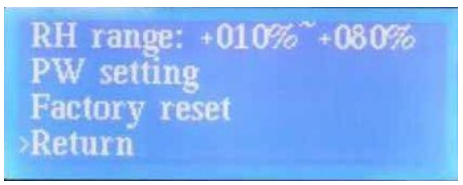
Operating instructions: the user settings page will be displayed as follows after 

is pressed in this page:





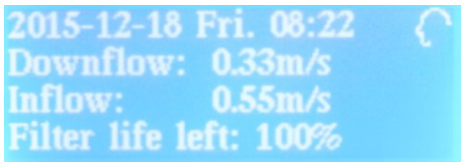




1. **“Language”:** the operator may select Chinese or English.
2. **“Unit”:** the operator can select Metric or British
3. **“Alarm”:** the operator may set the time of alarm and decide whether to turn on the alarm function. In spite of the alarm page, the buzzer on the control board will buzz for 30s at the time set for alarm

with the sound of “DD...DD...”and the texts “it is the time set for alarm” for 30s. If the button “OK” is pressed in 30s, the original page will be displayed and the buzz will be canceled

4. **“Mode”:** ‘HR1200-IIA2-D does not include this option)the operator may select smart mode or standard mode. The smart mode is the default one when delivery. If the smart mode is selected, a head portrait will be displayed at the top right corner of the operating page, which represents that the smart mode has been selected successfully, as shown below:



5 **“ES Mode”:** ‘HR1200-IIA2-D does not include this option)the operator may select whether to turn on this mode. ES mode can be turned on or off only in smart mode. When the ES mode is turned on, the ES module will begin to work, and the safety cabinet will be switched into ES mode automatically 15 minutes (default value) if no operator in front of the safety cabinet is detected by the ES module of the product; the product will quit ES model and return to original one if specific personnel return to the product and begin to operate again. ES model can reduce the noise and energy consumption while ensure all performance parameters of the safety cabinet are qualified. The energy consumption of each product can be reduced by 7%.

6. **“Date”:** the operator may set the year, month, day and week

7. **“Time”:** the operator may set current time of the system (in the form of 24 hours)

8. **“UVL delay”:** the operator may set the delayed starting time of UV lamp. The default delay is 3s.

9. **“UVL life”:** the operator may set the life of UV lamp. The main reason is that the UV lamp is consumable item, and they will be replaced by users themselves. When a new UV lamp begins to work, its life shall be set as that of a new one. The default life of product is 8,000 hours.

10. **“UVL SRT”:** the operator may set the starting time of UV lamp, i.e. the disinfection time. This time can be set as 0-60 minutes, and the default value is 30 minutes.

11. **“Auto-cleaning”:** the operator may set the count-down time for auto-cleaning. This time can be set as 3-15 minutes, and the default value is 3 minutes. Before formal biological sample tests, the biosafety cabinet shall be started in advance and put into operation for a certain time till the wind speed in the working area and all indexes reach the standard state. This is also the objective of the auto-cleaning function.

12. **“Int fan”:** enable/disable options are available. This function mainly applies to B2 products.

13. **“Voice module”:** this option is mainly for setting the volume of voice module. The voice module is an optional component for users. When it is installed to the product, the volume option will be available on the “voice module”. For products installed with the voice module, alarming broadcast will also be delivered besides the sound of buzzer and the flashing of alarm lamp when the product is in alarming state.

14. **“Temp range”:** the operating temperature range of products can be set in accordance with users’ demands, and alarm will be triggered if the measured temperature is out of the range.

15. **“RH range”:** the operating relative humidity range of products can be set in accordance with users’ demands, and alarm will be triggered if the measured humidity is out of the range.

16. **“PW setting”:** the operator may turn on or off the password protection function as well as modify the password setting through this option. The default state of password protection function is off.

17. **“Factory reset”:** when select this option through the cursor, the product will be returned to factory settings by pressing 

. Relevant items are: auto-cleaning time (3 minutes), single running time of UV lamp (30 minutes), UVL delay time (3 seconds), unit (Metric), user login password (0006), time detection time without person (15 minutes), user password (off), temperature range (5-40℃), relative humidity range (10-80%)

18. **“Return”:** select the return option through cursor and press 

to return to the “user settings” page.

2.3 Administrator mode

2.3.1 Introduction to administrator mode

The administrator mode is set for after-sale personnel specially and is invisible to common operators. Following items can be set in administrator mode: interior and exterior fan speed, sensor value bias, inflow factor setup, filter parameter setup, magnetic SW test, alarm value settings, alarm linkage canceling, mode selection, fan TRT reset, filter TRT reset, etc.

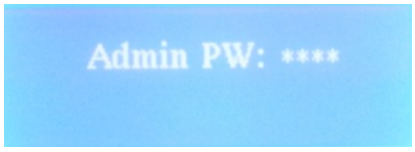
2.3.1.1 Entrance conditions for administrator mode

The administrator mode can be entered in any states if the button combination 

is pressed (password: 2012), and the current state will be hang up

2.3.2 Introduction to administrator mode page

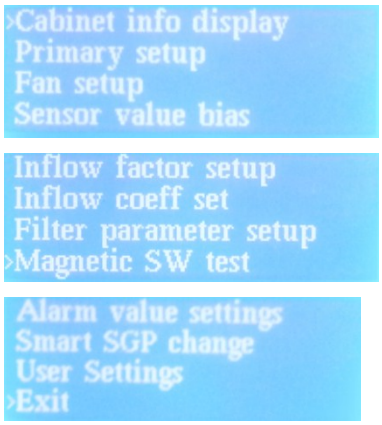
2.3.2.1 Input page for administrator password



Display instructions: the page above will be displayed firstly after the administrator mode is entered. The first digit of the number will be reversely displayed against the background with flashing characters;

Operation description: input the password 2012 in accordance with the common setting method and the administrator page will be displayed with correct password. If the password is input wrongly, however, **"wrong password, please input again"** will be displayed and the page above will be returned after 3 seconds to input the password again.

2.3.2 Summary for administrator mode page



Display conditions: the page above will be displayed automatically after the correct password is input by the operator in the "input page for administrator password".

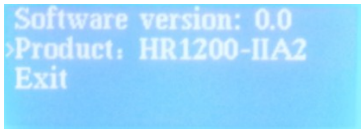
Is entered

Display contents: cabinet info display (product model), primary setup, fan setup, sensor value bias, inflow factor setup, inflow coeff set, filter parameter setup, magnetic SW test, alarm value settings, smart SGP change, user settings and exit.

Operation instructions: the cursor can be moved up and down by pressing  or  and specific operation items can be entered by pressing 

.

2.3.2.3 Cabinet info display

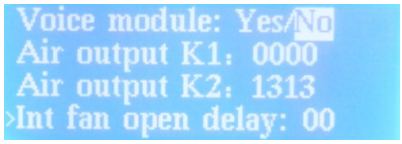


Display conditions: this page will be displayed by selecting “cabinet info display” in the “administrator mode page” and pressing 

Display contents: the first row: software version; the second row: model of current product; the third row: exit

Operation instructions: when the cursor is in the second row, press  and the position displaying the mode will be contrasted with the light. Press  or  to select the model.

2.3.2.4 Primary setup

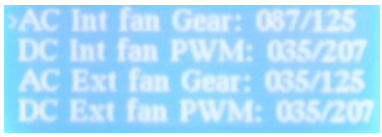


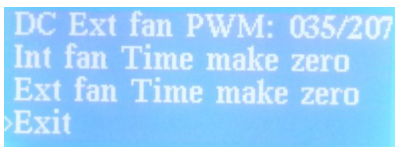
Display conditions: this page will be displayed by selecting “primary setup” in the “administrator mode page” and pressing 

Display contents:

1. Alarm linkage: the operator may start or cancel the alarm linkage in this option. Most of the application of this option is for after-sale personnel to cancel the alarm linkage before maintenance and start it again after the maintenance is completed. The work efficiency can be improved in this way, and the default setting is ON.
2. Door bias alarm de: the operator may set the delay time of alarming for the door bias, and the default value is 5 seconds.
3. AV PPT & alarm: the operator may turn on or off the function of AV PPT & alarm in this option, which mainly applies to B2 products
4、 Human RT: the operator may set the human reaction time in this option for 3-15 minutes, and the default value is 15 minutes.
5. Voice module: the operator may select whether the voice module is available in this option. The option “yes” shall be selected after the voice module is installed in accordance with users’ demands. In this case, the voice module will not run until the administrator mode is exited.
6. Air output: the value for this option has been set when the product leaves the factory. It cannot be altered without the authorization of Haier engineers.

2.3.2.5 Fan setup





Displaying conditions: Select "fan setup" in the "administrator mode page", and 

the key to enter the page.

Displaying contents: Inner and outer AC fan gears, inner and outer DC fan PWMs, therein, the upper limit value of "inner AC fan gear" and "outer AC fan gear: is 125-gear. The fan rotation speed will be

increasingly low along with the increasingly large gear value of fan. The gear upper limit value of "inner DC fan PWM" and "outer DC fan PWM" is 207-gear. On this option, the fan rotation speed will be increasingly high along with the increasingly large gear value of the fan. "Inner fan time reset" and "outer fan time reset" means that the new fan needs to be defined the working time again when the product replaces the fan, hence, it is necessary to make the reset for the fan time.

Operation instructions:

1. When the cursor arrow is displayed, please press the key to select gear, and press the key or to adjust the gear value.

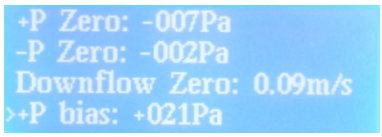
2. If the cursor arrow is displayed in "inner fan time reset' or "outer fan time reset", press the key to reset the fan time.

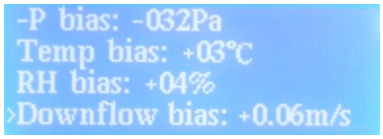
Precautions

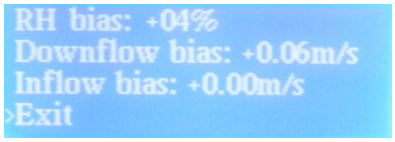
If the product is A2 pattern, commonly known as half-time biological safety cabinet, the gear can only be regulated to "inner AC fan gear".

Supposing that the product is B2 pattern, commonly known as full-time biological safety cabinet, the gear needs to be regulated to "inner AC fan gear" and "outer DC fan PWM".

2.3.2.6 Sensor value bias







Displaying conditions: Select "sensor value bias" in the "administrator mode page" and press the key to enter the page.

Displaying contents

Positive-voltage null point, negative-voltage null point, downflow null point, positive-voltage bias, negative-voltage bias, temperature bias, humidity bias, downflow bias, inflow bias and quit.

Therein, "positive-voltage null point", "negative-voltage null point" and "downflow null point" are unadjustable under the automatic regulation by the system. Other options can be normally regulated by operators.

Operation instructions:

If the cursor arrow is displayed on the line beginning, the commonly-used methods can be applied to make debugging. Provided that the cursor arrow fails to be displayed on the page beginning, it is requested to press key to activate the cursor arrow to make it be displayed.

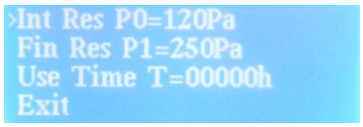
At the beginning of the line, common methods can be applied to debug.

Precautions:

The "sensor value bias" page is an operating page which mainly works on solving the alarm problems. When the alarm is given for product, it is necessary to confirm the positive voltage, negative voltage, downflow, inflow and other parameters of the product, furthermore, determine whether it would be better

to bias parameters for the sake of making the displayed contents consistent with the actually-measured contents.

2.3.2.7 Parameters setup of filter



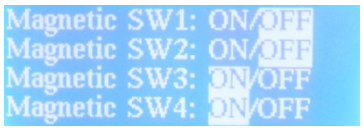
Displaying conditions: Select "filter parameter setup" in the 'administrator mode page", and press OK to enter the page.

Displaying contents: Initial resistance of filter (P0), final resistance of filter (P1), service time of filter (T) and quit.

Operation instructions: The filter resistance value can be set in the common setup method.

Instructions for use: This page values have been set when all patterns of products are delivered from the factory. Supposing that the filter needs to be replaced in the later period, please operate the product and enter administrator mode to make the regulation setup for filter parameters.

2.3.2.8 Magnetically controlled switch debugging



Displaying conditions: Select "magnetically controlled switch debugging" in the "administrator mode page", and press OK the key to enter the page.

Displaying contents: The operation state of the magnetically controlled switch of the current products will be displayed.

1) When door is lifted to the maximum height, the magnetically controlled switch 1 displays "close", otherwise, "interrupt" will be displayed;

2) When door is lifted to the maximum height, the magnetically controlled switch 2 displays "close", otherwise, "interrupt" will be displayed;

3) If door is completely closed, the magnetically controlled switch 3/4 will show "close", otherwise, "interrupt" will be displayed;

Precautions: This function is specifically provided for the after-sale maintenance personnel. However, the page observation is permitted, instead of option setup. After the magnetically controlled switch is confirmed to be qualified, please press OK the key to get back "administrator mode page".

2.3.2.9 Precautions:

The "influx gas parameter revision", "influx gas parameter setup", "alarm value setup" and "intelligent actiyator parameter revision" in the "administrator mode page" are unnecessary to be debugged by the maintenance personnel. It is prohibited to make adjustment for these parameters without the permission of Haier R&D engineers. The "user setup" option is identical with the "user setup" under the common mode. The “user” setup option is identical to …..

Chapter 3 Safety Cabinet Installation

3.1 Installation environment

3.1.1. Installation site

The biosafety cabinet is mainly used for providing protection for personnel, product and environment in the infectious microbes operation process. The biosafety cabinet provides protection on the basis of the physical isolation for the infectious microbial samples, including the clapboard around the operating space, exhaust HEPA filter and airflow with certain air velocity (if there is opening). As an ventilating system in practice, the biosafety cabinet is extremely likely to be installed within a space controlled by airflow, hence, it is requested to consider that the installation site shall meet the safety cabinet and the airflow requirements of installation environment in the installation process, for the sake of ensuring the safety cabinet can realize its normal protection functions.

The most ideal place is to install the biosafety cabinet in places away from personnel and article flow as well as disturbing the airflow possibly. The ideal installation position of biosafety cabinet shall be kept away from the entrance (such as, the lab rear keeping away from channel). The air will enter the biosafety cabinet from the front opening with the speed of 0.45m/s. The foregoing directional airflow is extremely liable to be affected, including the airflow when personnel gets around the biosafety cabinet, window opening, blowing-in system adjustment as well as door opening and closing. As a result, the lab equipment (such as, hydroextractor, vacuum pump, etc.) affected by airflow shall not be installed closing to the biosafety cabinet. The biosafety cabinet is also prohibited to be mounted in the position closing to air supply outlet or the opening windows. Likewise, the portable fan and chemical ventilation hood are also forbidden to be installed in a place close to biosafety cabinet.

In the room with airflow control, the biosafety cabinet shall be installed on the lower part of airflow direction, or in the vicinity of air outlet in the best case. As for the safety cabinet with sealing connection, the airflow can keep the original structure as far as possible; The safety cabinet pipeline connected by annular tubes is the shortest; As for the safety cabinet with indoor exhaust, the polluted air can be discharged as quickly as possible.

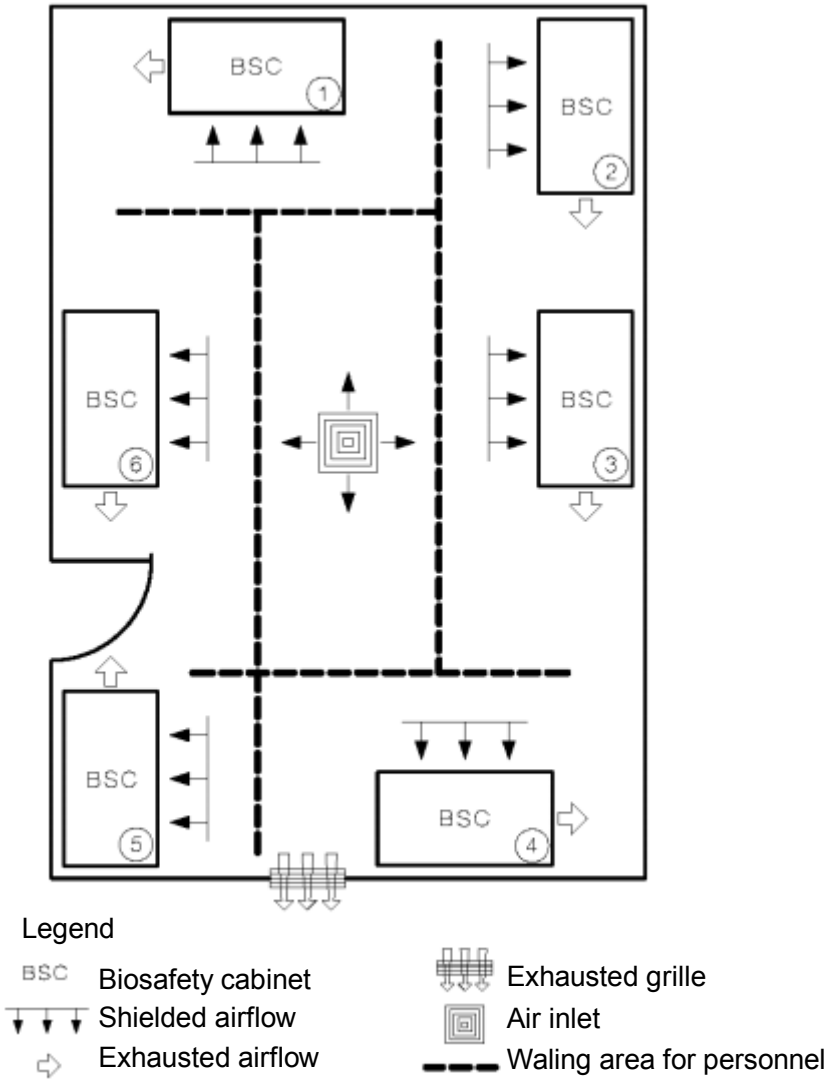


Figure 1 Influence Schematic Diagram on Airflow by Safety Cabinet Installation Position

Figure 1 is a schematic diagram for the influence on safety cabinet airflow by safety cabinet installation position. It is relatively suitable that the safety cabinet is installed in the position 1, which basically complies with the installation position requirements of the foregoing safety cabinet (keeping away from the air outlet). The problem of position 2 is that the air is directly exhausted to the indoor position 3, as a result, the equipment similar to safety cabinet can't be placed in position 3. The distance between position 3 and air supply outlet is too close, in addition, it is also affected by the airflow deriving from position 2. Comparing with others, the position 4 is suitable due to the advantage of closing to air outlet, however, the distance from door is not considered as the best one. Position 5 is too close to the door. Position 6 is too close to the door and air supply outlet.

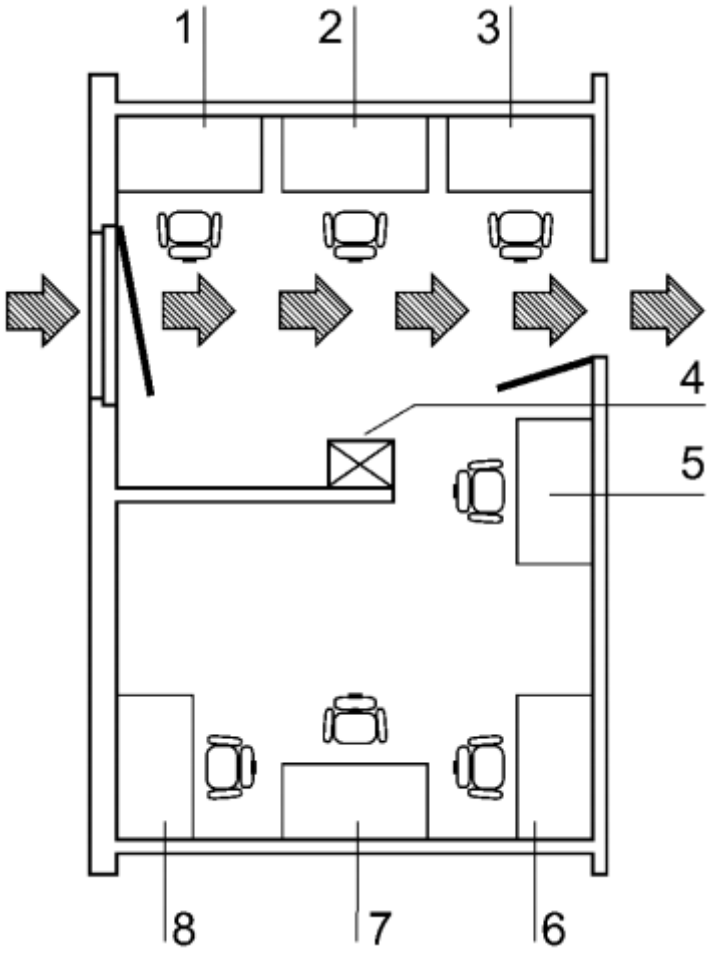


Figure 2 Safety Cabinet Installation Position Schematic Diagram in the Room

In the room layout of Figure 2, position 1, 2 and 3 are unfit for installing biosafety cabinet because they are located in the vicinity of airflow channel formed due to door and window. Located in the room channel and within the airflow range of ventilation opening (position 4), the position 5 is liable to be affected. Comparing with others, position 6, 7 and 8 are relatively suitable in the room layout.

Please refer to Figure 3 for the reference diagram of II-degree safety cabinet installation position in the lab. Aiming at safety cabinet installation position, the following suggestions are proposed:

1. The safety cabinet shall not be installed in the channel. In case of staying away from it, the room airflow of isolation layer which is derived from working air barrier can be destroyed. The shown contents in Figure 3 are the recommended installation position of safety cabinet after taking all airflow disturbance sources into account.

2. If the lab is equipped with windows, please make sure they are closed at any time.it be closed at any moment. The safety cabinet is prohibited to be mounted on the flowing air inlet to avoid air blowing over the operating port or towards the exhaust-air filter.

3. If space allows, 30cm space at the back and periphery of safety cabinet shall be reserved for cleaning the safety cabinet. If it is not allowed, 8cm on every side and 3.8cm at the back at least shall be reserved to clean the safety cabinet. The installation position can get close to the safety cabinet power socket to provide convenience for safety cabinet maintenance, besides, the electrical safety test can be conducted without moving the safety cabinet.

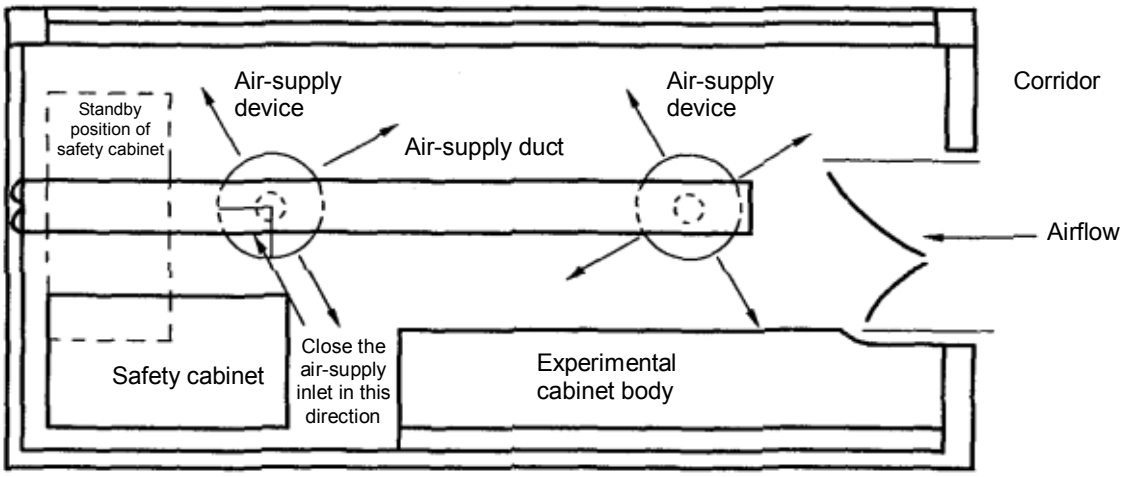


Figure 3 Installation Position of Recommended II-Degree Safety Cabinet in Lab

Except that the safety cabinet position in the room shall be taken into account, 30cm space at the rear of biosafety cabinet and every side face shall be reserved in order to ensure that there is space to be easy to get through during maintenance and the backflow air to the lab will not be impeded. Meanwhile, 30-35cm space above the safety cabinet is also requested to be reserved for the sake of making use of hot-bulb anemometer to accurately inspect the airflow speed on both sides of exhaust filter and replace exhaust-air HEPA filter. The safety cabinet, of which the underside and bottom side are tightly closing to the ground, and all gaps along the juggle shall be sealed, in addition, please reserve enough space on the power supply location of safety cabinet to provide convenience for maintenance in the premise of refusing to move the safety cabinet. When the biosafety cabinet is connected by airtight or annular tube, enough space needs to be reserved for the sake of making pipeline structure put no influence on air flowing. The annular tube shall be reserved with passageway to conduct exhaust HEPA filter test.

3.1.2 General requirements for safety cabinet installation

1. Altitude. The different atmospheric pressures on different altitudes are likely to put influence on the normal operation of biosafety cabinet. Therefore, the installation position of safety cabinet is restricted by altitude. In general, the normal operation altitude height of safety cabinet is 2,000m. Supposing that the installation position altitude exceeds the design range of safety cabinet, it is necessary to make wind speed and other performances debugging on the spot.

2. Power supply and socket. In order to avoid unintentional switching-off of power supply, the power supply socket shall be protected by physical isolation or locking devices on the premise that there is power supply which can satisfy the safety cabinet operation. The desired power supply socket shall be installed higher than the safety cabinet. The changes superior to the power voltage will affect the airflow mode of safety cabinet. When it is necessary, please install the voltage stabilizer for voltage fluctuation.

3. Floor. The floor for safety cabinet installation shall be flat, firm and fire-resistant.

4. Room The room with safety cabinet installation shall have enough height. As for the safety cabinet with indoor exhaust, the distance between the top side and the room floor after installation shall be over 20cm at least to avoid putting influence on the air exhaust of safety cabinet. The safety cabinet connected by annular tube or tightness shall be provided with enough height to install the connecting pipeline and related spare parts.

5. Temperature and humidity. The room for safety cabinet installation shall be controlled with regard to temperature and humidity. In general, the temperature and humidity are requested to be 15℃-40℃ and less than 90% respectively.

6. Air supply and exhaust. When the room is provided with air supply and exhaust system, the air supply and exhaust outlets shall be mounted without influence on the normal functions of safety cabinet during operation, especially, don't affect the inward airflow of the former operation port. Generally speaking, the room air circulation rate is requested to be not less than 12 times/hour.

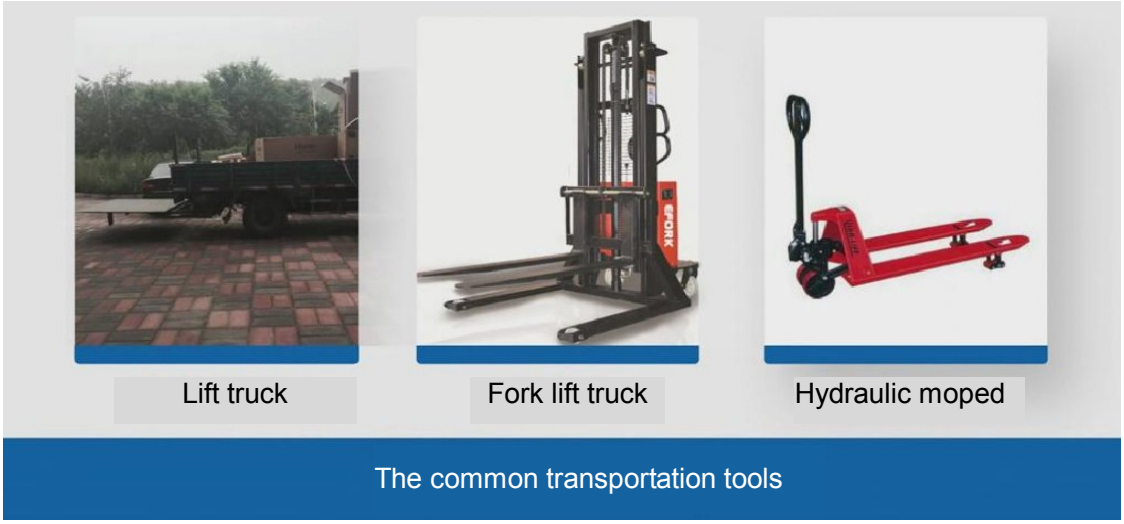
7. Transshipment. Please make use of electric fork-lift truck to make transshipment for the safety cabinet to the installation position, during that, pay attention to not open the transportation package as soon as possible to avoid safety cabinet tilt. It is requested to ensure that the safety cabinet can be successfully

transported though the corridor and door. When it is necessary, please take protective measures for both sides of the product.

3.2 Installation procedures

3.2.1 Equipment transportation

The common equipment transportation tools



The common transportation tools

During the transportation, the lift truck and hydraulic moped are inclined to be applied, or the fork lift truck can also be employed for loading and unloading. However, please take measures to avoid dump towards both sides. In the process of loading and unloading, safety cabinet must be handled with care in the automatic loading and unloading ways as far as possible. Please make no effort to keep the equipment upright in case of manpower transportation. When it is necessary, sideward inclination is accepted, instead of fore-and-aft tilt. Please put the safety cabinet down gently without violent vibration, falling and flipping. As for the permitted transportation methods, please refer to the following figures:

3.2.2 Remove the product package

Place the biosafety cabinet products in the appointed position, then, make unpacking process.

The unpacking disposal steps:

1. Make use of wallpaper knife to cut the product external packages off.

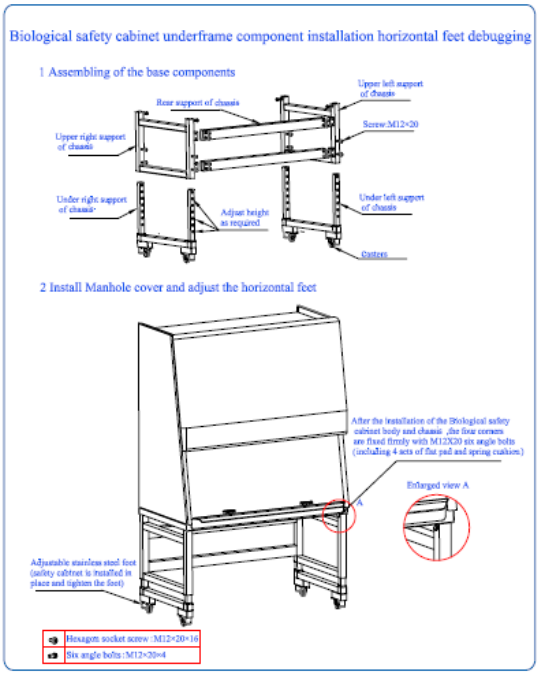
2. Carry the board on the product top down (if any).

3. One person is needed for both product sides at least, meanwhile, pull the external packaging carton to remove the package box from product.

4. Make use of wallpaper knife to cut the laminating adhesive tape, remove both-side packages of product, take the chassis packaging in the rear of product down, as well as place it in the appointed position.

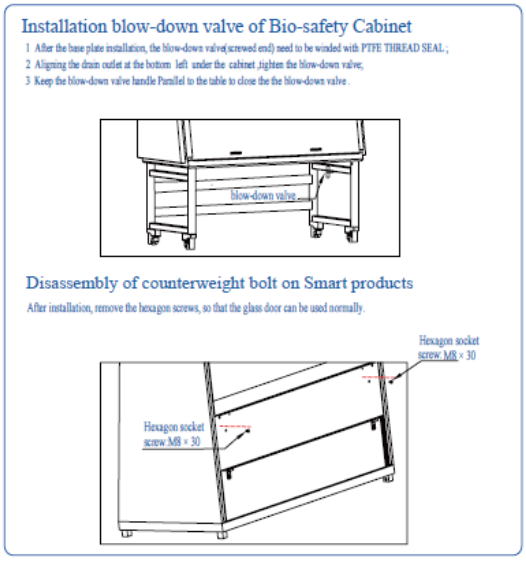
As shown in the Figure:


3.2.3 Chassis assembling



⚠ Note

In order to ensure the safety of biological safety cabinet ,all screws must be tightened.



⚠ Note

The equipment itself is rather heavy, so at least four people are needed for joint handling, during which you can contact its manufacturer without delay if any question. Moreover, different people are quite different in bearing strength, so try once before formal lifting to avoid risks.

3.2.4 Cabinet assembling

After the chassis installation, it is necessary to install the main body on the chassis, as shown in the Figure:

1. Make use of fork truck or other auxiliary devices (including carrying and lifting by manpower) to lift the main body slowly, as shown in Figure 1:

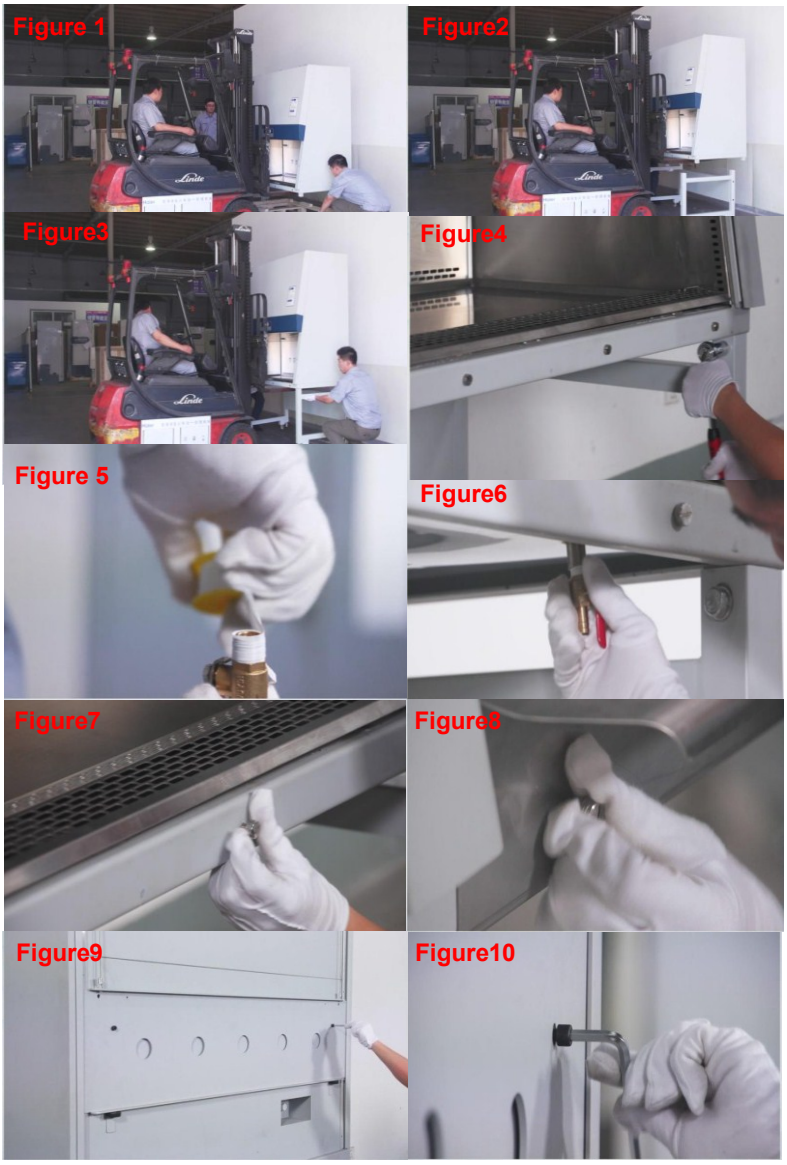
2. Shift the chassis below the cabinet, lift and chassis to make it align with interface, then, slowly lay the main body down. As shown in Figures 2 and 3.

3. Fasten the screw of cabinet body and chassis by No. 19 socket spanner. It is requested to make preparations in advance due to the special tool. As shown in Figure 4.

4. Fasten the included blow-down valve on the drain valve connection port at the bottom of product after binding with raw tape, as shown in Figures 5 and 6.

5. Remove the scaffold packages, then, disassemble all screws of the cabinet body, assemble the scaffold on the product, as well as fasten the screw. As shown in the Figures 7 and 8.

6. The additional weight on the back of product shall be fastened during transportation. After all products are assembled, please disassemble the back-equipped inner hexagon screw. Operating steps are as shown in Figures 9 and 10.



3.3 Precautions for installation

3.3.1 Installation precautions for II-degree A2 biosafety cabinet

1. II-degree A2 biosafety cabinet is equipped with two kinds of exhausting ways, namely, air exhaust within lab and in the annular tube connection way. Supposing that it is necessary to operate very small amounts of volatile radioactive nuclide/chemical, the annular tube connection method to exhaust air to the lab outside shall be applied. According to the design, the air exhaust of II-degree A biosafety cabinet is accomplished by the built-in fan. When the sealing connection is applied to access to the lab exhaust system, the lab exhaust system is likely to affect the airflow distribution within the biosafety cabinet, in addition, the lab exhaust system changes during operation will also put influence on the biosafety cabinet airflow, as a result, the personnel, product and cross contamination protective function of biosafety cabinet are also be affected. Therefore, it is recommended to replace the exhaust connection into connection with exhaust hood on the premise that A2 type safety cabinet is directly connected with the upper exhaust system, instead of exhaust hood.

2. Please confirm the safety cabinet installation position on the basis of lab operation technological process. Please refer to the installation environment for the specific installation position of safety cabinet. In general, it would be better to make the exhaust outlet of safety cabinet close to the room exhaust outlet in case of indoor exhaust. Due to the extremely difficult pipeline changes after safety cabinet movement which is superior to the annular tube connection, it is necessary to give sufficient consideration to the engaged experimental activities in lab, the configuration and arrangement position

of other instruments and devices during the design phase of safety cabinet installation position, beyond that, appropriate leeway shall be reserved.

3. Install the holder (if any) and guarantee the fastness of it. Install the safety cabinet in the proper position of holder. Accomplish the connection between safety cabinet and holder (such as, tighten and fasten the screw, etc.)

4. Adjust the operation plane level of biosafety cabinet. Put a gradienter on the worktable of biosafety cabinet; adjust the height of support leg of biosafety cabinet to make the worktable of biosafety cabinet horizontal. Generally adjust the support level from the left to the right or from the back to the front. The level requirements of operation plane of biosafety cabinet shall combine with the requirements of the biosafety cabinet and built-in instruments and equipment (if any).

5. Install or link necessary accessories, such as drain valve, illuminating lamp and UV lamp. When it is required to use other gas in biosafety cabinet, gas circuit for gas source, pressure gage and valve shall be installed. In addition, note that choose the pipeline materials suitable for different gases.

6. Inspect the status of power supply and earth leakage protection measures of electric appliances and connect the power supply.

3.3.2 Precautions for the Installation of the Class II B2 Biosafety Cabinet

1. Determine the exhaust system design of biosafety cabinet. There are two precautions for the exhaust system design of the class II B2 biosafety cabinet: one is the hard pipe connection, representing seal pipe connection; the other is outdoor exhaust, which represents that exhaust air to outdoor by pipe. If use independent fan to exhaust air in outdoor, the capacity and static pressure of the fan shall match with relevant parameters of safety cabinet; if the exhaust of biosafety cabinet is connected to the system exhaust, it is important to note the balance between exhaust resistance of safety cabinet and the exhaust resistance of room, and the static pressure of exhaust fan must be able to satisfy the exhaust requirements of safety cabinet.

2. Determine the installation position of safety cabinet according to operation technology process of laboratory. As closed connection is adopted for the class II B2 biosafety cabinet, generally the safety cabinet will not be moved after being installed in place, so it is needed to fully consider the experiment activities which will be taken in laboratory and the configurations and riding positions of other instruments and equipment during the design stage for installation position of safety cabinet, and leave appropriate room.

3. Install support (if any) and insure its fastness. Place the safety cabinet on appropriate position of support. Complete the connection between safety cabinet and support (for example, tighten the fixing screws)

4. Adjust the operation plane level of biosafety cabinet. Put a gradienter on the worktable of biosafety cabinet; adjust the height of support leg of biosafety cabinet to make the worktable of biosafety cabinet horizontal. Generally adjust the support level from the left to the right or from the back to the front. The level requirements of operation plane of biosafety cabinet shall combine with the requirements of the biosafety cabinet and built-in instruments and equipment (if any).

5. Connect the exhaust outlet of safety cabinet to the exhaust pipe of laboratory.

6. Install or link necessary accessories, such as drain valve, illuminating lamp and UV lamp. When it is required to use other gas in biosafety cabinet, gas circuit for gas source, pressure gage and valve shall be installed. In addition, note that choose the pipeline materials suitable for different gases.

7. Inspect the status of power supply and earth leakage protection measures of electric appliances and connect the power supply.

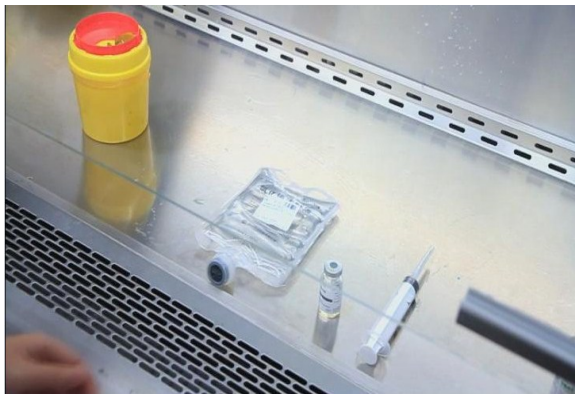
Chapter 4 Basic Operation of Safety Cabinet

4.1 Basic operation principles of biosafety cabinet

1**. Principle of moving slowly:** to avoid influencing normal wind path state, hands shall try to move slowly and gently when operation within cabinet. Hands should move slowly and gently when operating within the cabinet.

2. Principle of placing articles parallelly: To avoid cross contamination phenomenon among articles, articles placed in cabinet shall be laid out like a horizontal straight line, avoiding resulting in cross

contamination during air return. And avoiding block air return barrier in the back, which will influence normal wind path.



3. Principle of avoiding vibration: Try to avoid using instrument with vibration in nature (for example: centrifugal machine, vortex oscillator) within cabinet, because vibration will make particulate matter accumulated on filter membrane shake off, resulting in internal clean level within operating room lower.

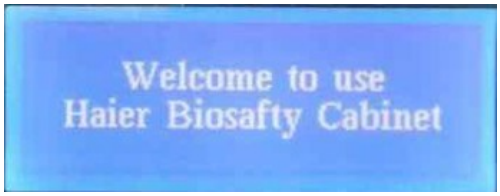
4. Principle of moving different articles in cabinet: when two kinds of articles or more need to be moved within cabinet, principle of moving low contamination article to high contamination article must be followed, to avoid that high contamination articles during movement cause large–area internal contamination.

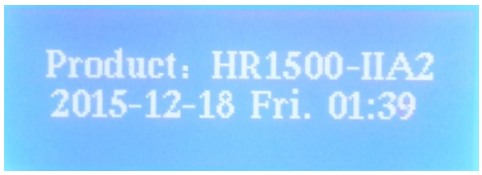
5. Principle of using open fire: try not to use open fire within cabinet. Because fine particle impurity produced in the process of using open fire will be brought into filter membrane area, these high temperature impurity will damage filter membrane, so it is better to use Bunsen burner with low flame.

4.2 Operation of Zhijing Series Safety Cabinet

1. Startup

When all pretest preparations are completed, the external power supply of product will be connected. After the power supply is connected, red power indicator of the current product means successful power supply. Press and hold  the button for 2s to start up the product. At the moment of startup, all indicators of this product will be lit for one time, the buzzer will ring once, and the display screen of product will show “welcome page”, then enter into “standby page” shown as below:





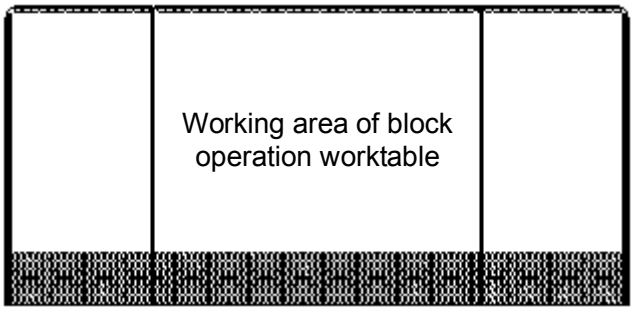
2. Disinfection

When the product is in the status of standby page, press  the button, the UV lamp will light automatically, where the default disinfection time is 30 min. After 30 min, the UV lamp will go off automatically.

When the UV lamp goes off normally, pull up the glass door from closed status to limit place to make the lower edge of glass door and the sign of height limit place in the same horizontal line, then the screen of product will enter into “self-cleaning interface”, where the default self-cleaning time is 3 min. When the product is conducting self-cleaning, operator shall use 70% alcohol or disinfectant to scrub the worktable and inner tank in working area of safety cabinet, so as to conduct full disinfection for working area.

3. Experiment

On the workable of biosafety cabinet, only the article needed by this experiment can be placed. When placing the articles needed by experiment, “**Principle of placing articles parallelly” shall** be observed. Do not place superfluous experiment articles at the air intake and outtake of product so as not to affect the air intake and return of product. When testing samples, operator shall try to put samples at the position near the center of worktable, shown as below



4. Shutoff

When the experiment is over, the operator is required to collect the waste experimental samples on worktable and put them in a garbage can. Then use alcohol to scrub the worktable and inner tank in working area. After finishing scrubbing, close the glass door completely. Press  the button to conduct disinfection by ultraviolet light, where the default time is 30 min. After 30 min, the UV lamp will go out automatically.

4.3 Introduction of UV lamp (if installed)

UV lamp is a kind of light source, which can produce greater effective range of UV-light. UV lamp is applicable for the disinfection of indoor air, article surface and other liquid. UV lamp is to destroy pathogenic microorganism in external environment, cut off the route of transmission of infectious disease and block the spread of infectious disease so as to achieve disinfection.

The UV lamp with 254 nm of wave length is used frequently in biosafety cabinet. UV lamp can only be used for disinfection, but not a mean of sterilization. Disinfection is a method to kill pathogenic microorganism, which may not be able to kill bacterial spore; while sterilization is a method to kill all microorganisms (including bacterial spore) on article. Therefore, strictly speaking, disinfection and sterilization are two different concepts. So to use UV lamp in biosafety cabinet to disinfect cannot be the unique mean for the disinfection of working area of safety cabinet. The correct method is to combine with daily clearing and maintenance to realize thorough disinfection.

Precautions for using UV lamp

1. It is suggested that every disinfection time by using UV lamp is 30 min – 60 min, 30 min is recommended, because lighting for long time will narrow the lifetime of UV lamp.

2. UV lamp shall be used when the room is empty. Avoid irradiating naked eye and skin of human for long time. Although momentary UV irradiation does not have a significant influence on human body, long time of UV radiation will cause skin cancer.

3. When conducting UV irradiation, try to reduce experimental articles in biosafety cabinet. Long time of UV irradiation will accelerate the aging g of plastic or rubber parts even may cause other danger (for example, harmful gas).

4. UV radiation does not have penetrability and is of rectilinear propagation, so it cannot disinfect the lower surface of articles and the surface of overlapping parts of articles. That is to say, UV radiation cannot disinfect the place that it cannot irradiate.

5. The UV lamp can be turned on until the glass door of biosafety cabinet is closed completely. In addition, the UV lamp is interlocked with illuminating lamp. And the tempered glass of front window of biosafety cabinet can isolate the penetration of UV radiation.

6. During the using of UV lamp, keep the surface of UV lamp clean. Generally use it with alcohol wipes every two weeks. Scrub it immediately when there is dust or greasy dirt on the surface of lamp tube.

7. When changing the tube of UV lamp, wear gloves. Do not grab the tube directly. Use hands to grab both side of tube to remove the tube and then install the new tube. As the temperature of human hands is relatively high, if the operator does not wear gloves and grab the tube of UV lamp directly, fingerprints will appear on the surface of the tube, which will influence the UV radiation. Therefore, when changing the tube of UV lamp, try to avoid the direct contact between palm and tube.

8. Zhijing series UV lamps mainly have two professional design technologies

1) Delay start of UV lamp. In order to eliminate the fear of operator to UV radiation thoroughly, the function of delay start of UV lamp are added for Zhijing series product, with default delay time of 3 s. when the button of UV lamp is pressed, its indicator will flash. 3 s later, UV lamp will be lightened.

2) One-button appointment technology of UV lamp can realize the appointment of two spans. When the product reaches the time point, it can turn on UV lamp automatically, with 30 min of default disinfecting time. UV lamp appointment set shall be behind the completion of page setup of “UV lamp appointment set”, press  the button to start the appointment function of UV lamp. Slow flash of the UV lamp means that the appointment is completed successfully.

9. For UV lamp, dedusting shall be conduct conducted every week; UV illuminance inspection shall be conduct conducted every month; change tube every year to ensure the effectiveness. When cleaning and maintaining UV lamp, ensure it have been shut off.

10. Please note that all important international standards and suggestions clear that it is not suggested to use UV lamp in biosafety cabinet.

Chapter 5 Inspection

5.1 Installation inspection

After the biosafety cabinet is installed or moved, conduct installation inspection according to standard.

The performance inspection items required by installation inspection are: appearance, alarm and interlock system, completeness of high efficiency filter, velocity of downward airflow and inflow airflow, and airflow pattern

In addition to above required items, it is also needed to detect the installation environment, external supply voltage and other indexes of product and the effectiveness of various warning functions of product.

Audit and check the specific inspection items according to the following table

Installation Qualification (IQ)					
S/N	Item	No.	Requirements	Inspection Result	Single Conclusion
1	Installation site	1.1	Whether the safety cabinet is placed at the passage to keep away from the room airflow that can damage the isolation layer formed by air barrier of working port.		
		1.2	Windows in the laboratory, if any, shall always be		

			closed. The safety cabinet shall not be placed at the inlet of circulating air to avoid that the air can blow over the front operating port or blow to the exhaust filter.		
		1.3	If there is enough space, the space of 30 cm at the back of and surrounding the safety cabinet shall be left to clean the safety cabinet; If not, however, the minimum 8 cm for each side and 3.8 cm for the back shall be left to clean the safety cabinet. The power socket of safety cabinet shall be accessible for the maintenance of the safety cabinet; and the electrical safety test can be conducted without moving the safety cabinet.		
		1.4	For A2 biosafety cabinet, the distance between the top exhaust port and ceiling shall be at least 8 cm. The distance less than 8 cm will hinder the exhaust to reduce the airflow entering operating port front window of safety cabinet.		
		1.5	The exhaust system of B2 biosafety cabinet shall include: external exhaust fan, exhaust pipeline, air valve and other parts. Consider that the pressure loss allowed by the pressure loss in pipeline and the polluted high efficiency filter is at least 500 Pa, adjust the external exhaust fan to satisfy the requirement of exhaust volume.		
2	Environmental conditions	2.1	For indoor use		
		2.2	Highest altitude: 2,000 m (6,600 ft)		
		2.3	Relative humidity: 20% - 60%		
		2.4	The temperature shall be between 5 ℃ and 40 ℃ (it is suggested that keep ±2 ℃ of laboratory temperature under all conditions)		
3	Power supply	3.1	The voltage and frequency of safety cabinet shall be 220 V and 50 Hz (if you have 60 hz models, change it to 50/60 hz). The socket power of safety cabinet shall conform to aforementioned requirements. If the chosen power supply is incorrect, the safety cabinet cannot operate well, even be damaged. The supply hub of safety cabinet shall satisfy 10 A requirements. If supply hub cannot satisfy aforementioned requirement, the power supply of this building may trip, or the power supply of other electric appliances indoor may be affected.		
		3.2	The socket power of safety cabinet shall be independent, shall not be shared with other electric appliances.		
		3.3	It is suggested that the voltage fluctuation shall not exceed ±2% of nominal voltage. Otherwise, install power regulator.		
		3.4	Ensure there is no barrier in power plug.		
		3.5	Safety cabinet shall be equipped with breaker protection, so as to ensure it can trip when protection circuit is overloaded. The rated value of breaker is 12 A.		
		3.6	The combined current produced by all electric appliances connected to the socket in working area of safety cabinet shall not exceed 4 A. The combined leakage current from all sockets in working area of		

			safety cabinet shall not exceed 2.0 mA.		

Operation Qualification (OQ)					
S/N	Item	No.	Requirements	Inspection Result	Single Conclusion
1	User training	1.1	Please ensure all personnel operating safety cabinet have received good working practice training about biosafety cabinet.		
2	Product manual	2.1	Please ensure product manual is kept a place easy to reach, and is known by all operator who may use safety cabinet.		
3	Start up safety cabinet	3.1	After the safety cabinet is powered on, pull up the glass door, the fan shall operate and the illuminating lamp shall be lighted up.		
4	Front window operating port alarm	4.1	When the glass door reaches limit place, the product will enter “self-cleaning” status. When the glass door is higher or lower that the height limit place, audible and visual alarm will generate.		
5	Linage of UV lamp	5.1	The UV lamp can be lighted up until the glass door is closed completely. Under this condition, UV lamp will go out automatically if the glass door is uplifted.		
6	Interlocking between UV lamp and illuminating lamp	6.1	When UV lamp is turned on, illuminating lamp cannot be turned on and vice versa.		
7	Display of microprocessor	7.1	Press "power” button, it will display the welcome interface “welcome to use Haier biosafety cabinet”, then skip to standby interface which mainly display product model and date. When the glass door is opened to the height limit place, it will skip to working interface, first it enters “in self-cleaning, please wait a moment and the rest time is 3:00”, then enter into normal operation page which mainly displays the downflow and inflow of product and the lifetime of filter.		
8	Shut off safety cabinet	8.1	Close the glass door completely, both the fan and illuminating lamp will go out.		

Performance Qualification (PQ)					
S/N	Item	No.	Requirements	Inspection Result	Single Conclusion
1	Appearance	1.1	Shell: check whether there are bacteria accumulation and corrosion area on the external surface of safety cabinet		
		1.2	Working area: check whether there are bacteria accumulation and corrosion area on the internal surface of safety cabinet		
		1.3	Support: check whether the support of safety cabinet is welded firmly.		
		1.4	Sign: check whether there is international safety cabinet is biohazard sign on safety cabinet.		
		1.5	Nameplate: check whether there is Chinese nameplate on safety cabinet. Where the nameplate information shall include produce model, specification, name, level type, equipment number, date of manufacture, nominal values of velocity of downward airflow and inflow air at least		
2	Alarm and Interlock System	2.1	Front window operating port alarm: when the front window of safety cabinet is opened to be higher or lower the nominal height of front window operating port, the audible alarm apparatus shall give an alarm and the interlock system shall boot.		
		2.2	When the opened height return to nominal height, the alarm voice and interlock system shall release automatically		
		2.3	Interlocking alarm of internal air supply/exhaust fan: if safety cabinet is equipped with internal downward airflow fan and exhaust fan, it shall also have interlocking function. Once exhaust fan is out of service and downward airflow air supply fan is off, audible and visual alarm will give an alarm		
		2.4	Once downward airflow air supply fan is out of service but exhaust fan continue to work, audible and visual alarm will give an alarm		
		2.5	Class II B1 and B2 safety cabinets exhaust alarm: Class II B1 and B2 safety cabinets have outdoor exhaust fan. Once allowable airflow range is set for safety cabinet, when the exhaust volume loss is 20% with 15 s, audible and visual alarm will give an alarm, and the interlocked internal fan of safety cabinet will be shut off.		
		2.6	Class II A1 and A2 safety cabinets exhaust alarm (information tip): if A1 and A2 safety cabinets are connected to exhaust hood and exhaust air by outdoor fan, audible and visual alarm will be used to remind the loss of exhausted airflow.		
		2.7	Safety cabinet airflow fluctuation alarm: when the fluctuations of velocity of downward airflow and inflow air exceed ±20% of their nominal values, audible and visual alarm will be used to remind the fluctuations of velocity of downward airflow and inflow air.		

S/N	Item	No.	Requirements	Inspection Result	Single Conclusion
3	Completeness of High Efficiency Filter	3.1	The leakage rate of filter at any points which can be scanned and inspected shall be no more than 0.01%		
		3.2	The leakage rate of filter at any points which cannot be scanned and inspected shall be no more than 0.005%		
4	Velocity of Downward Airflow:	4.1	The mean velocity of downward airflow of safety cabinet shall be between 0.25 m/s and 0.5 m/s		
		4.2	The mean velocity of downward airflow of safety cabinet shall be ± 0.025 m/s of nominal value		
		4.3	For safety cabinet with mean downward airflow, difference between the measured value and mean velocity of each measurement point shall not exceed ± 20% or 0.08 m/s (choose the higher value)		
5	Velocity of Inflow Airflow	5.1	The mean velocity of inflow airflow of safety cabinet shall be ± 0.025 m/s of nominal value of inflow airflow		
		5.2	Mean velocity of inflow airflow of Class II safety cabinet shall be no less than 0.5 m/s		
		5.3	The flow volume in each meter of the working zone shall be no less than $0.1m^3/s$		
6	Airflow Pattern	6.1	Downward airflow: the inspected airflow shall be downward, shall not product vortex and upward airflow, have no dead point, and never escape from safety cabinet		
		6.2	Inspection window airflow: the airflow shall be downward, shall not product vortex and upward airflow, have no dead point, and never escape from safety cabinet		
		6.3	Peripheral airflow of front-window operating-port: the peripheral airflow of front-window operating-port shall be inward without airflow that flows out. The inflow airflow in the front window operating-port of safety cabinet shall not enter into the working zone		
		6.4	Sliding leakproofness: the airflow shall be downward, shall not product vortex and upward airflow, have no dead point, and never escape from safety cabinet.		

5.2 Methods for Installation Inspection and Performance Detection

5.2.1 Completeness of High Efficiency Filter

1. Purpose

This test is to determine the completeness of the installation structure of filter of safety cabinet (including downward airflow high efficiency filter, exhaust high efficiency filter, and the cover and frame of filter).

2. Reagent

Dioctyl phthalate (DOP) or similar liquid that can produce aerosol particles with the same particle size distribution of DOP aerosol particles: for example: poly-α-olefine (PAO), di(2-ethylhexyl)sebacate, polyethylene glycol and medical light mineral oil.

3 Instruments

Instrument used for the completeness test of high-efficient filter:

----Linear or log-scale calibrated aerosol photometer, which can indicate polydisperse aerosol particles with the concentration of 10 μg/L DOP (or similar liquid) in the upstream airflow on filter as 100% and test 0.001% particles of same aerosol. The photometer shall be calibrated according to instructions of producer;

----Adjust the pressure of aerosol generator to the minimum 140 Pa. Use DOP or similar liquid to generate aerosols. The depth of generator immersing into the liquid shall be no more than 25 mm. The maximum range of aerosol generator is 0 kPa - 550 kPa with the resolution and precision of 7 kPa. The generator pressure gauge shall be calibrated by producer or according to its instructions.

4. Test method:

4.1 Filter that can be scanned for detection

4.2 Operate safety cabinet to make the fan and lamp work normally; remove the diffusing device and protective cover (if any) of filter; Place the aerosol generator and connect the tube on aerosol generator in positive pressure to import the aerosol into safety cabinet and the viewing instrument will make the solubility of upper aerosol in filter maintain 10μg/L.

4.3 The probe of photometer is below the filter with a distance of no more than 25mm from the filter and it is moved with a scanning speed slower than 50mm/s. Use probe to scan and test the whole lower side of the filter as well as the edge of every group filter leaf. The route shall be slightly overlapped. Carefully examine the whole periphery of the filter, the joints along the filter leaf and the frame, as well as the seals surrounding the filter and other components.

4.4 Filter that cannot be scanned for detection

4.5 Operate safety cabinet to make the fan and lamp work normally; remove the diffusing device and protective cover (if any) of filter; Place the aerosol generator and connect the tube on aerosol generator in positive pressure to import the aerosol into safety cabinet and the viewing instrument will make the solubility of upper aerosol in filter maintain 10μg/L.

4.6 Remove the probe of photometer; connect the tube connection in negative pressure at fan cover to photometer; observe the reading on photometer and record it.

5.2.2 Cleanness

1. Objectives

The test is mainly engaged in inspecting the cleanness degree within the working area.

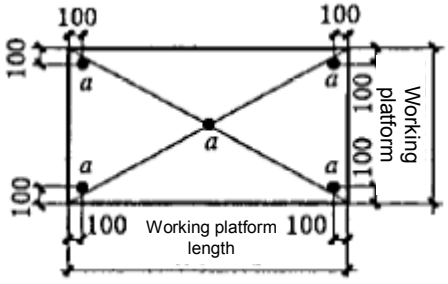
2. Instrument

Dust particle counter (the particle size resolution starts from 0.3 μm or 0.1 μm), of which the sampling flow is 2.83 L/min, 28.3 L/min or even greater.

3. Test method:

2.3.1 Location of measuring point: Place the measured safety cabinet under normal working conditions to operate for 10 min. The distance between measuring edge of cleanness and surface or working window is 100 mm. The sampling port of particle counter is designed on the 200 mm position below

working platform. Arranged according to Figure 1, the measuring point can outnumber the measuring point quantity in Figure 1.



α - Measuring point

Figure 1 Measuring Point Distribution Diagram of Safety Cabinet

5.2.3 Noise

1. Objectives

Test safety cabinet's noise when the airflow velocity is within the nominal value range of ± 0.015 m/s during operation. The test can be carried out in the room with ordinary acoustic conditions because the room wall will not absorb nor completely reflect sound.

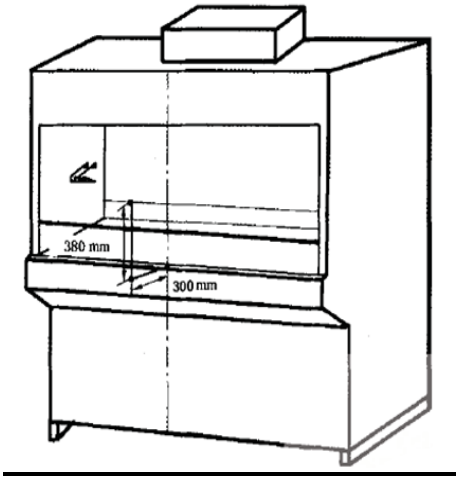
2. Instrument

Sound level meter, of which the measuring range, accuracy degree and resolution rate are 50 dB - 100 dB, ±1 dB and 1 dB respectively, what's more, it is equipped with "A" weighting mode.

3. Test method:

3.1 Set the sound level meter to be "A" weighting mode.

3.2 Switch on the fan and floodlight of safety cabinet, then, measure noise on the location with 300 mm of outside the front center of safety cabinet and 380 mm above the working platform.



3.3 Switch off the fan and floodlight of safety cabinet. Supposing that there is outdoor air exhauster, please keep it continue to operate, then, measure the background noise in the same position;

3.4 Provided that the background noise is larger than 57 dB, the actually-measured value shall be revised by referring to the curve or Table in the instrument operation manual. In case of inapplicable, please apply the standard calibration curve or the following Table to make amendment.

Noise Measurement Value Amendment Table

Difference between total measured noise and background noise dB	Value which is subtracted from the total measured noise.
0 ~ 2	Reduce the background noise and make new test
3	3
4 ~ 5	2
6 ~ 10	1
> 10	0

5.2.4 Illumination

1. Objectives

The test is aimed at inspecting the illumination of safety cabinet working platform.

2. Instrument

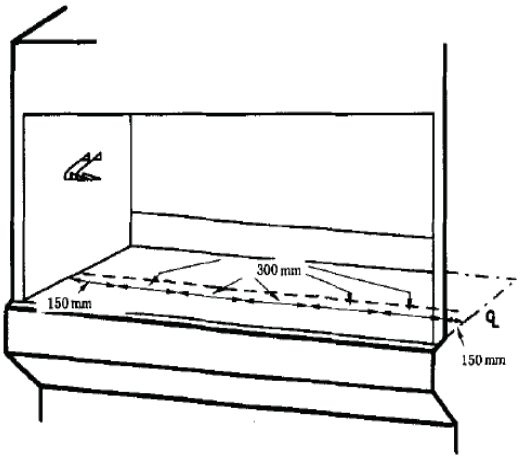
Illuminometer can satisfy the measurement below 1000lx due to the accuracy degree of ±10%, in addition, which will be calibrated according to the manufacturer instructions.

3. Test method:

3.1 On the working platform, please set the illumination measuring point along the two inside wall centers connection of working platform, what's more, the distance between two measuring points is prohibited to be more than 300 mm, however, the minimum distance between measuring point and side wall shall be 150 mm.

3.2 Turn off the safety cabinet lamps, and make the background illumination measurement on the measuring points from one side. The average background illumination shall be (110±50) lx;

3.3 Turn on the safety cabinet lamps, launch the fan of safety cabinet, then, make illumination measurement for safety cabinet on the measuring point from one side.



5.2.5 Downdraft airflow velocity

1. Objectives

The test is conducted with the purpose of measuring the downdraft airflow velocity within the safety cabinet.

2. Instrument

The instrument which is used for inspecting the downdraft airflow velocity within safety cabinet is:

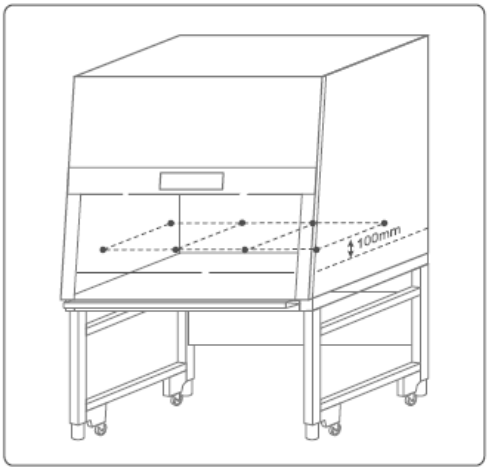
- Thermal anemometer, of which the accuracy is ±0.015 m/s (or accounting for ±3% in the indicating value, however, the larger value shall prevail), then, make calibration according to the manufacturer instructions. When the pressure and temperature of measuring point deviate from the standard

conditions listed on the thermal anemometer, the correction factors in the manufacturer manual shall be applied for calibration.

- Anemometer probe clamp, which can accurately locate the anemometer probe and put no influence on the airflow mode (such as, ring clamp and forceps holder are also be permitted to be employed).

3. Test method:

3.1 Determine the measuring point position on the front window operation port higher than working area top along 100 mm horizontal plane. The multi-point measurement shall pass through the downdraft airflow velocity of the plane. (As shown in the following Figure).



3.2 Equally-spaced distribution on measuring point, as a result, The minimum measuring points shall be 2 rows, and 4 measuring points shall be distributed on each row.

3.3 The distance between the regional border and internal wall and front window operating port of safety cabinet is tested to be 150 mm.

Make use of gripper to accurately locate the anemometer probe on various measuring points for measurement implementation. Please record all measuring values in the measuring point instructions and calculate the average value according to the measuring value.

5.2.6 Influx airflow velocity

1. Objectives

The test is conducted for the sake of measuring the influx airflow velocity in the front window of safety cabinet.

2. Instrument

- Thermal anemometer, of which the accuracy is ±0.015 m/s (or accounting for ±3% in the indicating value, however, the larger value shall prevail).

- Anemometer probe clamp, which can accurately locate the anemometer probe on the measuring point and put no influence on the airflow mode (such as, ring clamp and forceps holder are also be permitted to be employed).

3. Test method:

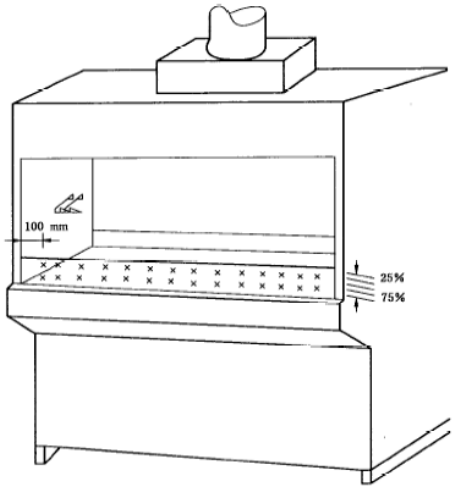
Anemometer method

3.1 Open the front window to the standard height

3.2 Make use of thermal anemometer to measure the airflow velocity on the two rows of the front window operating port plane. From top down, the position accounting for 25% height in the first row on the front window operating port will be opened; In the front window operating port of second row, the position accounting for 75% height will be opened (refer to the following Figure);

3.3 The distance between measuring points is about 100 mm. Although measuring point closes to the side edge of the front window operating port, the distance is not less than 100 mm. The influx airflow velocity will be reflected by the average value of all measuring values;

3.4 The test report includes the actually-measured value of influx airflow velocity on various measuring points, the average influx airflow velocity and the applied methods for measurement.



5.2.7 Airflow mode

1. Objectives

The test is conducted with the purpose of observing the airflow mode within safety cabinet.

2. Instrument

Smoke generator and smoke agent, providing visible smoke.

3. Test method:

3.1 Downdraft airflow test

On the 100mm height above the front window operating port top, the smoke flows from one end of safety cabinet to the other end along the central line of working platform.

3.2 Airflow test of observation window

In the rear of observation screen for 25 mm and on the 150 mm height above the front window operating port top, the smoke flows from one end of safety cabinet to another one.

3.3 Airflow test on the front window operating port edge

The smoke will flow through from about 38 mm outside the safety cabinet along the periphery of the whole front window operating port.

3.4 Sliding window impermeability test

Within the sliding window, the smoke will flow through from 50 mm above the safety cabinet side wall and working area.

5.2.8 UV lamp (if any)

1. Objectives

The test is conducted for the sake of measuring the UV radiation intensity of UV lamp under the normal usage conditions.

2. Instrument

UV illumination meter, which will be calibrated according to the manufacturer instructions.

3. Test method:

The radiation intensity test shall be carried out according to the following steps:

a) On the working platform, set illumination measuring points along two side wall central lines of working platform. The distance between measuring point is prohibited to be more than 300 mm, in addition, the minimum distance with side wall shall be 150 mm.

b) Turn on the UV lamp of safety cabinet, and make the radiation intensity measurement for safety cabinet on the measuring point from one side.

Chapter 6 Product Maintenance and Repairing

6.1 Maintenance

The rational and regular maintenance is of great importance for the normal operation of any equipment. This point is also applied to the biosafety cabinet. It is well known that the protective function of biosafety cabinet will be significantly reduced in case of improper usage. Supposing that the user only puts it to use without maintenance, the biosafety cabinet will certainly suffer from unsafe factors and lose its key class-I protective barrier function.

After the biosafety cabinet is installed, moved, or overhauled, including at regular intervals, the qualified professional personnel or product supplier shall verify the installation inspection or maintenance inspection for every biosafety cabinet to inspect whether it can satisfy the performance requirements in the related standard or specification.

The qualified profession personnel is responsible for the on-spot maintenance and regular inspection works of biosafety cabinet. Please maker report as long as biosafety cabinet suffers from any breakdown during application. Only after being maintained and inspected to be qualified, the foregoing cabinet can be permitted to be put into use.

In case of providing maintenance for biosafety cabinet, please observe the following suggestions:

1. A specially-assigned person is in charge of management.

2. Make standard operating procedure (SOP) and use maintenance record

3. Please apply appropriate disinfector (such as, ethanol for disinfection) to make cleansing and disinfection for working platform before and after operation.

4. Please make immediate disposal for the spilled sample during operation according to procedures.

5. After operation, the biosafety cabinet is requested to keep on running for 5-10 min for internal conservation.

6. Please make use of proper disinfector to make a weekly complete cleaning sterilization.

7. Provide a semiannual air disinfection and sterilization for biosafety cabinet.

8. Verification shall be conducted once a year by professional institutions.

9. According to the usage assessment results, the safety cabinet shall be eliminated and renewed after a certain period of years.

6.1.2 Regular maintenance projects

6.1.2.1 Daily maintenance projects

Before work commencement:

1. Inspect the alarm system and airflow mode of safety cabinet.

2. Clean and disinfect the safety cabinet surface. Provide thorough cleanness and disinfection for the working area surface, side wall and rear wall within the safety cabinet. Please be careful to apply chlorine-containing disinfectant due to the possibility to destroy the stainless steel structure of safety cabinet; In addition, the strong acid, base and other corrosive reagents are also prohibited to be applied to cleanse the stainless steel surface, otherwise, it will be corroded.

3. Clean the observation window. When it is necessary, please make use of purificant to wipe observation window surface to bring about visual clarity result.

After work:

1. Systemize the safety cabinet. When the experiment is finished, all articles in the biosafety cabinet, including instrument and devices, are requested to be provided with surface cleaning and disinfection by ethanol for disinfection (other bactericides depend on the user materials and experimental subject), and removed from the safety cabinet because the balance nutrient medium offer nourishment to microorganism growth.

2. Make cleanness and disinfection for surface. Provide thorough cleanness and disinfection for the working area surface, side wall and rear wall of safety cabinet. Please make cleanness and disinfection

for the safety cabinet which is equipped with UV lamp, standby socket and other accessories, and the surface which is equipped with UV lamp, lamp holder, standby socket and other accessories.

3. Clean the observation window. please make use of purificant to wipe observation window surface to bring about visual clarity result.

4. Inspect the alarm system and airflow mode of safety cabinet.

5. Make a record, and the trained safety cabinet user is in charge of the daily maintenance projects.

6.1.2.2 Weekly maintenance project

On the basis of the daily maintenance works, the weekly maintenance project also includes:

1. Intercepting basin disposal:

1) Pour proper disinfection antiseptic agents (of which the types depend on the user materials and experimental subject) in the intercepting basin, then, make suitable period according to the applied disinfection antiseptic agent requirements.

2) Turn on the blow-down valve of intercepting basin to completely discharge the inner liquids.

3) Separate the working platform and make use of suitable disinfection antiseptic agent to cleanse the stainless steel surface of intercepting basin. Likewise, the strong acid, base and other corrosive reagents are also prohibited to be applied.

4) Assemble the working platform after cleansing the intercepting basin surface by wet cleaning cloth.

2. Wipe the safety cabinet external surface by wet cleaning cloth, especially the front, top and bottom of safety cabinet. When the stain is relatively serious, please soak the wet cleaning cloth in warm water or neutral detergent. Supposing that the neutral detergent is applied, the wet cleaning cloth shall be adopted to cleanse it.

3. Inspect the completion conditions of entrance and exit valve position, as well as vacuum interface valve of safety cabinet.

4. Please make record, and the trained specially-assigned personnel is responsible for the weekly maintenance project.

6.1.2.3 Monthly maintenance project

On the basis of the weekly maintenance works, the monthly maintenance project also includes:

1. Inspect the rational usage conditions of all maintained accessories.

2. Inspect whether the safety cabinet suffers from any physical abnormity or breakdown, and whether the corresponding interlocking or alarm function is normal.

3. Inspect whether all operating valves (when they are equipped) are in satisfactory operation state.

4. Inspect the dirt retention conditions of prefilter and whether there is foreign matter.

5. Inspect the fluorescent lamp, UV lamp (if any) and operating screen, and ensure that they can work properly.

6. Supposing that there is hard-to-remove stain on the stainless steel surface, please make use of ammonia polyester cloth or sponge to dip a little of organic chlorinated solvent to wipe it, then, apply clean water or liquid detergent to rapidly wash the stainless steel plate. The stainless steel surface will be kept to be smooth and beautiful after cleansing the it at regular intervals.

7. Make a record, and the trained safety cabinet user is in charge of the monthly maintenance projects.

6.1.2.4 Annual maintenance project

On the basis of the monthly maintenance works, the annual maintenance project also includes:

1. It is recommended to make use of hot-bulb anemometer to measure the airflow rate in the working area per half a year. Suppose that the airflow rate deviates from the rated value, and please inform the professional personnel to make adjustment and calibration.

2. Replace the prefilter spare parts.

3. Replace UV lamp tube (if any)

4. Although it is unnecessary to make special maintenance for fan, its operation state shall be inspected every year.

5. The qualified technical personnel or the professional technical personnel from manufacturing enterprises are responsible for providing the annual maintenance and inspection, of which the inspected projects shall comply with the maintenance inspection requirements in YY0569 Standard.

6. Make a record, and the trained safety cabinet user is in charge of the annual maintenance projects.

Maintenance Items and Period Schedule

Series no.	Execution-Waited Task Explanation	Maintenance cycle			
		Every day	Every week	Every month	Every year
1	Make decontamination for working area surface	√			
2	Alarm inspection of biosafety cabinet	√			
3	Clean the glass door	√			
4	Water disposal pan surface cleaning		√		
5	Clean the external surface of biosafety cabinet		√		
6	Inspect the safety cabinet valve conditions		√		
7	Inspect whether there is residue on the paper scrap capture net.		√		
8	Inspect the rational usage conditions of all maintenance accessories.			√	
9	Inspect whether the safety cabinet suffers from any physical abnormity or breakdown.			√	
10	Inspect whether all operating valves (when they are equipped) are running well.			√	
11	Inspect the dirt retention conditions of prefilter and whether there is foreign matter.			√	
12	Inspect the fluorescent lamp, UV lamp (if any) and operating screen, and ensure that they can work properly.			√	
13	Inspect whether there is hard-to-remove stain on the working platform.			√	
14	Wind speed test of biosafety cabinet				√
15	Replace the prefilter spare parts				√
16	Replace UV lamp (if any)				√
17	Conduct annual maintenance and inspection for safety cabinet				√

6.2 Replacement method of UV lamp

Note: in order to get satisfactory disinfection performance, UV lamp shall be replaced every year. Before make it, it is necessary to make thorough disinfection for the UV lamp and working area of safety cabinet.

1. Unplug the power socket of safety cabinet.

2. Pull the glass door of biosafety cabinet to the maximum height.

3. Make use of antiseptic wipes after dipping proper disinfector to provide thorough disinfection for the UV lamp surface of safety cabinet.

4. Make counterclockwise rotation for the used UV lamp tube for 90° to make the plug feet (on both sides of lamp tube) horizontal, then, pull the UV lamp tube backwards, after that, the disassembling will be accomplished.

5. Place the new UV lamp in the UV lamp holder, then, make clockwise rotation for 90°. Fix the lamp tube in the lamp holder, then, the installation is accomplished.

Precautions:

1. The operators must wear gloves during UV lamp replacement, especially, picking the new UV lamp tube up.

2. When the new UV lamp tube is installed, please guarantee to take up both ends of UV lamp tube, instead of holding the central parts of lamp tube by hands.

6.3 Replacement method of fluorescent lamp

1. Unplug the power socket of safety cabinet

2. Loosen the right and left screws fastened on the bottom of the front shield, and turn the front shield over, after that, the fluorescent lamp tube of current product can be seen.

3. Make counterclockwise rotation for the used fluorescent lamp tube for 90° to make the plug feet (on both sides of lamp tube) be installed in the lamp holder recess, then, pull the lamp tube backwards, after that, the disassembling is accomplished.

4. Align the plug feet (on the both ends of the new fluorescent lamp) with the lamp holder recess, afterwards, make clockwise rotation for fluorescent lamp tube for 90° to make the lamp tube be fixed in the holder, then, the lamp tube installation is accomplished.

6.4 Replacement method of filter

6.4.1 Replacement conditions of high-efficiency filter

1. On condition that the downdraft airflow rate is too smaller or the influx airflow rate is too low, it will be considered to below the minimum index which is set during ex-factory process.

2. The high-efficiency filter is inspected to be unqualified in the aspect of leakage survey, or the foregoing filter has been confirmed to be destroyed.

3. The high-efficiency filter has reached the rated usage time.

4. There are other requirements to request to replace the high-efficiency filter.

6.4.2 Replacement operation precautions of high-efficiency filter

As a kind of operation with high technology requirements, the filter shall be replaced by operators with careful observation; hence, the profession personnel shall be required to carry out the operation. It is recommended that the trained and qualified maintenance engineers from the equipment manufacturing factories are responsible for replacing the high-efficiency air filter of biosafety cabinet. After the replacement, the professional personnel shall make inspection for the filter. As occasion requires, the biosafety cabinet needs to be conducted with proper debugging and commissioning.

The high-efficiency air filter will encounter increasingly large obstruction due to overmuch dust, in addition, which shall be scrapped when the normal air supply is affected, hence, the high-efficiency air filter shall be equipped with automatic supervision system to give an alarm before its failure and replace the new high-efficiency air filter. It is important to note that some biosafety cabinets supervise the filter by right of the timing system, instead of the automatic inspection system for filter pressure. The system will tacitly approve to give an alarm signal when the filter needs to be replaced after a certain period of time. In this way, the biosafety cabinet will suffer from the following inevitable problems during usage process: Under the influence of environment cleanness degree, the filter load has not reached the replacement degree due to extremely cleaning environment, however, the command about filter replacement will be given prematurely to result in unnecessary waste as long as the equipment has put into operation for the period exceeding the system acquiescent time; Or, the filter may have excessive loads due to the overmuch dust particle in the usage environmental when the equipment has not reached the system acquiescent time, as a result, the system fails to give an alarm despite that the system air outlets are changed and the working performance of safety cabinet are incapable of satisfy the safety requirements. Therefore, the user shall understand the working principle of alarm system for filter replacement to ensure that the system performance is normal during the safety cabinet usage process.

In summary, the service life of high-efficiency air filter has a lot to do with the cleanness degree of the current operating environment, besides, the usage period is also considered as one important index for service life restriction. In order to reduce the working load concerning filter replacement, and decrease

the usage costs, firstly, make no effort to enhance the environment cleanness to reduce the retained dust by filter as far as possible, consequently, extend the service life of high-efficiency air filter; Secondly, put the biosafety cabinet to use according to the actual requirements. During the design process, the open-initiate system of biosafety cabinet is ganged with the switching-on equipment of room exhaust system because the exhaust system of biosafety cabinet shares the same room system in some labs. In this case, the biosafety cabinet is still in opening state when it is not in use, as a result, the actual service time of high-efficiency air filter in biosafety cabinet will be inevitable to be reduced, and the replacement frequency for high-efficiency air filter is increased.

6.4.3 Replacement steps of high-efficiency filter

1. Ensure that the power cord of safety cabinet has been unplugged.

2. Loosen the right and left screws which are fastened on the bottom of front shield, and turn the front shield over, after that, fix the opening-closing angle of front shield to the maximum position. As shown in Figure 1.

3. Close the glass door entirely, loosen the fastening screw on the front coverplate, and then, open the front board. As shown in Figure 2.

4. Loosen the screw which is fastened on the positive-pressure case cover, and disassemble the foregoing case cover plate. As shown in Figure 3.

5. Loosen screws of four holders to make the upper parts of positive-pressure case freely drop on the positive-pressure case roof. As shown in Figure 4.

6. Make use of wallpaper knife to cut up the lower sealing strip and sealing gum of exhaust-air filter, then, take the exhaust-air filter out.

7. Fasten the four screws for lifting the positive-pressure case to make the positive-pressure case be lifted in the cabinet, then, unreeve the exhaust-air filter.

8. Install the new filter with the sequence from Step 7 to Step 1.

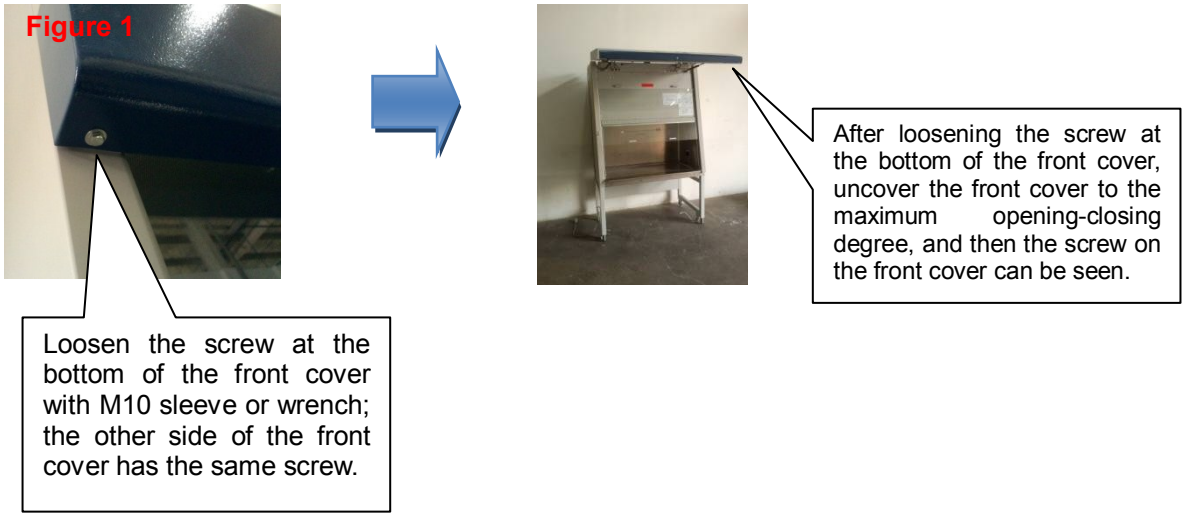



Figure 2

Multiple screws fasten around the front cover and it can only be removed after all the screws are loosened.

Loosen all the screws around the front cover with a plus driver and remove the front cover.


Figure 2-1

After the front cover is removed, the positive-pressure tank and its cover and fans can be seen.

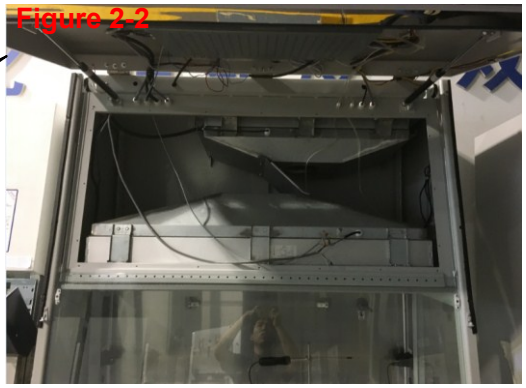


Figure 2-2

Precautions:

1. Before replacing the high efficiency filter, germicidal treatment must be done to the internal surface of the biosafety cabinet as well as to the high efficiency air filter which is to be replaced.
2. Before replacing the filter, prepare the new filter and tools needed for replacement.
3. When unpacking, handling, installing and taking the high efficiency filter, special attention shall be paid to protect the filter paper to be intact and undamaged. It is prohibited to touch the filter paper with hand in order to avoid its damages.
4. Before installing the product, avoid violent collision, tumble, etc. Carefully examine whether the filter paper in the filter has damages.
5. After the filter is taken out from the cabinet, put the old filter into the plastic bag which is prepared in advance as soon as possible and seal the bag mouth. It must be combusted finally.
6. Before installing the new filter, thoroughly clean all the silica gel on the surface and the adhesive and liner materials. Before installing, carefully handle and verify the new filter. It is very important to examine whether the filter and gasket which were used have leakage.
7. When replacing the new filter, pay attention to the wind speeds and direction labeled on the filter. The direction of arrow shall be consistent with the labeled direction of arrow on the filter.
8. After the filter is replaced, be sure to request the professionals to make a test on the performances of the biosafety cabinet. The product can only be put into normal production and using phase after the performance test is passed.

6.5 Method of replacing wind speed sensor

Notice: The wind speed sensor is a thermobulb-type. The front testing probe is very delicate. Handle it gently when replacing the wind speed sensor. Avoid violent collision or drop to the wind speed sensor.

1. Unplug the power of the biosafety cabinet.
2. Loosen the screws at the bottom of the wind speed sensor at the rear side of the liner tank and pull out the integrate wind speed sensor. It is shown in Figure 1.
3. Remove the testing pole of the wind speed sensor from the bottom and replace the new testing pole of the wind speed sensor. It is shown in Figure 1.
4. Then conduct the wind speed drop test to the product and compare the tested value of the wind speed sensor with the actual value, and then calibrate them to make the two consistent with each other.

Figure 1

Loosen the four screws fastened at the bottom of the sensor with a plus driver and pull out the wind speed sensor. Replace a new wind speed sensor.

Figure 1-1

6.6 Method of replacing computer board

1. Unplug the power of the biosafety cabinet.
2. Loosen the two screws respectively at the left and right of the bottom at the lower half part of the front cover (the blue part) and open the opening-closing degree of the front cover to the maximum. It is shown in Figure 1.

3. Loosen the two thumb screws respectively at the left and right of the electric control cabinet and open the cover of the electric control cabinet. It is shown in Figure 2.
4. Remove all the socket terminals and pipelines on the computer board. It is shown in Figure 2-2.
5. Loosen the screws fastened on the computer board, remove the old computer board and fasten the new computer board onto it.
6. Pursuant to the requirements of the circuits and pipelines, plug all the connecting terminals to the computer board.
7. Power on the biosafety cabinet, turn on and test.


Figure 1


Figure 2


Figure 2-1

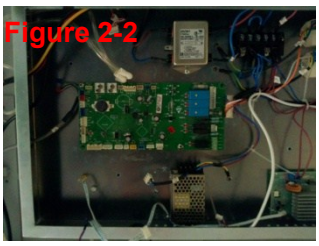


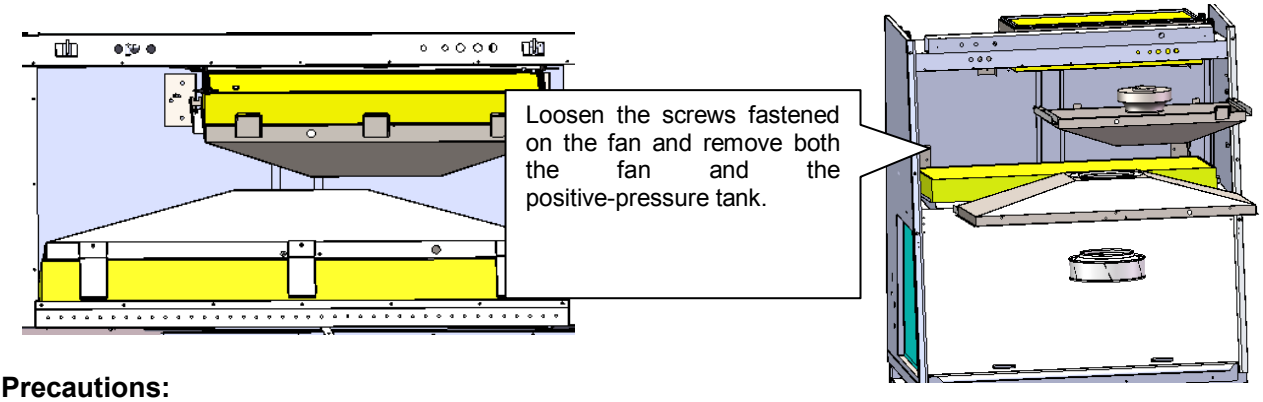
Figure 2-2


Figure 2-4

6.7 Method of replacing fan

Notice: the maintenance job can only be undertaken by the technical personnel trained and recognized by Haier Group. Do not replace any components with our approval. In addition, before open the panel connected to the negative pressure, please make a thorough disinfection to the internal environment of the biosafety cabinet in advance.

1. Finish the thorough disinfection to the internal environment of the biosafety cabinet. It is suggested to adopting the standards for biosafety cabinet to make fumigation disinfection.
2. Unplug the power of the biosafety cabinet.
3. Loosen the two screws fastened respectively at the left and right of the bottom of the front cover, uncover the front cover and fix the opening-closing degree of the front cover to the maximum position.
4. Fully close the glass door, loosen the fastening screws of the front cover and open the front panel. (Refer to the first 4 steps of replacing the filter)
5. When the fan is at the left side of the positive-pressure tank, remove all the wire harness joints on the fan, loosen the screws fastened on the fan and take out the fan from the front of the biosafety cabinet.
6. Paste sealing washers around the air outlets of the new fan, and then reverse execute the aforementioned steps to assemble the fan onto the product.
7. Plug in the power plug of the biosafety cabinet and check whether the fan can be operated normally. Conduct performance test again before it is formally put into use.



Precautions:

1. Since the fan is heavy itself, when handling the fan, pay attention to handle it gently and be careful.
2. Before replacing the fan, be sure to make a thorough disinfection to the inside of the cabinet.
3. After the new fan is replaced, note if the connection of the fan is correct.
4. After the new fan is replaced, be sure to make the performance test. The biosafety cabinet can only be put into normal use after the performance test is fully passed.

Chapter 7 Fumigation Methods for Biosafety Cabinet

For the biosafety cabinet that used to operate infectious materials, it must be disinfected before replacing the filter or making internal maintenance. Before relocating the biosafety cabinet, it must consider to make hazard assessment to the pathogen operated in the biosafety cabinet so as to determine whether it needs disinfection or which disinfection method shall be taken.

Generally, for the following situations, fumigation for the biosafety cabinet shall be done:

1. Before replacing the air discharge filter/air supply filter of the biosafety cabinet
2. Before replacing the internal fan
3. When leakage occurs or pollutes the surface which is difficult to be disinfected
4. Before conducting performance test and retest
5. Before move the installation location of the biosafety cabinet
6. Determine whether it needs fumigation according to the risk judgment by the user.

For both certification & test personnel and fumigation & disinfection personnel, they must wear the suitable personal protective equipment (PPE), including gloves, work clothes, etc.

7.1 Classification of fumigation and notice on disinfection

Fumigation methods for biosafety cabinet are mainly divided into three types: 1. paraformaldehyde; 2. chlorine dioxide; 3. hydrogen peroxide.

7.1.1 Notice on disinfection with formalin/ paraformaldehyde

Generally, disinfection & sterilization can be achieved by the evaporation of the 37% formaldehyde or the depolymerization of the solid paraformaldehyde.

Though formalin/ paraformaldehyde are widely used in disinfection & sterilization, the formaldehyde (formalin gas) may cause the following health risks:

- It may irritate the skin, eyes and mucosa through external exposure.
- Intake of low concentration of the gas may cause cough, nausea and diarrhea.
- Intake of high concentration of the gas may cause convulsion, coma and death.
- Long term exposure may cause cancer.

Though the permitted exposure level (PEL) of the formaldehyde is 0.75 ppm, many scientists take the view that no safety level exists for human exposure carcinogen. Therefore, the relevant personnel must evacuate from the laboratory when decontamination and so the “unavailability time for the laboratory” occurs.

Other disadvantages may exist by using the formaldehyde for decontamination:

- This method is very time consuming.

Time for using formalin is set as below:

S/N	Process	Time
1	Set and seal the BSC to make it fully closed.	1 h
2	Evaporate formalin	½ h
3	Formalin exposure time requested due to ensure the elimination of 4-6 targeted microorganisms in the record	8-10 h
4	Time of ammonia liquefaction due to the neutralization of formalin	½ h
5	Time of ammonia exposure due to the neutralization of formalin	2 h
6	Discharge the ammonia residues	1 h
7	Decompose and clear (a large amount of) residues	1 h
Total hours (excluding the time of ammonia neutralization)		10½ - 12½ h
Total hours (including the time of ammonia neutralization)		14-17 h

Since the formaldehyde (formalin gas) may cause harmful effects to the human health, countries including Germany, Austria and Switzerland have prohibited the use of it. It is expected that other

European countries will prohibit the use of it. The two main substitutes of formalin for decontamination are chlorine dioxide and hydrogen peroxide.

7.1.2 Notice on disinfection with chlorine dioxide

Inject the chlorine (Cl2) into the solid air cylinder full of sodium chlorite (NaClO2). The generated greenish-yellow gas chlorine dioxide (ClO2) can be used for disinfection & sterilization. The decontamination speed of chlorine dioxide is faster than that of the formalin. Chlorine dioxide is a real gas and it can quickly distribute without the BSC fan operation. Within 1 hour of exposure, chlorine dioxide can quickly and effectively kill various kinds of microorganisms. Before open the gas seals, the user must be sure to guarantee the concentration of chlorine inside the biosafety cabinet reduces to the safety level. The short term exposure limit (STEL) of chlorine dioxide is 0.3 ppm. The time for the whole process of decontamination by chlorine dioxide is set as below:

S/N	Process	Time
1	Set and seal the BSC to make it fully closed.	1 h
2	Treatment of chlorine dioxide gas	½ h
3	Exposure time to chlorine dioxide	1 h
4	“Washing” of chlorine dioxide	½ h
5	Decompose and clear (a small amount of) residues	½ h
Total hours		3½ h

Compared with formalin (0.75 ppm), the PEL of chlorine dioxide is 0.1 ppm. The BSC gas tightness shall be guaranteed during both processes so as to prevent exposure to the gas by relevant personnel.

7.1.3 Notice on disinfection with hydrogen peroxide

Conduct flash evaporation to the aqueous mixture of hydrogen peroxide (H2O2), the generated stream will distribute in the overall inside of the BSC so as to achieve decontamination to hydrogen peroxide.

STERIS and BIOQUELL are the two major suppliers of hydrogen peroxide generator. The operating principles of the two generators are obviously different.

- The principle of STERIS is to avoid surface condensation so as to minimize corrosion as well as optimize stream distribution. The relative humidity inside the BSC must be reduced to 30% so as to ensure the stream of hydrogen peroxide to absorb the other 70% relative humidity.

- The principle of BIOQUELL is to eliminate microorganisms through micro condensation. The generator will discharge the micro high speed drops inside the BSC.

The stream of hydrogen peroxide is non-carcinogen and can effectively eliminate microorganisms. In the presence of a catalyst, the stream of hydrogen peroxide (H2O2) will be decomposed to be oxygen and water, benefit to the environment protection and no residues are left. Pipes are commonly used for gas charging to the BSC so as to speed up the decomposition of the stream of hydrogen peroxide.

Time for the overall process is set as below:

S/N	Process		Time	
1	Set and seal the BSC		½ h	
2	Regulating and decontaminating cycles		½ - 1 ½ h	
3	Use pipes to export H_2O_2	Conduct gas charging to the H_2O_2 generator	½ h	8 h
4	Decomposition		½ h	
Total hours			2-3 h	9½ - 10½ h

The BSC must be equipped with two terminals when decontaminating hydrogen peroxide:

1. One terminal locates at the front opening or the side wall, passing through the working area.
2. Another terminal locates at the top of the discharge filter.

All the generators are determined with the functions of terminals, setting as below:

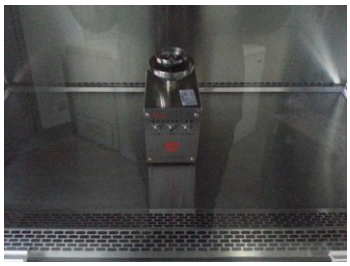
	Steris	Bioquell
Sources of hydrogen peroxide	Inject to the BSC	Generate inside the BSC
Terminals at the front / side of the bottom	Introduce hydrogen peroxide	Introduce hydrogen peroxide again
Terminal at the top	Extract hydrogen peroxide	Extract hydrogen peroxide

7.2 Recommended fumigation & sealing methods

This section gives the sample of the method for sealing biosafety cabinet when using FV-011 formaldehyde carburetor. However, similar principles can be applied to contamination methods of other gases.

Detailed steps:

1. Place the formalin fumigant applicator at the central place of the operating board of the biosafety cabinet.



2. Integral assembly of the biosafety cabinet with plastic bags

The plastic bag being used must be a full-sealed structure. Examine the sealed bag before using. The plastic bag with high-temperature resistance and moisture resistance is preferred.

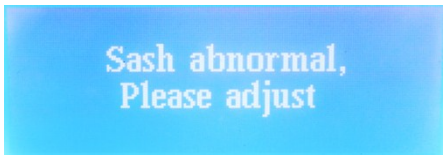
3.Seal the corners and power wires with adhesive tapes

4. Use formalin to fumigate for disinfection and sterilization after everything is prepared well.

Chapter 8 Trouble Shooting Repair Guide

8.1 Alarm page and methods of discarding alarm

8.1.1 Sash abnormal, please adjust



Alarming conditions:

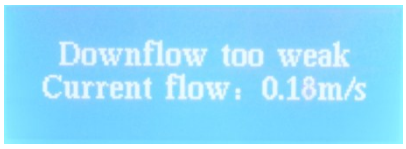
1. Lower cut of the sash door not being at the high limit will trigger the alarm status of the aforesaid page.
2. Malfunction of magnetism switch will trigger the alarm status of the aforesaid page.

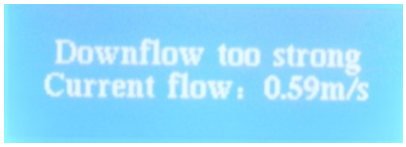
Methods of discarding alarm:

1. First of all, confirm whether the glass sash is at the high limit of the product (shown as below). If it is not at the high limit, pull the lower cut of the sash door to the high limit and observe whether the page contents on the observing board changes to be “operating page” and whether the alarm lamp puts out, whether the buzzer doesn’t work or whether the broadcast of voice module doesn’t broadcast the alarming contents (if any)

2. If the alarm still cannot be discarded after regulating the sash door, it will enter the administrator mode to check the debugging options for the magnetism switch to see whether malfunction happens to the magnetism switch. If malfunction happens to the magnetism switch, it needs to replace the magnetism switch.

8.1.2 Downflow too strong/weak





Alarming conditions: after the product self-cleaning is finished, if the downflow of the product exceeds the alarming scope, the product will trigger the downflow too strong/weak alarming.

Methods of discarding alarm:

1. Use the anemometer can refer to the detection method of downflow of the YY 0569-2011 biosafety cabinet to detect the downflow of the product.
2. If the detected wind speed result is the same with the result showed in the screen, it needs to enter the “administrator panel” and regulate the fan gears at the “fan settings” (see 2.3.2.5 fan settings for regulation methods), and then check whether the alarming is discarded; if it is still not, it needs to measure the downflow again. Until the measured downflow achieves the status of the nominal value, check whether the screen alarms.
3. If the detected wind speed has been achieved the status of the nominal value, but the product still prompts wind speed alarming, then it needs to confirm how much is the downflow in the current

screen of the product and to enter the “administrator panel” to select the option of “bias of sensor value” and make value regulation in the option of “bias of downflow”, finally exit the “administrator panel” to check whether the alarming is discarded.

4. If the alarming is still not discarded, it needs to repeat the steps in article 3.Until the discarding of alarming.

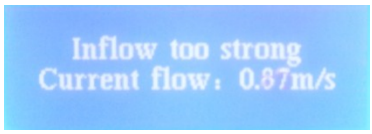
Measurement techniques of downflow:

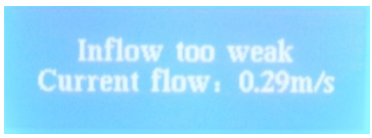
Downflow of the product needs several measuring points. Measuring for each time is time consuming. Therefore, the debugging personnel may place the anemometer on the third point of the second line at the measuring point. When the value of this point reaches the nominal value, measure all the wind speed measuring points. It can save measuring time.

Terminology

Nominal value: working point of biosafety cabinet specified by the manufacturer, the flow rate of downflow and inflow set under normal work condition of the biosafety.

8.1.3 The inflow is too strong or weak





Alarm conditions: when the product downdraft wind speed exceeds the alarm range after the product cleanliness, the product will trigger the alarm that the inflow is too strong or weak.

Alarm cancellation method:

1. Make use of anemometer to inspect the product inflow after referring to the YY 0569-2011 Inflow Inspection Method for Biosafety Cabinet.

2. If the wind speed result is inspected to be identical with the displayed result on screen, it is requested to enter "administrator interface" to regulate the fan gear in "fan setup" (please refer to Article 2.3.2.5 Fan Setup for the regulation method), after that, check whether the alarm has been cancelled. In case of failing to work it, please make the wind speed measurement once again. Until the measured wind speed reaches the nominal value state, then, inspect whether the screen will give an alarm again.

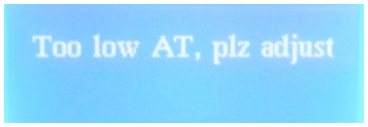
3. Supposing that the wind speed has been inspected to reach the nominal value state on the premise that the product still prompts the wind speed alarm, it is necessary to confirm the product inflow on the current screen, after that, select "sensor value bias" option after entering into "administrator interface" to regulate the value in "inflow bias", then, quit from "administrator interface" to check whether the product has cancelled the alarm.

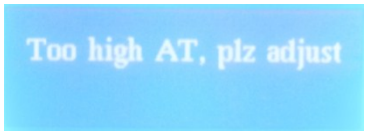
4. If the alarm fails to be eliminated yet, the steps in Article 3 need to be repeated,until the alarm is cancelled.

Inflow Alarm Cancellation Method Precautions of B2 Biosafety Cabinet

As for B2 biosafety cabinet, the inflow of B2 type products shall regulate the external exhaust fan gear in the first place, namely the "AC external exhaust fan PWM" in "exhaust fan setup" under administrator interface, due to the external connecting exhaust pipeline existence. As a result of the inconsistent external exhaust pipeline lengths of B2 type products, it is requested to make repeated debugging for many times during the exhaust fan gear regulation.

8.1.4 Airflow temperature and humidity alarm





Alarm conditions: Supposing that the product airflow temperature and humidity exceed the temperature and humidity range after the product cleanliness, the product's excessive low/high temperature and humidity alarm will be displayed on the product screen.

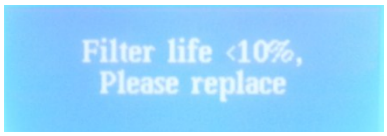
Alarm cancellation method:

1. As long as the product shows up temperature and humidity alarm, please press 

the key to check the specific values of current temperature and humidity, afterwards, enter into administrator interface and make temperature and humidity bias in "sensor value bias" option under administrator interface. Until product alarm is cancelled.

2. Beyond that, please check the current temperature and humidity range under "user setup" page. Supposing that it is inconsistent with the experimental conditions, please enter into administrator mode to select the applicable range of temperature and humidity once again in the "user setup" option.

8.1.5 Give an alarm when the filter balance service life is less than 10%.



Alarm conditions: If the filter service life is inspected to be less than 10% by pressure filter after the product cleanliness, the words "filter balance service life is less than 10%, please contact to replace" will be shown in the product screen.

Alarm cancellation method:

1. Supposing that the new arrival machines give the foregoing alarm as long as switching on, the positive pressure inspected by pressure sensor can be judged to be problematic, at this moment, please check whether the positive-pressure tube has been successfully connected, and whether the layup is virtually connected or fails to be connected. When the connection is out of question, the positive-pressure bias" debugging will be conducted. After that, the computer board can be judged to be out-of-order as long as alarm has not been cancelled yet. On this occasion, the foregoing computer board needs to be replaced.

2. On condition that product has been used by user for long period, the filter shall be replaced. Please refer to Article 6.6 Filter Replacement Method for the specific replacement method of filter.

3. After the filter replacement, the wind speed, completeness scanning for filter, airflow mode and other related tests are requested to be conducted again, beyond that, please debug product under normal operation state.

Precautions

When product gives the foregoing alarm, the product can still be in service until the filter service life becomes 0%, at this moment, the product will be completely non-usable. During that period, the product wind speed will suffer from unqualified hidden troubles with the necessity to make wind speed test for the sake of guaranteeing the basic performance of product, meanwhile, the product noise will accordingly become higher to put influence on the operator experience.

8.1.6 Filter abnormity alarm

Alarm conditions: The filter abnormity alarm will be displayed when the product positive-pressure value is beyond that regulated range.

Alarm cancellation method:

1. If the positive pressure of pressure sensor is inspected to be problematic, it is requested to check whether the positive-pressure tube is successfully connected, whether the layup is virtually connected or fails to be connected, as well as whether the pressure senor of computer board is not connected.

2. Inspect whether the product positive-pressure spare parts suffer from leakage to result in relatively low positive-pressure value.

3. Please inspect the filter's completeness performance in accordance with YY0569-2011 Filter Inspection Method in Biosafety Cabinet Industry Standard.

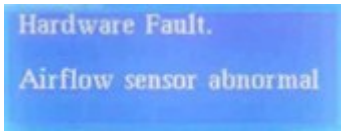
4. Then, press 

the key to check the current positive-pressure value of product, afterwards, regulate the fan gear (please refer to Article 2.3.2.5 for the debugging methods). Supposing that the alarm still fails to be cancelled, the product wind speed needs to be measured. When the measured wind speed fails to reach the standard nominal value, the fan gear shall be continued to be regulated. As long as the product wind speed value has reached the nominal value without product alarm cancellation, the "positive-pressure value bias" is requested to be adjusted to relieve the alarm state.

Precautions

The alarm for filter abnormity differs from the alarm for less than 10% filter service life. When product suffers from filter abnormal alarm, product will be prohibited to be put into use until it is successfully repaired and debugged. The filter abnormity is mainly caused by the filter leakage or poor filter sealing, therefore, please test and check whether the filter suffers from leakage problem as long as the foregoing alarm state occurs.

8.1.7 Hardware breakdown alarm



Alarm conditions: if the product components fail to make normal communication, the foregoing alarm page will occur.

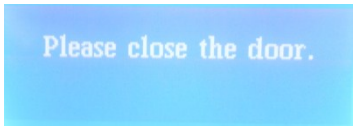
Component alarm range: The alarm component is applicable to the pressure sensor, wind speed sensor breakdown, communication fault between control panel and display board, as well as abnormal wind valve.

Alarm cancellation method:

1. The related component failure can be determined to assume the liability when "hardware fault" alarm page occurs. Therefore, the wire connection conditions of related components shall be checked.

2. Firstly, inspect the component's functions to confirm which component has been destroyed, secondly, replace the component after assessment.

8.1.8 Please close the door to give an alarm



Alarm conditions: If the fan is closed during the normal operation, the foregoing alarm page will occur.

Alarm cancellation method:

A2 type: Inspect the current fan usage conditions, check whether the fan can be controlled with switching on or off by pressing key. If fan breakdown is found, please repair it and check the corresponding connection circuit.

B2 type: Firstly, please inspect whether the product negative pressure has reached the alarm range. When the negative pressure is lower than 36Pa, the product will enter into "please close door" alarm page when the cleanliness is finished. At this moment, please adjust PWM value of the external exhaust fan in the first place. Increase the rotation speed of external exhaust fan. Afterwards, make the inflow test. When the wind speed reaches the nominal value, the alarm page will be automatically cancelled.

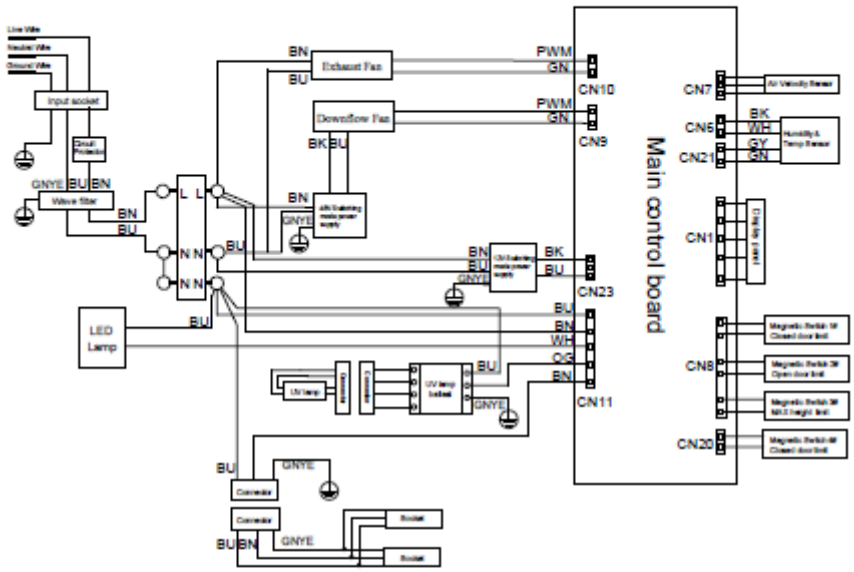
8.2 Electrical failure and mechanical structure breakdown cancellation

The Guidance can be used for solving the most common repairing problems. The Article is suitable for the Zhijing series biosafety cabinet models. As for more failure cancellation or repairing information, please contact with the local after-sales technical manager or regional manager of Haier.

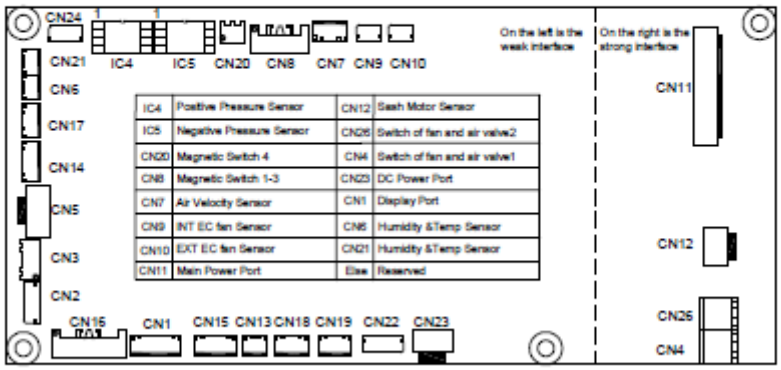
8.2.1 Electric cabinet and electric control layout

Open the front shield, then, the electric cabinet is at the back of front shield. When opening the electric control cabinet cover, the spare part distribution within the electric control cabinet can be seen, of which the specific distribution is as shown in the following Figure.

Biological safety cabinet wiring diagram



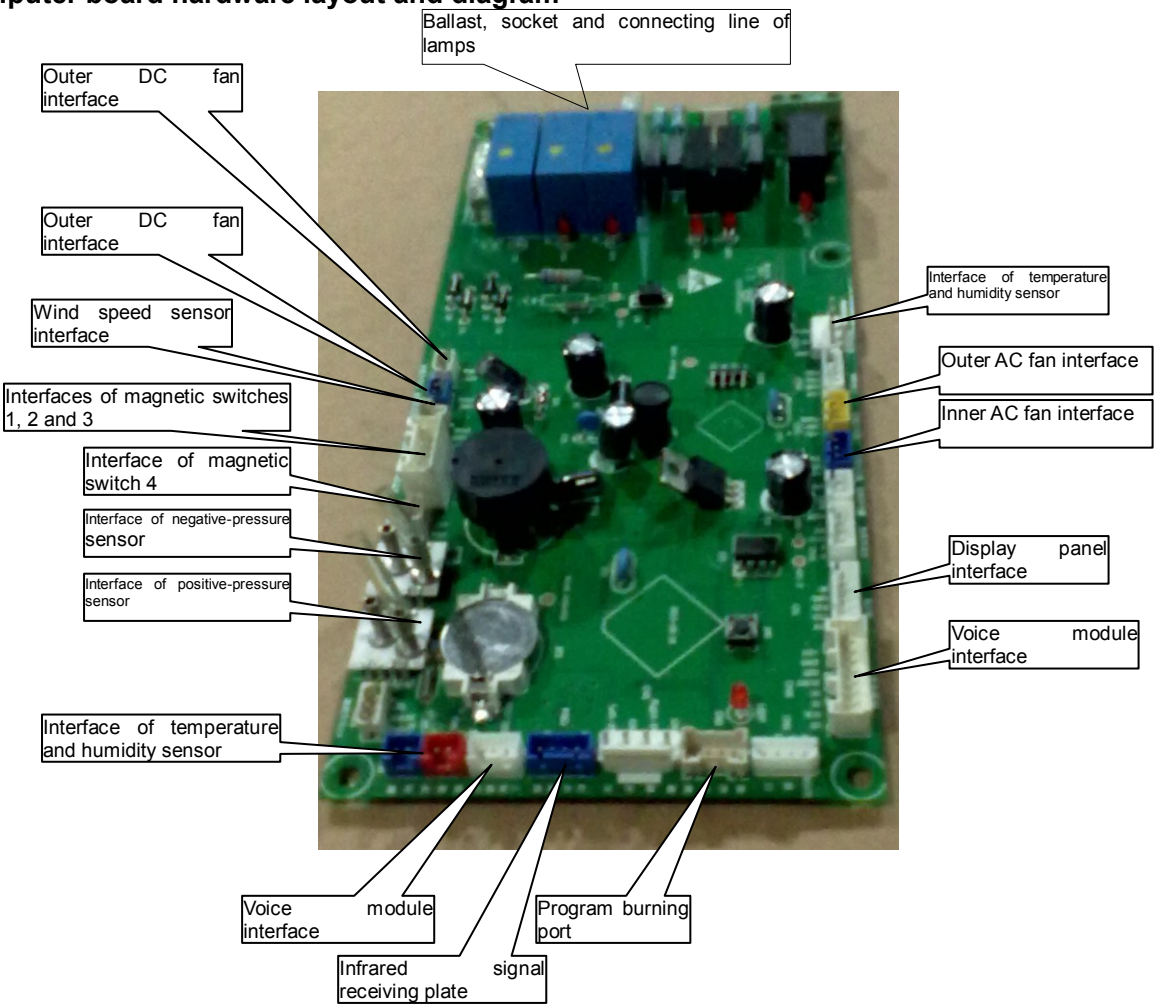
The physical PCB board map for reference



IC4	Positive Pressure Sensor	CN12	Sash Motor Sensor
IC5	Negative Pressure Sensor	CN26	Switch of fan and air valve2
CN20	Magnetic Switch 4	CN4	Switch of fan and air valve1
CN8	Magnetic Switch 1-3	CN25	DC Power Port
CN7	Air Velocity Sensor	CN1	Display Port
CN9	INT EC fan Sensor	CN6	Humidity &Temp Sensor
CN10	EXT EC fan Sensor	CN21	Humidity &Temp Sensor
CN11	Main Power Port	Else	Reserved

Note: the exhaust fan module within the dotted line is only included by B2 type products.

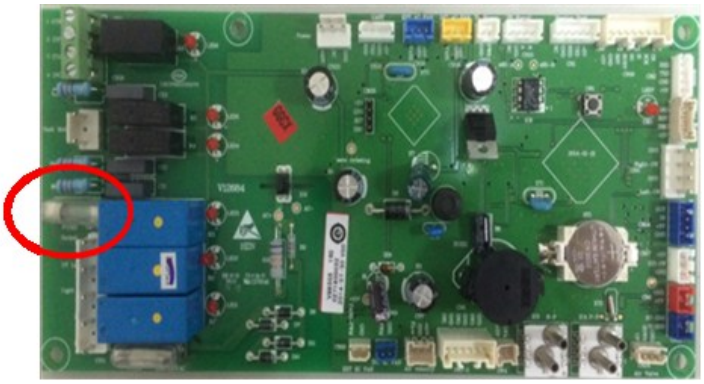
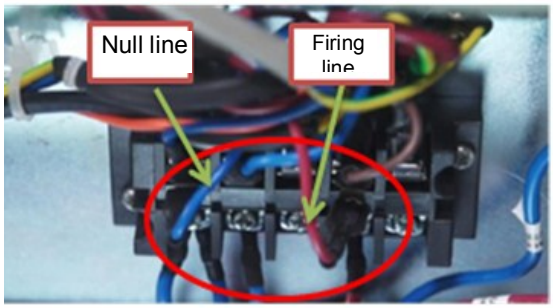
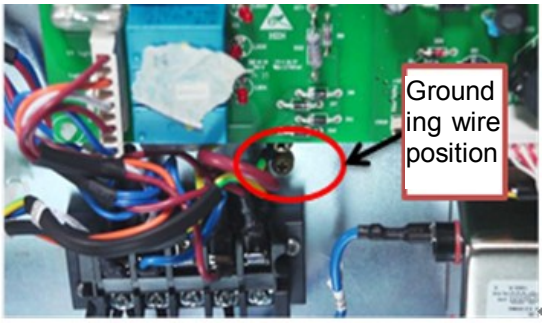
8.2.2 Computer board hardware layout and diagram

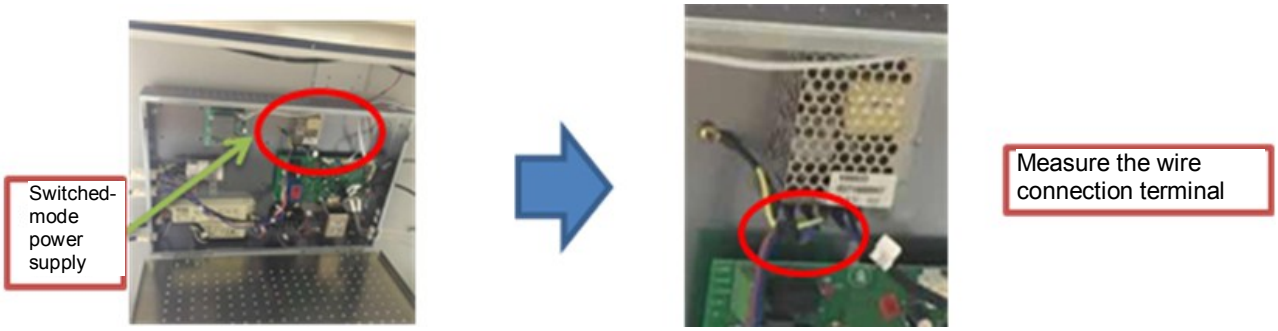
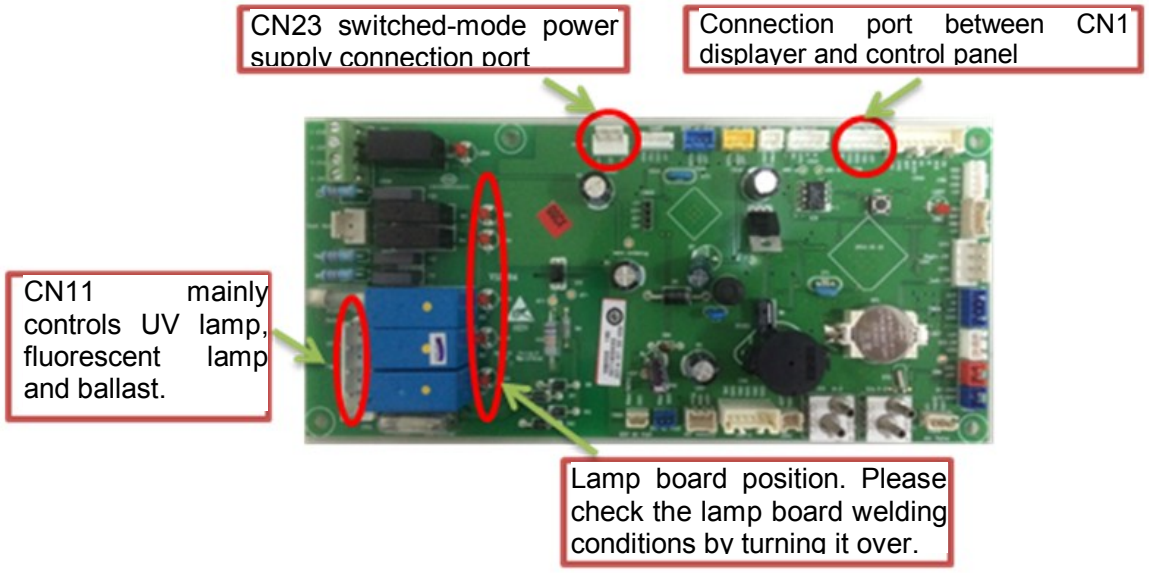


8.2.3 Common failure elimination

Failure 1: the safety cabinet can't be switched on normally (fan, LCD, button, lamp and other spare parts don't work).

Failure causes	Correction actions
Power failure	• Inspect whether the power socket on wall or ground has been connected.
	• Supposing that the total wall or ground socket is provided with switch, please ensure that the switch has been turned on.
Power cord is incorrectly connected or suffers from failure.	• Ensure that the power cord has been correctly connected with the wall-type socket, and check whether the power cord surface has been squeezed or destroyed.
	• Ensure whether the power cord of safety cabinet is virtually connected with cabinet body.
	• Make use of multimeter to measure the power cord resistance value, and confirm whether the power cord has been destroyed. In case of damage, please replace the power cord without delay. Otherwise, proceed to the next step.
Breaker tripping	• Check whether the fuse in computer board has been burned.
	Note: Supposing that the fuse has been burned, it is requested to inspect the wire connections of all spare parts once again, followed by installing the new fuse.
	• Whether the safety cabinet runs normally after the new fuse replacement.

	In case of abnormal, please proceed the next step.
Fuse position. The fuse capacity is 12A, which will be automatically fused when the current is overlarge.  	
Improper connection	• Measure whether there is voltage output on the connector bar within the electric control cabinet. Apply multimeter to measure the voltage. Measure the blue and red lines. Namely, firing line and null line in the following Figure.
	• It would be better that the voltage is within ±2% rated voltage range. Don't exceed ±10% at most.
	• On condition that the voltage output between red line and other ground lines is measured, it is reflected that the blue line has poor connection or being destroyed when the voltage output between red line and blue line fails to be inspected.
	• Supposing that the red line (firing line) has no voltage display, but voltage is measured on the power cord socket on the top of safety cabinet which is used for connecting power cord, the failure exists in each wire between socket and connector.
 	
Faulted power-switched-mode power supply	• Inspect whether the switched-mode power supply surface has been destroyed.
	• Check whether there is voltage on the input signal above the switched-mode power supply. The key point of measurement lies in firing line (red line) and null line (blue line).
	• The voltage range is +12 VDC ± 10%.
	• In case of non voltage, please measure voltage on the other side of wiring board.
	• Whether the switched-mode power supply can be normally started. In case of voltage input existence, please make replacement for spare parts as long as no voltage input is measured.

<table>
<tr><td colspan="2"> 
</td></tr>
<tr><td rowspan="4">Connection failure of mainboard or between mainboard and displayer</td><td>• Measure whether the input voltage on CN11 position of computer board has signal.</td></tr>
<tr><td>•Measure whether the input voltage on CN23 position of computer board has signal.</td></tr>
<tr><td>• If the input voltage exists, please check whether the connection line between displayer and control panel has been successfully connected.</td></tr>
<tr><td>•Please check whether the lamp panel on computer board is virtually welded when LCD displayer has been electrified but LED lamp on keyboard cover fails to be powered on.</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td rowspan="4">Control panel failure</td><td>o All LEDs on control board suffer from outage.</td></tr>
<tr><td>o No display on LCD.</td></tr>
<tr><td>o The buzzer has no sound.</td></tr>
<tr><td>• Please replace the control panel of computer board in case of these conditions occurrence.</td></tr>
<tr><td></td><td><u>Note:</u> please make correct connection for all electric lines during the mainboard replacement. Any connection error is likely to destroy the product.</td></tr>
</table>

Failure 2: Fan stops to work.

Failure reason:	**Correction measures**
Fan has no operation reaction.	• Press "fan" control button on displayer to check whether the indicator light of fan has been lighted up. Supposing that the indicator light doesn't light, please make repairing by referring to Failure 1. • If the indicator light of fan has been lighted up, but fan fails to be started, please make the next step.
Pressure problem	• When B2 biosafety cabinet has insufficient negative pressure, fan will stop operation. • It is requested to make adjustment according to the operating page adjusted by negative pressure, then, check whether the safety cabinet can normally run after adjustment.
Motor failure	Alert: please ensure to make antiseptic disinfection for the negative-pressure area of safety cabinet before opening the front coverplate. • Check whether the appearance has been destroyed. • Whether motor can be used normally. •Check the connection line. • Replace the fan.

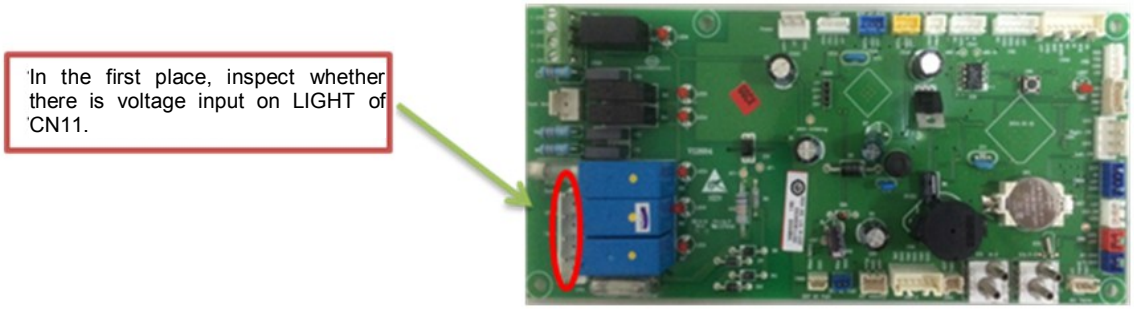
Failure 3 The light is not working.

Failure causes	Correction measures
The position of glass door	• The fluorescent lamp can be lighted up on the premise that the glass door is under opening state. • Press the light button and check whether the indicator light below the fluorescent lamp has been lighted up. In case of failing to make it, please make identification according to Failure 1.
The fluorescent light tube is burned.	• Replace the destroyed fluorescent light tube. • The fluorescent light tube is installed in the blue panel. • Please release the white lamp holder from the fluorescent lamp tube.
Fluorescent lamp ballast or relay board failure	• Inspect the input voltage of relay board.
	• Inspect whether there is voltage input and output on both sides of ballast.
	• Inspect whether fuse has been burned.
	• If the foregoing inspection matters are out of question and the lamp tube is unused, please replace the ballast.
	• Suppose that the ballast is investigated with no problem, please replace the new lamp tube.

In the first place, inspect whether there is voltage input on LIGHT of CN11.

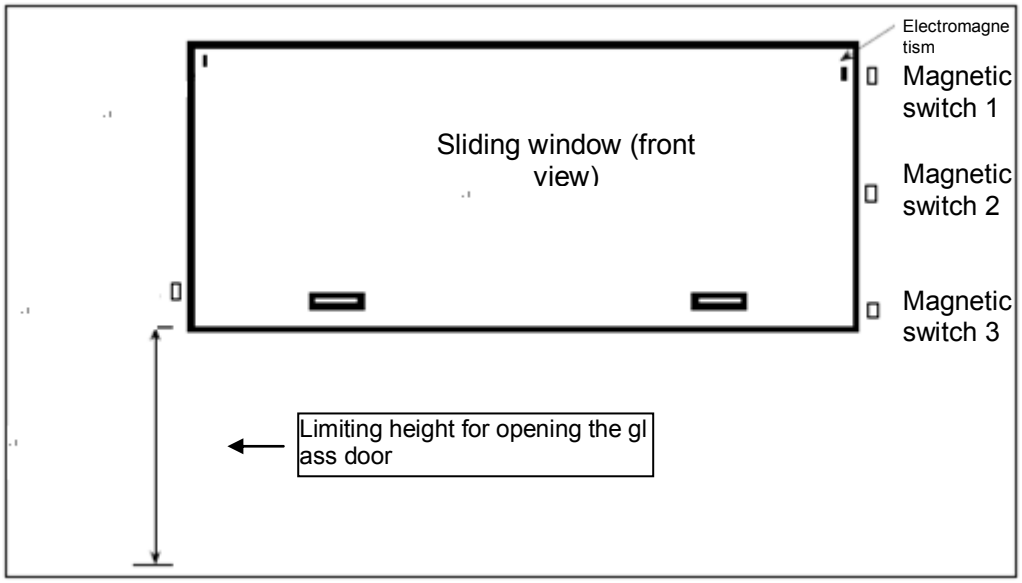
Failure 4 UV lamp is not working all the time

Failure causes	Correction measures
The position of glass door	• The UV lamp can be lighted up on the premise that the glass door is under closing state. • Press the light button and check whether the indicator light below the UV lamp has been lighted up. In case of failing to make it, please make identification according to Failure 1.
The UV light tube is burned.	• Replace the destroyed UV lamp tube • UV lamp tube is located at the back of the inner container. • Please release the white lamp holder from the UV lamp tube.
Fluorescent lamp ballast or relay board failure	• Check the input voltage of relay board.
	• Inspect whether there is voltage output or input on both ends of ballast.
	• Check whether the fuse has been burned.
	• If the foregoing inspection matters are out of question and the lamp tube is unused, please replace the ballast.
	• Supposing that the ballast is investigated with no problem, please replace the new lamp tube.



8.2.4 Linkage relation between glass door and various parts and magnetically-controlled switch

<table>
<tr><th>Glass door position</th><th>Fan</th><th>Floodlight</th><th>UV lamp</th><th>Magnetically-controlled switch state</th></tr>
<tr><td rowspan="2">Closing position</td><td rowspan="2">Self-closing or maintained closing, unavailable</td><td>Self-closing or maintained closing</td><td rowspan="2">Switch-on or off</td><td rowspan="2">Switches 3 and 4 are underswitching-on state.</td></tr>
<tr><td>Switch-on or off</td></tr>
<tr><td rowspan="2">Get away from closing position</td><td rowspan="2">Switching-on is tacitly approved, it can be switched on or off.</td><td>Automatically lightening or maintained lightening</td><td rowspan="2">Self-closing or maintained closing, unavailable</td><td rowspan="3">Switch 2 is under switching-off state.</td></tr>
<tr><td>Switch-on or off</td></tr>
<tr><td rowspan="2">Operating position</td><td>Switching-on is tacitly approved.</td><td>Automatically lightening or maintained lightening</td><td rowspan="2">Maintained closing, unavailable</td></tr>
<tr><td>Switch-on or off</td><td>Switch-on or off</td></tr>
<tr><td rowspan="2">Get away from working position</td><td>Switching-on is tacitly approved.</td><td>Automatically lightening or maintained lightening</td><td rowspan="2">Maintained closing, unavailable</td><td rowspan="2">Switches 1, 2, 3 and 4 are under constant switching-on state.</td></tr>
<tr><td>Switch-on or off</td><td>Switch-on or off</td></tr>
</table>



Chapter 9 General Specifications of Product

9.1 Specifications and parameters of product

Product model	HR1200-ⅡA2-D
Level and type	Level-Ⅱ, Type-A2
Boundary dimensions (L x W x H) mm	1380×845×2160
Work area dimensions (L x W x H) mm	1310×620×650
Exhaust air filter Specification/quantity	HEPA FILTER×2 Filtration efficiency ≥99.995%@0.3μm
Downflow air filter Specification/quantity	ULPA FILTER×1 Filtration efficiency ≥99.9995%@0.12μm
Inflow velocity (m/s)	0.45m/s
Downflow velocity (m/s)	0.30m/s
Power Connection Type	X
Power supply	220-240V~, 50/60Hz
Rate Current	7.5A
Exhaust Fan power	170W
Exhaust Fan speed	2860r/min
Downflow Fan power	190W
Downflow Fan speed	2000r/min
Net weight	320kg
Pollution degree	Class 2
Altitude up	2000m

9.2 Packing list

★ We reserve the right to change the biosafety cabinet components due to the continuous research and improvement without further notice. Please accept our apologies.

Safety cabinet Packing List

S/N	Category	Name	Unit	Quantity	Remarks
1	Subject	Host	Set	1	
2	Document	Manual	Copy	1	
3	Document	Delivery inspection report	Copy	1	
4	Parts	Manual package	Piece	1	
5	Parts	Accessory package	Piece	1	
6	Parts	Drain valve	Piece	1	
7	Parts	Handrest	Piece	1	
8	Parts	Handrest fastening screws	piece	4	On the host
9	Parts	Drawbench cloth	Piece	1	
10	Parts	Water cock	Piece	1	Optional parts
11	Parts	Air cock	Piece	1	Optional parts
12	Parts	Vacuum cock	Piece	1	Optional parts
13	Parts	Gas cock	Piece	1	Optional parts
14	Parts	Exhaust hood	Piece	1	Optional parts
15	Parts	Exhaust pipe∅200	Piece	1	Optional parts
16	Parts	Exhaust pipe hoop∅200	Piece	1	Optional parts
17	Packing	Chassis and packing accessories	Set	1	
17.1	Parts	Upper left support of chassis	Piece	1	
17.2	Parts	Under left support of chassis	Piece	1	Including two casters and two steel foots
17.3	Parts	Upper right support of chassis	Piece	1	
17.4	Parts	Under right support of chassis	Piece	1	Including two casters and two steel foots
17.5	Parts	Rear support of chassis	Piece	2	
17.6	Parts	Hexagon socket screw M12X20	Piece	16	
17.7	Parts	Six angle bolts M12X20	Set	4	Including flat and spring cushion
17.8	Parts	Inner hexagon spanner	Piece	1	
17.9	Document	Chassis assembly manual	Copy	1	

Inspired living

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