



Q5120 Benchtop Centrifuge with
Swing Buckets, 4000 rpm

User Manual

0 Notice to Purchasers

abm's products are guaranteed to meet required quality control standards at the time of shipment. Notice of problematic products must be made within 10 days of receipt. This product warranty limits **abm's** liability to the replacement of the product only. Refer to the Equipment Terms & Conditions at the end of this booklet for more details.

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Preface:

The copyright of this manual belongs to the manufacturer. Nobody is allowed to re-print or disseminate any information of the contents of this manual, including pictures and audio-visual products.

Equipment operators can copy some chapters of this manual, but only for internal use. Some examples include the chapters focusing on dealing with emergency situations. You can find a full listing of the chapters in the table of contents.

The manufacturer is not responsible for any damage to the equipment caused by users not following the protocols outlined in this manual.

The manufacturer has the right to amend the contents of the users manual at time.

Environmental Conditions:

In order to ensure the safety of using the machines, be aware that the centrifuge may be damaged by following factors:



- Chemical effects;
- Environmental impacts, including radiation of natural UV;
- The corrosion and abrasion and wear of shield and other security components.

Further Considerations:

- The centrifuge is designed for indoor use only
- Usage altitude must be ≤ 2000 m;
- The applicable temperature range for the instrument is: $+5^{\circ}\text{C} \sim +40^{\circ}\text{C}$;
- Relative humidity must be $\leq 80\%$;
- The scope of power supply for the instrument is AC110V/60 Hz 10 A ;
- There must be adequate ventilation surrounding the centrifuge;
- Vibrations or excessive airflow around the centrifuge can effect its performance;
- Do not place near corrosive or conductive, explosive dust.

Safety Tips

Please read this manual carefully before using for the first time!

- Q5120 Benchtop Centrifuge with Swing Buckets can only be operated by trained or authorized persons;
- The maintenance of the instrument can only be done by the manufacturer or authorized dealers of the manufacturer.;
- Please NEVER use the following materials in the centrifuge:
 - ◇ Inflammable and explosive materials;
 - ◇ Strong chemical materials;
 - ◇ Toxic or radioactive substances or pathogenic micro-organisms and so on.
- Only a qualified maintenance technician using the appropriate tools can perform operations on the system maintenance of Q5120 Benchtop Centrifuge with Swing Buckets.
- If you encounter issues not mentioned in the manual, please contact the manufacturer or authorized dealers from the manufacturer to discuss the right approach.
- Please use accessories provided by the manufacturer. If you choose to use other accessories, be aware that the manufacturer will not be responsible for any adverse consequences. However, users can submit an application to the manufacturer to verify if an accessory can be used with the machinery.
- Inspections and maintenance of the Q5120 Benchtop Centrifuge with Swing Buckets must be conducted at regular intervals.

Security Signs Warning Descriptions



Caution: Before using this equipment, please read the manual carefully!



Caution: Low pressure, dangerous! Electricity!

The Meaning of the Security Statement

In order to avoid any injury or damage to users, equipment or environment, please comply with all the security statements in this manual.

In addition to measures for accident prevention and environmental protection, the user should obey all the rules and laws of the country and local region.

The consequences of ignoring safety procedures

Any action ignoring the safety procedure, the law and rules, or other relative rules will cause damage and danger to the user, device and environment.

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1.0 Terms of Security Use

Q5120 Benchtop Centrifuge with Swing Buckets is based on current technology and safety standards:

- GB4793.1-2007 Measurement, control electrical equipment for laboratories safety requirements part 1: General safety requirements;
- GB4793.7-2001 Measurement, control electrical equipment for laboratories safety requirement special requirements for laboratory centrifuge;
- GB191-2000 Transportation packaging logo icon;
- GB6587.6-86 Transport-Test of Electronic Measurement Instruments;
- GB/T14710-1993 Medical electrical equipment environmental requirements and test methods;

Therefore, usage must be in accordance with the requirements of the design. If incorrect or inappropriate use occurs while using Q5120 Benchtop Centrifuge with Swing Buckets, it will result in equipment damage or personal injury:

- Only use in accordance with design requirements;
- Only used and maintained by trained individuals;
- Do not inappropriately change the contents with authorization of the manufacturer;
- Do not use the machine without understanding the safety rules.



Any person who involving the using or maintenance of Q5120 Benchtop Centrifuge with Swing Buckets should read and understand the using way and rules of safe using of this manual.

Following rules must be enforced to avoid accidents:

The "Manual" is one of the elements of device components of "Q5120 Benchtop Centrifuge with Swing Buckets", which should be consistent with the low-speed centrifuges together in order to be accessed by the operator.

The Q5120 Benchtop Centrifuge with Swing Buckets is designed for clinical medicine, biology, chemistry, genetic engineering, immunology and so on. The maximum separation speed can not exceed the density of the sample $1.2\text{g}/\text{cm}^3$; when the sample is greater than the density of $1.2\text{g}/\text{cm}^3$, the maximum rotor speed must be reduced accordingly.

When the Q5120 Benchtop Centrifuge with Swing Buckets process is running (in the separation of the sample or when the rotor rotation), make sure that the operator must not be within 30 cm of the centrifuge and that there are no hazardous substances or items blocking vents within 30 cm of the centrifuge.

If in the use of Q5120 Benchtop Centrifuge with Swing Buckets, non-compliance with the following safety precautions happens, the centrifuge can cause the operator or other personnel injury or cause damages to the centrifuge separation plant and the internal sample:

- Centrifuge design is neither anti-corrosion, nor is proof, therefore, ensure no centrifuges corrosion in the environment and the possibility of an explosion happen in the use of the environment;
- The use of centrifuges is strictly prohibited in the following materials:
 - ◊ Flammable and explosive materials;
 - ◊ Strengthen the role of materials science;
 - ◊ Toxic or radioactive substances or pathogenic micro-organisms and so on.
- For the separation of corrosive substances and pathogenic micro-organisms cell, effective sealing measures should be carried out in advance and effective disinfection measures should be carried out after use. For more details, see "repair and maintenance issues - sterilization" in the manual.
- To maintain the structural integrity of the centrifuge, when working with corrosive substances, ensure that they remain in a protective container.

1.1 Operation Notes

- Before running the centrifuge (sample separation), you must confirm the appropriate rotor and that the centrifuge has been properly installed;
- When in the process of running the centrifuge (rotors turning) or in the process of stopping the centrifuge (but the rotor is still rotating), do not manually open the door or move the centrifuge;
- The components used in Q5120 Benchtop Centrifuge with Swing Buckets must be dedicated accessories provided by the manufacturer. A number of common components, such as: glass and plastic containers can be used for separation, but you should confirm that they meet the requirements of the centrifuge, such as rotor speed and centrifugal force;
- Do not open the door of the cases when using the centrifuges or in separation of sample;
- The replacement of the mechanical parts of the centrifuge and electronic devices, must be implemented by relevant personnel designated by the manufacturer.;
- When the operator uses the centrifuges, it is important to choose an appropriate load of the rotor, and avoid overloading the rotor;
- Ensure regular checks of the rotor, if the rotor has obvious corrosion or obvious signs of damage, usage must be stopped;
- Perform regular cleansing and disinfection of the rotor;
- After centrifugation at low temperature, raise the temperature to 25 ~ 30 °C. After ~ 2 minutes, open the door, power off, and dry the interior centrifugal with a clean sponge or cotton cloth to remove any condensation and maintain a dry centrifugal chamber;

1.2 The Relevant Quoting Standards

- GB4793.1-2007 Part I of Safety Requirements of Measurement, control of laboratories electrical equipment: General safety requirements;
- GB4793.7-2001 Safety requirement of measurement and control of laboratories electrical equipment & special requirements of laboratories electrical centrifuge;
- GB191-2000 Icon of packaging & Transportation;
- GB6587.6-86 Transport-Test of Electronic Measurement Instruments;
- GB/T 14710-1993 Environmental requirement & test way of medical electrical equipment;

2.0 Introduction of Q5120 Benchtop Centrifuge with Swing Buckets

2.1 Introduction of the outlook Q5120 Benchtop Centrifuge with Swing Buckets

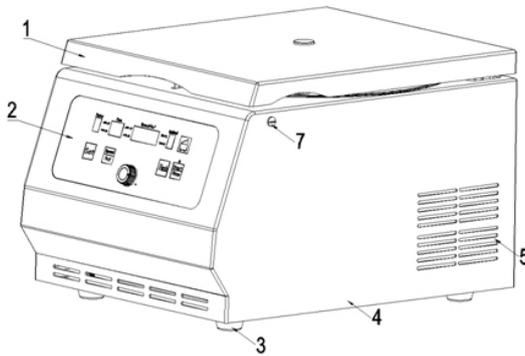


Figure 1:
Picture of front
side of Q5120
Benchtop Centrifuge
with Swing Buckets

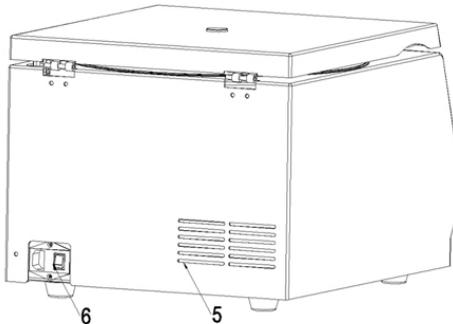


Figure 2:
Picture of back
side of Q5120
Benchtop Centrifuge
with Swing Buckets

Introduction of Figure 1, Figure 2:

1. Door / cover
2. The control panel and display area
3. Floor mat
4. Fuselage shell
5. Air intake
6. Power outlet and Switch
7. Emergency lock cord

2.2 Overview

Q5120 Benchtop Centrifuge with Swing Buckets can be widely used in clinical medicine, biology, chemistry, genetic engineering, immunology and other fields, which is the conventional instruments in the laboratory for centrifugation and sedimentation. The rotor configuration of the machine details, see "Table 1: Rotor types and technical parameters".

2.3 Instrument Structure Introduction

This equipment consists of the door and cover system, chamber system, drive system, rotor system, base system, power supply system, control system, display system and components such as the alarm system. The door and cover system, including door / cover, door hinges and distortion springs, door locks, door alarms, emergency cord, such as door locks. The door hinges are in the rear rack, the door locks are in front of the rack. Only when the doors are locked can you start the centrifuge. Otherwise the door alarm system will start to work (buzzer sound), and the machine will not be activated.



To open the door cover, press on the machine control panel door button. When the door cover opens to a certain height, the door hinge and distortion spring will be able to hang on the door cover.



In the situation of power failure or door button fail, and the samples need to be removed, you need to use the emergency lock cord. A slow pull down of the cord can manually open the door cover. (The position of emergency lock cord can refer to 2.1 Figure 1.)



When the rotor of the device is turning or the power supply is on, do not open the door cover manually!

- 2.3.2 Chamber system consists of stainless steel basin, rubber air tight seals. Chamber system can provide a stable working environment.
- 2.3.3 The device uses variable frequency electric motor to drive the rotor which loads the samples. Cone-driven system connected with the rotor shaft with low precision and smooth operation.
- 2.3.4 Rotor system consists of a variety of test-tube centrifuge rotors (For more detail, see Table 1: Rotor types and technical parameters) and other related accessories. The role of the rotor is loading samples to a certain degree of load rotation speed, resulting in a relative centrifugal force field, so as to achieve the purpose of separation of samples. As a result of low-speed rotation, the centrifugal force of the rotor is thousands of times of the Earth's gravitational acceleration g , so it is vital important to use the rotor safely and maintain it carefully!
- 2.3.5 The base system is composed by the protection steel, plate, shell and rubber body support legs.
- 2.3.6 Power supply system, including power outlet and switch, which is responsible for the machine's electricity supply from the power net.
- 2.3.7 Control system includes speed and centrifugal force settings, operating time settings, accelerate/decelerate settings, the whole display system and alarm control systems etc.,. In order to make sure the right operation of the machine and the operator's safe, please do not disassemble the device!
- 2.3.8 Display system consists of the liquid crystal display panel and PVC keyboard touch panel (control panel). It is the interface for human-computer dialogue. It can simultaneously display settings of the parameters, and track display the actual change of the parameters, in addition, it can display and alarm a variety of errors.

2

2.3.9 The alarm system covers alarms such as door cover fault, over speed, imbalance, over pressure etc.. When the machine has error conditions such as over speed, door cover open, imbalance, etc, the control panel will blink, and play alarm sounds. At this point, the machine will not boot (not allowed to start), and a running machine will automatically shut down until troubleshooting, after which the machine can be restarted.

Note: To mute the alarm sound, press the start/stop button  on the control panel. Check the device, accessories and document as per packing list.

2.4 Security Protections

Q5120 Benchtop Centrifuge with Swing Buckets has a series of security protections:

- Rack and the steel protection are produced by steel plates, the internal cavity is produced by stainless steel liner;
- The door/cover uses explosion-proof structure, the door/cover has a lock. Only when the centrifuge is power on and the rotor is stopped, the open door button can be pressed to open the door, only when the door/cover is locked, the centrifuge can start to run.
- Over speed
 - When the centrifuge rotor runs faster than the speed set by 400r/min, the machine will issue alarm; when the rotor runs faster than the maximum rated speed by 450r/min, the rotor will automatically stop. After the rotor completely stopped, open the door/cover, remove obstacles and re-run.
- Imbalance
 - When running, the rotor rotates imbalanced, resulting in excess of the shaft of the rate of shaking, the machine will stop running in time, and issue alarm; generally because of unbalanced rotor load. After the rotor completely stopped, open the door/cover, remove obstacles and re-run.
- Emergency door open In the running of the rotor, if there is a sudden power failure or machine fault, and the door could not be opened by the open door button, the door/cover can be opened through manual method.(see "Fault Handling").

2.5 Machine Placement Requirements

- 2.5.1: The machine should be placed on a sufficient level of rigid surface and should be kept away from any impact or vibration, heat and direct sunlight exposure.
- 2.5.2: There should be 10 to 15 cm away from all surfaces of the machines to allow for adequate ventilation.
- 2.5.3: Level should be adjusted after installation, and ensure that the four supporting legs at the bottom of each foot, support the equipment evenly on a horizontal surface.

2.5.4: The scope of the equipment working power supply is AC110V/60 Hz 10 A.



The machine must be totally grounded and power ground lead should be connected to ground lead of electricity grid. Don't cut the electricity when the rotor is running, or it will damage the control circuit.

3.0 Rotor Type and Technical Parameters

The manufacturer provides Q5120 Benchtop Centrifuge with Swing Buckets for a variety of users with different rotor specifications. The default purchase comes with a set of Q5122 and a set of Q5121 (i.e. 50ml x 4 and 15ml x 8).

If you need to purchase optional auxiliary parts, please contact the manufacturer or an authorized dealer from the manufacturer. They can advise you regarding optional auxiliary parts and procurement codes.

Table 1: Rotor types and technical parameters

No. (Rotor)	Cat No.	Capacity (ml x tube vol)	Max speed (r/min)	Max RCF (xg)	Test Tube Type
#3 or 4	Q5122	50 x 4	4000	2720	PP
#4	Q5121	15 x 8	4000	2790	PP Grad Cone base. G, PP urine dreg tube.
#6	Q5123	2 x 2 x 96 Plate	4000	2190	PP

4.0 Pre-Use Preparation

4.1 Transportation and Installation of Q5120 Benchtop Centrifuge with Swing Buckets

The Buckets are transported in boxes containing material to protect the internal components. Please open the box and remove the protecting buffer materials.



The net weight of the machine is about 29.5 kg. In order to prevent damage to the spindle, please remove the rotor before moving the centrifuge. Please don't shake the machine!

4.2 Choosing a Reasonable Settlement Place

Q5120 Benchtop Centrifuge with Swing Buckets can only be used indoor, placement should be in accordance with the following requirements:

- When the centrifuge is running, a minimum safe distance of approximately 20 cm should be maintained. Please do not bring hazardous material or allow personnel to stay within this space;
- Scaffold or horizontal for centrifuge placement should be firm and can not shake or vibrate; If you use removable stents or trolley, locking devices should be used as well to ensure the safe operation of centrifuge;
- If the centrifuge is placed in the wall or corner, in order to ensure smooth flow of air circulation and cooling cycle of the equipment, please ensure that the distance away from centrifuge's back, right, left sides and the posterior wall is not less than 10~15 cm;
- Centrifuge should be placed away from the location of the windows to avoid heat and direct sunlight exposure.
- After the centrifuge has been placed ,the level of the four supporting legs can be adjusted.
- The room for centrifuges installation must be constant temperature room at ambient temperature 5 °C ~ 40 °C, between environmental humidity \leq 80%, and the environment must be clean.

4.3 Fixed Machinery

After the centrifuge has been placed, do not move it. If it needs to be moved, you will need to confirm that the machine is evenly leveled and that all the necessary supports are in place to prevent shaking or vibration of the centrifuge.

4.4 Correct connection of power supply

Centrifuge's power wire should use a separate power outlet and the power outlet must be well grounded. Confirm that the power wire used for the centrifuge is in line with the safety requirement in your country and region. The applicable supply voltage and power frequency to the centrifuge should be consistent with the description of the requirements of the mark or centrifuge nameplate specifications. Please use the attached power cable, with the correct access to the machine outlet and a solid network of power connections. The power will switch on when "I" ,and will switch off when "O".

5.0 Operating Instructions

5.1 Control Panel and Display Interface Introduction

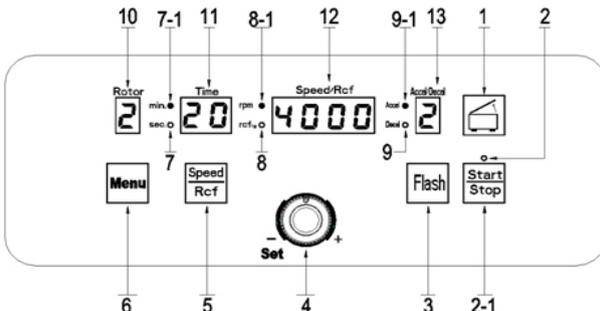


Figure 3: Schematic Drawing of Control

Figure 3 Description: The control and display interface functions

1. Open door button
2. Start / Stop Light Emit Diode
 - 2-1. Start / Stop button
3. Fast centrifugation button
4. Parameter setting knob with press function
5. Speed / Relative Centrifugal Force setting button(Speed/RCF)
6. Rotor→Time(min./sec.)→Accel/Decel Switch button
7. Second LED
 - 7-1. Minute LED
8. Relative Centrifugal Force LED
 - 8-1.Speed LED
9. Slow down file
 - 9-1.Acc file
10. Rotor No. Display
11. Run time countdown display
12. Real-time speed / centrifugal force (Speed/Rcf) / status display
13. Acc file/Slow down file display

5.2 Start the Machine

Connect the power cable to the outlet on the back side of the machine, and connect the other side to the power net. The power net should use an independent socket. The power range of this equipment is AC 110V/ 60 Hz 10A. After connection, press the power switch at the right side of the back of the machine. With a short buzzer alarms, the LCD screen on the control panel turns on. This is followed by a machine self-test complete, after which, the main interface will appear.

5.3 Open the Door

Press the open door button  on the control panel to open the door. The door / cover in the effect of distortion spring will automatically open up to a certain height, then lift up the door by hands until the door is completely opened, and the cavity is exposed to the user.

Note: To open the door, the door / cover will be automatically bounce up to a certain height, at this moment the head or other items should not be above the door avoiding danger!

If a malfunction occurs and the door cover can not be opened automatically, and items must be removed from the body cavity quickly, you can open the door manually, as shown in the "Troubleshooting" section of the manual.

5.4 Close the Door

Push down the door / cover until the hook on the front side of door / cover slide passes the lock pin with a "click" sound, then the bottom of hook will touch the trip switch and the door will be locked.



Please press the door cover properly.
Don't overexert, or the hook will be damaged.

5.5 Installing the Rotor

The rotors used must be confirmed and designated by the manufacturer, otherwise they will cause damage to the equipment. As there are rotor specific specifications determined by the manufacturer, it is recommended that you use the specified types of rotor model seen in Table 1.



Poor centrifugation or damage to the centrifuge may occur if inappropriate type of rotors or centrifuge tubes were used.

Steps to install the rotor is as follows (indicated in Figure 4, Figure 5)

- Switch on the power, wait for the self-test finish;
- Press the open door button to open the door / cover, confirm the cavity be clean and without irregular subjects;
- Clean the surface of the spindle motor;
- As shown in Figure 4, Figure 5, target the rotor slot in the bottom of the angle rotor with the rotor slot pin on the motor main shaft, then put the angle rotor on the shaft through the hole, then fix the angle rotor and motor main shaft with the rotor cover nut with the attached hexagon wrench (Figure 4, Figure 5).

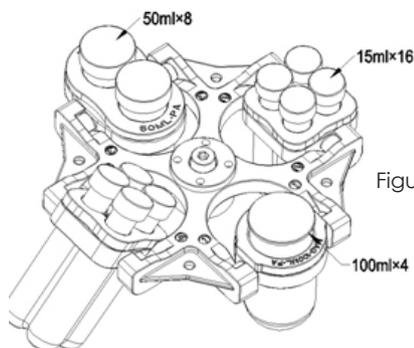
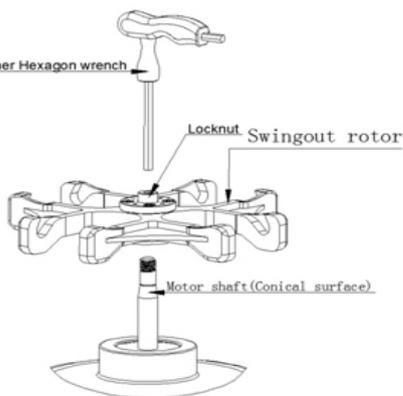


Figure 4: Swing Rotor

Figure 5: Picture of installing angle rotor (from up to down: 5mm inner Hexagon wrench; locknut, Swingout rotor, spindle motor (conical surface))





After completing the installation of the rotor, and before each use, you should check whether the installation of the rotor position has changed and when necessary, tighten up the lock sets again to ensure the installation of a solid rotor.

5.6 Calculating the Rotor Load

How to calculate the maximum load

- When the Q5120 Benchtop Centrifuge with Swing Buckets is at a low speed operation, there is tremendous centrifugal force; each rotor is designed with the requirements under the maximum rated speed when there is sufficient mechanical strength - that is, "safety factor"; However, this "safety coefficient" require the rotor load shall not exceed its maximum rated load.
- If you are separating the sample, putting the sample container into the rotor with the sample, if the sum exceeds the maximum rated load of the rotor, you must reduce the weight of the sample or of calculate the rotor speed allowed by the operation (NPERM), to ensure that the rotor load shall not exceed its maximum rated load.
- The rotor allowing operation speed(NPERM) calculating method as follows:
 - $NPERM = N_{max} \times (\text{maximum permissible load} \div \text{actual load}) \times 0.5$
 - N_{max} : Maximum rated speed



Don't overload the rotor, or it could explode and damage the centrifuge.

5.7 Sample Injection of Centrifuge Container

When the centrifuge is running, the better the balance of each sample, the better the distribution of centrifugal force will be. Therefore, in the centrifugation container the sample should be injected evenly as much as possible in order to run the process to achieve a better balance effect. To ensure even sample injection, it is important to choose a suitable container.

Examine the centrifuge container carefully (centrifuge tubes, etc.) and check whether it is consistent with its rated maximum allowed acceleration (centrifugal force); in line with the request, please use the lower speed operation.



Please note the usage life of the centrifugal container. Always check whether the centrifugal container (plastic, glass) is damaged or not. If there's anything damaged, please replace it quickly.

5.8 Safe Use of the Rotor

- 5.8.1: Samples loading and test-tube placing should be accurate and symmetrically before rotor operation.
- 5.8.2: Swing rotor should not run at the 1200r/min critical speed regional for long time, otherwise the machine will experience large vibrations, which will have an impact on its service life.
- 5.8.3: When replacing the rotor, use the incidental wrench to screw open the locking sets by anti-clockwise rotation, and then change the rotor.



Don't start the machine before the screw is tightened on the shaft!

- 5.8.4: If the centrifuge needs repeated operation, check whether the locking sets are loose after several uses. If the screw is loose, it must be tightened before the boot operation.
- 5.8.5: Tubes can be unloaded or loaded at the same time, but the load of the rotor must be symmetric (to allow the weight of error $\leq 1.5g$), asymmetric loading of samples is not allowed before boot and running.

5.9 Parameter Setting Operation Examples

- 5.9.1: For example, the equipment configuration rotor is #2 (Swing rotor 50ml \times 4), then the concrete operation is as follows: access to power \rightarrow open the power switch on the right side of the apparatus then the control panel LCD display area will be light up. For example, parameters to be set up as follows:

Rotor No.	Time Min.	Speed r/min	ACC	DEC
2	20	4000	2	3

5.9.2: Rotor number setting: Press down the **Menu** button on the control panel→the number of rotor No. flashes→ Rotate the knob button to set the Rotor No. 2.

5.9.3: Speed setting: Press down the **Speed Rcf** button on the control panel→the SPEED/RCF number flashes, the green RPM LED lights→Rotate the knob button to set the number 4000.

5.9.4: Time setting: Press down the **Menu** button on the control panel→the number of running time flashes→the Min LED lights, Rotate the knob button to set the number 10, Pressed down the knob settings button. If you want to use second as the time unit, Press down the **Menu** button for twice continually, the Sed LED light, rotary the knob settings button to set the Seconds.



The method to set the parameter selected: after the parameters settings, press the knob vertically or wait for the display system to flash for 3 times which indicate the settings are saved.

5.9.5: Acceleration and Deceleration settings (The accelerate to start the rotor velocity from zero to the set speed and decelerate to stop the machine velocity from set speed to zero, value of 0 ~ 9, the greater the value, the shorter the time): Press down both the buttons on control panel → Acc file/Slow down file display area will flash with "ACC", which indicate entering the Acceleration setting status → rotary the knob settings button to set the number to 5 → Press the knob button vertically, the Speed/RCF display area will flash with "dEC", which indicate entering the Deceleration setting status → rotary the knob button to set the number to 3 → Wait for 3 seconds without any button pressed, the system will exit the setting status automatically and save all the accelerate and decelerate parameters. (The parameters are hidden ones which will not display on the display panel directly.)

5.10 Additional Parameter Settings

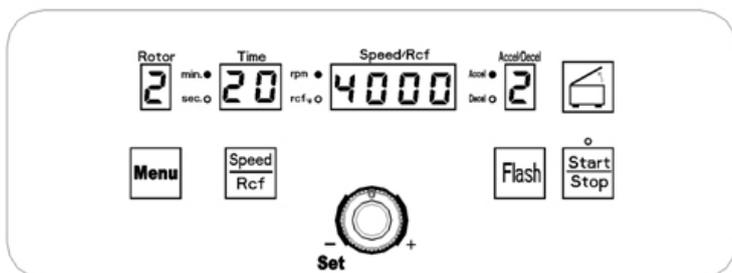


Figure 6: For the completion of parameter setting

5.10.1: Centrifugal force settings: Press down the **Speed Rcf** button on control panel→so that RCF of Speed/RCF flashes, the RCF green LED lights up and the number flashes and the dot of the last number lights up. → rotary the knob button and set its value.

5.10.2: In the process of setting parameters, if as a result of mechanical failure or incorrect parameter settings, which resulted in the machine

alarm, please press the stop button **Start Stop** to cancel the alarm, and then re-set the parameter refer to the rotor No.

5.10.3: Press the start button **Start Stop**, the machine starts running (if the machine need to be stopped on half-way please press the stop button

Start Stop), The setting time will gradually decrease to zero, when the time value shows zero that the centrifuge will automatically shutdown, when the speed displayed will gradually decrease from set speed to zero (speed from the set value decrease to zero is related to the settings of the speed deceleration), when the speed becomes zero, the door / cover will automatically open, the machine will issue a stopping sound, you may

press the stop button **Start Stop** to stop the sound.

5.10.4: For an instant centrifugal, please continually keep pressing the flash

Flash

button, the speed will continue to increase, releasing will stop the rotation, during which the maximum speed of the rotor corresponding to its set speed and will accumulate with the seconds.

5.10.5: After the machine speed becomes stable, if needed, the speed / centrifugal force, time, parameters such as take-off and landing speed can be re-modified. After parameters are re-set, there is no need to manually confirm while the system will automatically blink three times to confirm the settings.

- Before setting parameter with control panel, you must install the rotor on the shaft correctly.
- If operating errors were found in the parameter setting process, you may re-set the parameters.

5.10.6: The calculation of the centrifugal force

Relative centrifugal force is usually thousands of times of gravity (g). It's unit items to measure the efficiency of variety of instrument separation or precipitation. The calculation of centrifugal force has something to do with centrifugal speed and centrifugal radius. It's based on the following equation:

$$RCF = 11.18 \times (n/1000)^2 \times r$$

R: is the centrifugal radius, unit is cm;

n: centrifugal speed unit is rpm (revolutions per minute)

Note: The value of maximum centrifugal force has something to do with the maximum centrifugal radius.

The setting of value of centrifugal force should consider the radius of the rotor and the shape of centrifugal container.

6.0 Maintenance Matters

6.1 Cleansing and Purification

If the hazardous substances spill or into the device, users have the responsibility to conduct appropriate purification.



Users should conduct cleansing and purification in accordance with the methods described in the manual, in order to ensure equipment is not damaged. Using inappropriate cleaning agents and incorrect disinfection procedures, may cause damage to the centrifuge and the internal components.

6.1.1 The implementation of cleansing and purification



Please turn off the power switch and unplug the power cord before the cleaning or maintenance of the centrifuge!

Maintain regular cleaning of the various components of the centrifuge, including the outer surface. This is to prevent any contaminants left on the surfaces, which can cause corrosion to the components for use and environmental pollution.



Don't use organic solvents because it can break down lubricants inside the motor bearing. During the process of cleaning, don't exposure liquid especially organic solvents to motor bearing spindle and bearing ball inside.

6.1.2 The implementation of steam sterilizer

The life expectancy of the annex is related to the number of sterilization time and usage. If the rotor and the separation container have clear corrosion and damage, please stop using them immediately.

Table 2: Sterilization Parameters Table

Annex	Max Temp (°C)	Min time period (mins)	Max time period (mins)	Max number of times
Glass Tube	134 - 138	3	5	-
PC Tube	115 - 118	30	40	20
PP Tube	115 - 118	30	40	30
PA Tube	115 - 118	30	40	20

6.1.3: Maintenance

6.1.3.1: The rotor cannot have a collision with tipped objects, in the removal and disassembly should prevent any bump. This is necessary to prevent scratches or injury which can cause the rotor to crack while in use.

6.1.3.2: Periodically inspect of rotor components (especially the bottom of tube-hole) to check for corrosion spots, grooves, small cracks. If found in either case, please stop using the rotor, and contact the manufacturer.



For the removal of the rotor, please grasp the rotor and lift it vertically. Don't tilt or shake.

6.1.3.3: Under normal circumstances, the rotor should be washed once a week and if used to separate corrosive salts or other samples, washed immediately after using. If it's found that the sample split or dripped onto the rotor, it should be cleaned immediately and dried.

6.1.3.4: When cleaning the rotor, use neutral detergent and a damp cotton cloth or sponge to clean, and then wash detergent with distilled water. Do not sprinkle or spray water on the rotor, because liquid could linger and cause corrosion. Inversion and drying are allowed after washing the rotor

6.1.3.5: After centrifugation at low temperature, heat it to 25 ~ 30 °C and after 2 minutes, open the door, switch off the power and dry any condensate in the centrifuge interior with a clean sponge or cotton cloth, to maintain a dry centrifugal chamber.

6.1.3.6: Use cloth or tweezers to move out spoil debris inside the centrifuge.

6.1.3.7: Motor shaft and rotor shaft hole connection site should be painted with grease.

6.1.3.8: Maintenance of the spindle motor steps:

- Open the power switch, until self-test to be finished;
- Press the  button to open the centrifuges door cover;
- Use the dedicated attached tool for disassembling the rotor. Unscrew the locking sets, remove the rotor and clean the locking sets. NOTE: Clockwise to tighten up lock sets, anti-clockwise to release the lock sets;
- Clean the cone part of the spindle motor, do not leave over oiled parts. An appropriate amount of lubricating oil or paper may be added.

6.1.3.9: When removing the machine mask in front, it is important to first cut the power and unplug the power cord connected to the posterior wall of the machine. Live operation are not allowed to prevent an electric shock or damage to the machine. Note: This operation can only be made by specially trained maintenance personnel from the manufacturer!

6.1.3.10: The machine can only use equipment accessories provided by the manufacturer.

6.1.3.11: Ensure the power supply of centrifuge to be cut off.

6.1.3.12: Transportation, storage

This machine is a precision instrument so during the transport and storage process, please note that moisture, shock, horizontal shaking should be prevented.

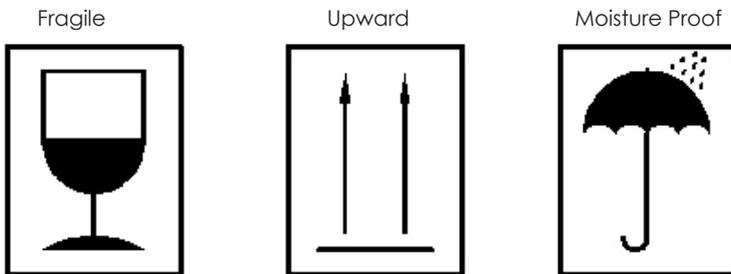


Figure 8: Transport and Storage Attention

6.2 Maintenance

Routine Maintenance shall include the following:

- Examination of electrical parts(Examination of internal circuit functions).
- Examination of stability of the resettlement of the centrifuge.
- Examination of electromagnetic locks and other security circuits.
- Examination of rotor locking device and spindle motor (driveshaft)

6.3 Basis of Warranty

Date of warranty will begin from the day user receive the product. Please refer to the Equipment T&C. If a component need be replaced because of its quality but not improper use, we will replace it for free. Otherwise you will be charged. Additionally, the Shell of the machine is not in the scope of warranty.

Basis of warranty are as following:

- Users should operate the machine as outlined in this manual.
- The operation of installation, commissioning, moving, adding accessories, maintenance etc should be designated by specialized or authorized staff of the manufacturer.
- Routine maintenance should be operated regularly as this manual required.
- If damaged occurs because of improper-use, the manufacturer will repair it but at the users cost. The manufacturer guarantees that if there's any problem with quality within 12 months of purchase, we will repair for free.

7.0 Fault Handling

7.1 Open Cover in Emergencies

In the process of normal usage, sometimes there's accidental power failure or failure to open the door, If you have to remove samples, you can open the door cover manually. Note: This method should only be used in an emergency.



When there is power failure, it will take long time to let the rotor stop totally because rotor can not use the break function to slow down. Please wait patiently.

Emergency door, following these steps:

- 7.1.1 To confirm the complete cessation of the rotor;
- 7.1.2 Cut off the electricity.
- 7.1.3 Pull right the emergency cord firmly and flatly and slowly, then the door cover open, and you'll be able to separate centrifuge samples out of the centrifuge;

7.2 Failure Alarm Information

The table below shows the error codes for machine, the reason they occur, as well as the way to solve them. If users still can't solve the problem or the alarm information is not included, please contact maintainer from the manufacturer immediately.



Please turn off the electricity first when there is any problem and only start it once the problem is solved.

Table 3: Error Alarm Data

Symbols	Information of abnormal phenomenon	Troubleshooting
Error 1	Imbalance. Centrifuge stops working because it detects over-vibration	<ul style="list-style-type: none"> • The device is placed on an angle and the stress is unequal. Please adjust the device to make the stress equal. • If the spindle motor is bent, please contact us for a replacement.
Error 2	Over speed. Centrifuge stops working because of rotor over speed	<ul style="list-style-type: none"> • Problem of microcomputer control system, please contact us. • Problem of speed sensor. Please contact us.
Error 3	Door cover protecting	<ul style="list-style-type: none"> • Re-close the door cover • Please contact us if the door cover is broken
Error 4	Input voltage too low	<ul style="list-style-type: none"> • Check the Power Source
Error 5	Braking over voltage	<ul style="list-style-type: none"> • Either the power source voltage is too low, the braking resistor failed or the brake is too fast.
Error 6	Over Current	<ul style="list-style-type: none"> • The Power source voltage is too low, or the acceleration is too fast.
Error 7	No velocity measurement	<ul style="list-style-type: none"> • The hall sensor failed or the motor failed.
Error 8	Fault of communication	<ul style="list-style-type: none"> • Check the communication lines.
Error 9	Over Voltage	<ul style="list-style-type: none"> • The Power source voltage is too low or the acceleration is too fast.

Table 3: Error Alarm Data

Fault phenomenon	Causes and Troubleshooting
No display	<ul style="list-style-type: none"> • Check whether the power outlet and the connection is right; is the power supply on. • Whether the switch is in the correct position. • Check the fuse. • If you can't solve it, please contact staff of the manufacturer.
Stop to work suddenly	<ul style="list-style-type: none"> • The speed exceeds the max rated speed of the rotor. • Once the speed of the rotor exceeds a rated speed of 250r/mi, the over speed alarm will sound. You should wait until the machine stops and reset the speed. • The speed extends setting speed of the rotor. • If the motor is overheating, power supply will be cut inside the machine, and then the machine will stop working. • If there isn't any display on the keyboard panel, please check the power supply system of the machine. • Maybe the voltage is low, please check whether the voltage of the power supply is right.
Couldn't open door	<ul style="list-style-type: none"> • The door can't open until the rotor finishes stopping turning. • Check the assembly of the door lock. • Check the electrical wires of the door lock. • Open the door manually. • If you can't solve it, please contact staff of the manufacturer.

Table 3: Error Alarm Data - Continued

Fault phenomenon	Causes and Troubleshooting
Heavy Vibration of machine	<ul style="list-style-type: none"> • The following situation is normal: The speed of rotor is over the critical speed and the machine vibrates. • Check whether the rotor is locked tightly or not. • Check the symmetry of the load of the rotor; check the working situation of the machine. • Check whether the rotor is installed correctly. • Check the shaft: rotate it with hand and if it can't rotate smoothly, then maybe there's problem with shaft or motor. If you can't solve it, please contact the manufacturer.
Indicator light of panel LED isn't up after switch on.	<ul style="list-style-type: none"> • Power supply is not connected, please check the power. • The fuse of PCB board and power outlet is broken, please ask professional staff change the fuse. • If you can't solve it, please contact the manufacturer.
Unusual display of operating panel	<ul style="list-style-type: none"> • Might be because of interference in the power grid. Please shut down and start it after 1 minute, then check the display.
The motor doesn't work after pressing	<ul style="list-style-type: none"> • Electric control circuit is broken. Please change the electric control board.
Burnt smell coming from the machine	<ul style="list-style-type: none"> • Cut off the power. • Whether the motor is burnt • Whether the electrical components are burnt • Rotate the driving shaft with hand, if it can't drive smoothly, please contact manufacturer to solve it.
None of the problems above	<ul style="list-style-type: none"> • Please contact the manufacturer to solve.

8.0 Technical Data

Function/ Parameter	Technical Data
Environment of Use	<ul style="list-style-type: none"> • There isn't any vibration or air-flow around which maybe effect the performance of the instrument. There isn't any conductive explosive dust or corrosive dust around • Altitude: $\leq 2000\text{m}$ • Relative humidity: $\leq 80\%$
Ambient Temperature	<ul style="list-style-type: none"> • $+5\text{ }^{\circ}\text{C}+40\text{ }^{\circ}\text{C}$
Applicable voltage	<ul style="list-style-type: none"> • AC110V / 60 Hz 10 A
Setting time range	<ul style="list-style-type: none"> • 0~99Min;0~99Sec
Max speed	<ul style="list-style-type: none"> • 6000 rpm (depending on rotor type)
Max relative centrifugal force	<ul style="list-style-type: none"> • $5150\times g$
Max capacity	<ul style="list-style-type: none"> • 400mL
Climbing Speed	<ul style="list-style-type: none"> • $\leq 20\text{s}$ from zero to max speed
Lowering Speed	<ul style="list-style-type: none"> • $\leq 30\text{s}$ from max speed to zero
Noise (Max speed)	<ul style="list-style-type: none"> • $\leq 60\text{dB(A)}$
Dimensions(machine)	<ul style="list-style-type: none"> • 280 mm (L) *500 mm (W) *320 mm (H)
Net Weight	<ul style="list-style-type: none"> • 29.5 kg
Quoted Standard	<ul style="list-style-type: none"> • GB4793.1-2007 Measurement, control electrical equipment for laboratories safety requirements part 1: General safety requirements; • GB/T14710-1993 Medical electrical equipment environmental requirements and test methods; • GB4793.7-2001 Measurement, control electrical equipment for laboratories safety requirement special requirements for laboratory centrifuge; • GB191-2000 Transportation packaging logo icon; • GB6587.6-86 Transport-Test of Electronic Measurement Instruments

EQUIPMENT TERMS AND CONDITIONS

These terms and conditions apply to Equipment purchased from Applied Biological Materials Inc. ("we" "us" or "our").

If you have any questions about our quotation, our ordering process, or what terms and conditions apply to your order, please call Customer Services at 1-604-247-2416.

1. Contract Terms.

1.1 General Terms. These are the contract terms and conditions under which we sell, and/or provide, our Equipment to you ("Service Terms"). By ordering or requesting Equipment from us, you agree to accept and be bound by these Service Terms. This Agreement is the complete and exclusive contract between us with respect to your purchase of Equipment.

1.2 When Agreement takes Effect. The Agreement between us is created when you send us your Equipment order and we provide you with an order confirmation.

2. Price.

2.1 Determining Price. For the Equipment you purchase, the price is shown in our quotation to you. If we do not provide you with a quotation, the price will be the list price that applies to your country on the date we receive your order.

2.2 Taxes and Fees. Our prices do not include any taxes (including VAT), duties, levies or other government fees that may apply to your order. If they apply, it will be your responsibility to pay them. If we pay them, we will add them to your invoice.

3. Payment Terms.

3.1 Late Payment. If you are late in making payment, without affecting our other rights, we may suspend the warranty support, cancel your contract, reject your future orders, and charge you a late-payment charge, from the due date until paid, at the rate of 1% per month (12% per year) or, if less, the maximum amount allowed by law. You agree to pay this late charge upon request.

3.2 Collection Costs. If we appoint a collection agency or an attorney to recover any unpaid amounts, you must pay all reasonable costs of collection, including all associated reasonable attorneys' fees.

4. Warranty.

4.1 Limited Warranty. We warrant that the Equipment we provide to you will be in accordance with the generally accepted standards. You must make any claim for this warranty prior to any unauthorized repair, change, or modification has been made to any part of the Equipment. If the serial number of the product is altered, removed, or defaced as to be illegible, the warranty shall be null and void in its entirety. We hereby undertake to repair, replace or refund at our option, or to arrange repair or replacement by our representative, on the Equipment if a defect in materials or workmanship arises under conditions of normal and proper use and maintenance provided that:

- The Equipment was purchased and used for a purpose for which it was suitable, was operated and maintained in accordance with the operating instructions, and was not used in a way which was unsuitable or not in accordance to the operating manual's procedures;
- The claim is first notified promptly to us in writing;
- The defect occurs within twelve months from the date of delivery of the Equipment;
- The Equipment has not been repaired or modified by anyone other than us or our authorized representative;
- You have paid the invoice for the Equipment in full.

4.2 Remedies. During the applicable warranty period only, we agree, at our option to: (i) repair the defective Equipment, (ii) replace the defective Equipment with the same model or equal value, or (iii) refund to you the fee you paid to us for the defective Equipment, if applicable. You need to arrange the defective Equipment to our service center at your cost, and the Equipment will be returned to you once repaired. This section states our entire liability for a valid warranty claim under this Agreement.

4.3 Obligations of the Original Purchaser. The original dated purchase receipt must be retained as proof of purchase and submitted upon request by us for replacement or repair processing. For the repair option, transportation to and from us is the responsibility of the purchaser.

4.4 Exclusions. Our warranties do not apply to: (i) normal wear and tear; (ii) damages by fire, flood, and/or acts of God; (iii) your neglect, carelessness, or unsuitable or improper use, such as but not limited to, connecting the Equipment to electrical services or other utilities not in accordance with the installation requirements for the Equipment, using incompatible solvents or samples with the Equipment, operating the Equipment not in conformance with our instructions or specifications, or your improper or inadequate maintenance of the Equipment; (iv) defective installation, bad civil works, or start up by you or third parties; (v) modification, repair, service transfer to another location of the Equipment that you or your employees, agents or an unauthorized contractor made; (vi) ignorance of relevant user manuals; or (vii) any defects or damage that we did not cause. ADDITIONALLY, ANY INSTALLATION, MAINTENANCE, REPAIR, SERVICE, RELOCATION OR ALTERATION TO OR OF, OR OTHER TAMPERING WITH, THE EQUIPMENT PERFORMED BY ANY PERSON OR ENTITY OTHER THAN US WITHOUT OUR PRIOR WRITTEN APPROVAL, OR ANY USE OF REPLACEMENT PARTS WE HAVE NOT SUPPLIED, WILL IMMEDIATELY VOID AND CANCEL ALL WARRANTIES WITH RESPECT TO THESE EQUIPMENT AND THE AFFECTED PRODUCTS.

4.5 Limitations. OUR WARRANTIES EXTEND ONLY TO YOU, THE ORIGINAL PURCHASER, AND YOU CANNOT TRANSFER THEM, WITH RESPECT TO EQUIPMENT, EXCEPT AS EXPRESSLY STATED, WE DISCLAIM ALL OTHER WARRANTIES OF ANY KIND, WHETHER OR EXPRESS OR IMPLIED, ORAL OR WRITTEN, INCLUDING BUT NOT LIMITED TO WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE OR MERCHANTABILITY.

4.6 Except as expressly warranted above, equipment is provided without other representations, warranties or conditions of any kind, including implied representations, warranties and conditions of merchantability, fitness for a particular purpose, title or noninfringement of third party rights. Except for the limited remedies provided above, you assume the entire risk as to the results and performance of Equipment. Nothing stated in these terms will imply that the operation of any equipment Equipment will be uninterrupted or error free or that errors will be corrected. Other written or oral statements by us, our representatives, or others do not constitute warranties of Applied Biological Materials Inc.

5. Compliance with Law.

We make no representation that the Equipment we provide to you will meet or satisfy standards of any governmental body, including the U.S. Food and Drug Administration. You agree that it is your responsibility to ensure that such Equipment are adequate to meet your regulation or certification requirements and that all requirements of any governmental body or other organization, including, but not limited to, any requirement of the U.S. Food and Drug Administration are your responsibility.

6. Limitation of Liability. TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, WE WILL NOT BE LIABLE UNDER ANY LEGAL THEORY (INCLUDING BUT NOT LIMITED TO CONTRACT, NEGLIGENCE, STRICT LIABILITY IN TORT OR WARRANTY OF ANY KIND) FOR ANY INDIRECT, SPECIAL, INCIDENTAL, PUNITIVE MULTIPLE, EXEMPLARY OR CONSEQUENTIAL DAMAGES (INCLUDING BUT NOT LIMITED TO COSTS OF COVER, LOST PROFITS, LOST DATA, LOSS OF BUSINESS, LOSS OF GOODWILL OR LOSS OF REVENUE) THAT YOU MIGHT INCUR UNDER THE AGREEMENT, OR THAT MAY ARISE FROM OR IN CONNECTION WITH OUR EQUIPMENT OR SERVICES, EVEN IF WE HAD NOTICE OF THE POSSIBILITY OF SUCH DAMAGES. WE WILL NOT BE LIABLE FOR ANY LOSS OR INJURY THAT IS THE RESULT OF INSTRUMENT, EQUIPMENT, OR PRODUCT ERROR OR THE FAILURE OF AN INSTRUMENT, EQUIPMENT, OR OTHER PRODUCT TO PERFORM IN ACCORDANCE WITH ITS SPECIFICATIONS. OUR TOTAL CUMULATIVE LIABILITY IN CONNECTION, INCLUDING WITHOUT LIMITATION ANY SERVICES RENDERED THEREUNDER, OR BREACH THEREOF OR FAILURE TO PERFORM IN CONTRACT, TORT, WARRANTY, OR OTHERWISE, WILL NOT EXCEED THE AMOUNT OF FEES YOU PAID US FOR THE EQUIPMENT THAT GIVE RISE TO YOUR CLAIM.

7. INDEMNIFICATION.

You shall indemnify, hold harmless, and if so requested by Applied Biological Materials Inc., defend Applied Biological Materials Inc. against all claims (Claims) directly or indirectly arising out of or in connection with the Equipment, its use or this Agreement. Claims refer to all losses, liabilities, damages, penalties, expenses (including legal fees and costs), claims, actions, and suits, whether in contract or in tort, whether caused by Applied Biological Materials Inc.' negligence or otherwise, and whether based on a theory of strict liability of Applied Biological Materials Inc. or otherwise, and includes, but is not limited to, matters regarding:

- The selection, manufacture, purchase, acceptance, rejection, ownership, delivery, lease, possession, maintenance, use, condition, return or operation of the Equipment;
- All latent defects or other defects in any Equipment or software, whether or not discoverable by Applied Biological Materials Inc. or by you;
- Any patent, trademark or copyright infringement; and
- The condition of any Equipment arising or existing during your use.

8. Miscellaneous.

8.1 Assignment. You may not transfer or assign your warranty or any contract with us on the Equipment. Any attempted transfer or assignment will be void. 8.2 Governing Law. The Agreement and performance under it will be governed by the laws of the British Columbia, Canada, without regard to provision on the conflict of laws. The United Nations Convention on Contracts for the International Sale of Goods shall not apply to the Agreement. 8.2 Uncontrollable Circumstances. We will not be responsible or liable for failing to perform our obligations under the Agreement to the extent caused by circumstances beyond our reasonable control. 8.3 No Waiver. Invalidity. Our failure to exercise any rights under the Agreement is not a waiver of our rights to damages for your breach of contract and is not a waiver of any subsequent breach. If any provision or part of the Agreement is found by any court of competent jurisdiction to be invalid or unenforceable, such invalidity or unenforceability will not affect the other provisions of the Agreement. No person other than you or us will have any rights under the Agreement. Headings are for convenience only and shall not be used in the interpretation of these Terms. 8.4 Confidentiality. You agree to keep confidential any non-public technical information, commercial information (including prices, without limitation), manuals or instructions received from us as a result of discussions, negotiations and other communications between us in relation to our products or services. 8.5 Notices. Any notice or communication required or permitted under these Terms must be in writing and will be deemed received when personally delivered, or 3 business days after being sent by certified mail, postage prepaid, to a party's specified address. 8.6 Commercial Purposes. You represent and warrant that Equipment is being purchased hereunder, as applicable, for business or commercial purposes and not for personal, family or household purposes. 8.5 You acknowledge that you have read and understand the terms and provisions of these Sale Conditions and have had an opportunity to have the same reviewed by an attorney of choice.