



# **Medical Centrifuge**

**MS-CE6000**

**Manual**

**MARSHALL**

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# Preamble

Thanks for purchasing MS-CE6000 Medical Centrifuge (hereinafter referred to as centrifuge or this device).

In order to help you have a better understanding of the centrifuge, this manual mainly introduce the technical parameters, installation environment, operation procedures, maintenance methods and simple troubleshooting of the centrifuge.

## Application range

This centrifuge is an advanced intelligent equipment, which is widely used in biochemistry, medical and health, food safety, life science, agriculture and forestry science, animal science, blood bank, blood station, biological products, pharmaceutical products and other fields, ideal equipment for sample separation, precipitation and concentration preparation.

Driven by DC motor, with small volume, low noise, convenient and flexible, high efficiency, over-speed automatic protection, safe and reliable advantages, the machine performance is stable and easy to operate. It is the ideal equipment for hospitals, laboratories, scientific research institute and other units at all levels.

This device's body is made of steel. Its surface is treated by spraying plastic, which makes it have good rigidity, high strength, corrosion resistance. It is also of high efficiency, novel appearance, safe and reliable. Besides, it is suitable for the test and analysis work of samples in low quantity with multiple separation steps.

This device is controlled by microcomputer, and integrates motor door lock control and other advanced technologies.

## Features

1. This device has an all-metal, multi-layer and explosion-proof design. It is safe in operation, stable in performance, strong and durable to ensure the safety of users.
2. It carries with micro processing control, brush-less DC motor drive, which is free from maintenance and operates smoothly.
3. It uses 5 inches touch LCD screen, supports minority language customization, and has a real-time display of all parameters, which is easy to operate.
4. It applies integrated motor door lock, which is easy to use, safe and reliable.
5. It applies silicone integral sealing ring to avoid aerosol spillover to ensure the safety of users.
6. It has self-check, blocked-rotor. It can monitor speeding, over-temperature and other conditions and alarm when something goes wrong. It has excellent shock absorption device to ensure the motor runs smoothly.

7. It stores custom programs for multiple groups of users. It would choose the system the user used last time.
8. It applies microcomputer processor to achieve precise control and has real-time display of speed, time, RCF (relative centrifugal force) and other parameters.
9. It is suitable for a variety of horizontal rotor and adapters, 0.2ml-500ml centrifugal tube, according to the needs to achieve multiple purposes.

# Safety Cautions

## Before power on

- Before each use, the user should carefully check whether the rotors and centrifugal tubes have cracks or severe corrosion. If they have, they should be replaced immediately.
- Keep the internal centrifuge clean. Avoid water remaining and prevent granular dirt falling in.
- The rotor system must be installed when the machine is power off.
- The power supply voltage must be the same with the centrifuge input voltage, AC220V 50Hz, and ensure that the power input end has a protective grounding wire.





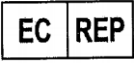

## During use

- When the product is under acceleration or deceleration process, short-term vibration is normal. No needs to turn off or press the stop button on the operation panel.
- If there is a power failure or passively power off, do not open the product's door immediately, it can be opened only when the motor stops (about 5-10min).
- After each parameter setting, press the "OK" to save.
- After each centrifugalization, the centrifuge will wait for the user to open the door for sampling. If it does not open the door and continues to work, the user has to wait.
- After use, the user should well keep the device, especially the rotor and centrifugal tube, in order to prevent corrosion caused by acid and alkali liquid contamination.
- The centrifuge works continuously for no more than 60 minutes at a time.

## Security Information

In order to use this instrument safely, please read the following safety regulations carefully. Any operation that violates the following safety regulations may cause accidental injury or instrument failure.

Description of related symbols:

Symbol	Marker	Description
	General warning	People who are not familiar with this product are not allowed to disassemble or replace, otherwise there may be electric shock or fire. Do not perform any operations other than the maintenance operations described in the user manual. In all cases marked with this symbol, it is necessary to consult the documents in order to clarify the nature of the potential hazards and any countermeasures that must be taken.
	Biological hazard	Biological hazards, disposable rubber gloves must be worn when operating the instrument. Do not touch the instrument when the skin is broken to prevent virus infection. The instrument should be disinfected before it is used or repaired.
	Warning crush	When closing the centrifuge door, be careful not to put your hands in the centrifuge room to avoid crushing injuries.
	CE mark	This medical device has been assigned to class I according to Annex VIII of the Regulation (EU) 2017/745. It bears this mark.
	European Authorized Representative	European Authorized Representative: Represents the authorized representative of the European Union..
	Marking of WEEE	Indicates the waste electrical and electronic equipment (WEEE), which designed for use with a voltage rating not exceeding 1000V for alternating current and 1500V for direct current, when marked with this marking the waste management should be in accordance with Directive 2002/96/EC(WEEE).

# Work Environment Condition

To ensure the stable and reliable operation of the centrifuge, the following conditions should be noticed:

- Environment temperature: 5-40°C
- Relative humidity:  $\leq 80\%$
- Power supply voltage: AC220V 50Hz
- Working environment should be well ventilated, no dust, floccule, metal chips and other materials that can fall into to interfere its work.
- Anti-corrosion gas, anti-strong electromagnetic interference.
- Working on an perfectly even surface to avoid vibration.

Transport and storage conditions

- The wrapped centrifuge should be transported according to the requirements of the contract. Violent impact, rain, direct sunlight should be avoided during transportation.
- The wrapped centrifuge should be stored in a room with a relative humidity of less than 80%, free from corrosive gases and good ventilation.

# Disclaimer

## Statement

Our company reserves the right of final interpretation of this manual.

The company should be responsible for the safety, reliability and performance of the products only if all the following requirements are met:

- Installation, expansion, resetting, improvement, repair and replacement of components should be conducted by professional personnel approved by the company;
- All new components, accessories and consumables involved in maintenance should be original or approved by the company;
- The relevant electrical equipment should meet the national standards and the requirements of this manual;
- Product operation should be carried out according to this manual.

## Exceptions

The company would not be liable for direct or indirect damage during use and the device failure and damage under the following circumstances:

1. Failure and damage caused by violation of the usage methods, precautions and purposes specified in this manual.
2. Failure and damage caused by the inspection professionals, doctors, laboratory personnel and other operators who are not trained by the company or the agents not designated by the company.
3. Failure and damage caused by maintenance or modification by other companies that are not designated by the company.
4. Failure and damage caused by the use of instruments not designated by the company.
5. Failure and damage caused by a different working environment comparing with the environment specified in the manual. (power supply conditions, installation environment, etc.).
6. Failure and damage caused by earthquake, flood and other natural disasters.
7. Failure and damage caused by the movement or transfer (transportation) of the product after installation without informing the company.



## **After-sales Service and Contact Information**

### **After-sales service**

At any time during or beyond the warranty period, the user can call the manufacturer 24h service for professional technical support.

The service life is 5 years. See product label for production date.

### **Maintenance service process**

1. To confirm the malfunction and repair method: Firstly, contact the company's after-sales service department to confirm the malfunction and then choose the door-to-door service or to return to the factory.
2. Maintenance fee: negotiate with the company according to specific situation.
3. Freight: If the product needs to be returned for repair, the user should bear the freight (including customs fee).

### **Return service process**

1. First, get permission to return goods. Contact the after-sales service department and inform the product serial number (see the nameplate on the back of the product), and explain the reason for return. If the product serial number is not clearly distinguishable, the company will not return the product.
2. Under the premise of obtaining the return permit, please go through relevant procedures according to the requirements of the company.

## **EC Declaration of Conformity**

This medical device has been assigned to class I according to Annex VIII of the Regulation (EU) 2017/745. It bears the mark



### **Whose single Authorized EU-Representative:**

Name:Luxus Lebenswelt GmbH

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# Chapter 1 Overview

The MS-CE6000 Medical Centrifuge is a microcomputer-controlled desktop low-speed centrifuge. The instrument is a steel body, multi-layer explosion-proof design, good rigidity and high strength. This instrument adopts a mechanical and electronic double-layer door lock protection system. The centrifuge is only started after the door lock is closed, and the cover can be opened only after the motor brake is completely stopped, making your operation safer and more reliable. This instrument uses a microcomputer processor for precise control, digital display of parameters such as speed, time, etc., has alarm protection functions, and is convenient to operate. This instrument uses a brushless DC motor, simple operation, maintenance-free, fast lifting speed, low noise, and low temperature rise. This instrument can be equipped with a variety of rotors, and various adapters can be designed according to the experimental requirements.

## 1.1 Major Technical Parameters

Major parameters	Specification
Power supply	AC220V 50Hz
Machine power	800W
Maximum speed	6000r/min
Speed accuracy	±10r/min
Maximum RCF	4387×g
Capacity	4*500ml
Timing range	1min-99h59min
Timing deviation	≤±1%
Loudness of noise	≤65 dB(A)
Environment temperature	5°C~40°C
Host machine size (L×W×H)	500mm*620mm*410mm
Package size (L×W×H)	620mm*740mm*700mm
Net weight	56kg
Gross weight	70kg

## 1.2 Adapter Rotor

No.	Rotors Type	Volume	Max Speed(r/min)	Max RCF(×g)	Adapters
5M00024	Horizontal rotor	48×2/3/4/5/7ml blood collection tube	4000	2952	

5M00025	48×5/7ml blood collection tube	4000	2952	2/3/4ml blood collection tube
5M00026	72×2/3/4/5/7ml blood collection tube	4000	2808	
5M00027	96×2/3/4/5/7ml blood collection tube	4000	3104	
5M00028	120×2/3/4/5/7 ml blood collection tube	4000	3327	
5M00029	16×10/15ml	4000	2957	2/3/4/5/7ml blood collection tube, 5ml, 7ml
5M00030	24×10/15ml	4000	2957	2/3/4/5/7ml blood collection tube, 5ml, 7ml
5M00031	32×10/15ml	4000	2952	2/3/4/5/7ml blood collection tube, 5ml, 7ml
5M00056	36×10ml	4000	2862	
5M00057	64×10ml	4000	3220	
5M00032	4×50ml	4500	3747	50ml sharp bottomed, 20ml, 15ml, 10ml, 5ml, 1.5ml
5M00033	8×50ml	4000	2952	
5M00034	4×100ml	4500	3894	2/3/4ml blood collection tube, 5ml, 7ml
5M00036	8×100ml	4000	3077	2/3/4/5/7ml blood collection tube, 5ml, 7ml
5M00038	4×250ml	4000	2780	40×1.5/2ml, 24×10ml (sharp bottomed) , 24×10ml, 20×15ml, 4×50ml (sharp bottomed) , 8×50ml, 4×100ml
5M00058	4×300ml	4000	3220	
5M00039	4×500ml	4000	3130	48×2/3/4/5/7ml blood collection tube, 36×10ml, 36×15ml, 12×50ml
5M00041	4×750ml	4000	3399	

5M00046	Automatic cap removal horizontal rotor	48×2/3/4/5/7ml (Vacutainer)	4000	2952	
5M00025		80×2/3/4/5/7ml blood collection tube (Automatic cap removal)	4000	3220	
5M00026		108×2/3/4/5/7ml blood collection tube (Automatic cap removal)	4000	3399	
5M00045	Horizontal plate rotor	2×2×96 holes	4000	2361	
5M00060	PRP special horizontal rotor	4×10ml Conventional syringe	4300	3401	
5M00061		4×20ml Conventional syringe	4300	3649	
5M00072	Angle Rotor	12×20ml	5000	3516	15ml, 10ml, 5ml, 1.5ml
5M00073		12×15ml	5000	3354	1.5ml
5M00074		8×15/20ml	5000	2655	1.5ml
5M00075		24×10ml	5000	3354	1.5ml, 2/3/4ml blood collection tube
5M00076		18×10ml	5000	3354	
5M00077		12×10ml	5000	3354	
5M00083		12×10/15ml	6000	4387	
5M00084		6×50ml	6000	2711	50ml sharp bottomed, 20ml, 15ml, 10ml, 5ml, 1.5ml



Note:

1. It is prohibited to use more than the rotor capacity specified in the table above!
2. The rotors listed in the attached table are suitable for this model of centrifuge, which can be selected by users according to the needs of their own laboratories, and should be subject to the actual order signed by both parties.

### 1.3 Working Principle

Centrifuge adopts two principles of centrifugal filtration and centrifugal sedimentation. The cells (particles) with different densities in the solution can be separated, concentrated or purified by the centrifugal force.

The centrifuge tube with the same volume of test liquid is placed symmetrically in the hole of the rotor test tube. Close the door and start the device. The relative centrifugal force (RCF) generated by the motor drives the rotor to rotate at high speed to separate the cells (particles) with different densities in the test liquid. The relative centrifugal force depends on the horizontal distance between the position of the sample and the axis, namely, the rotation distance “r” and the rotation speed “n”. Its calculation formula is as follows:

$$RCF=1.118*10^{-5}n^2r*g$$

n—— (r/min) speed

r—— (cm) radius

The time “T” required for particle separation and precipitation in the mixture is calculated by the following formula:

$$T_s = \frac{27.4 * (\log_e R_{max} - \log_e R_{min}) \mu}{n^2 r^2 (\sigma - \rho)}$$

Rmax——The radius of rotation of the test liquid farthest from the axis (cm)

Rmin——The radius of rotation of the test liquid closest to the axis (cm)

ρ——Mixture density (g/cm<sup>3</sup>)

μ——Mixture viscosity (P)

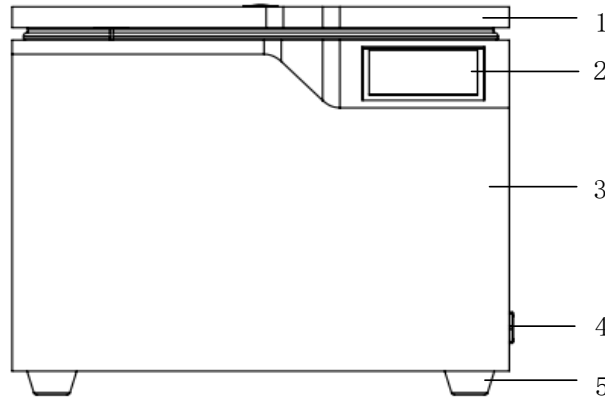
n——Speed (r/min)

r——Particle radius (cm)

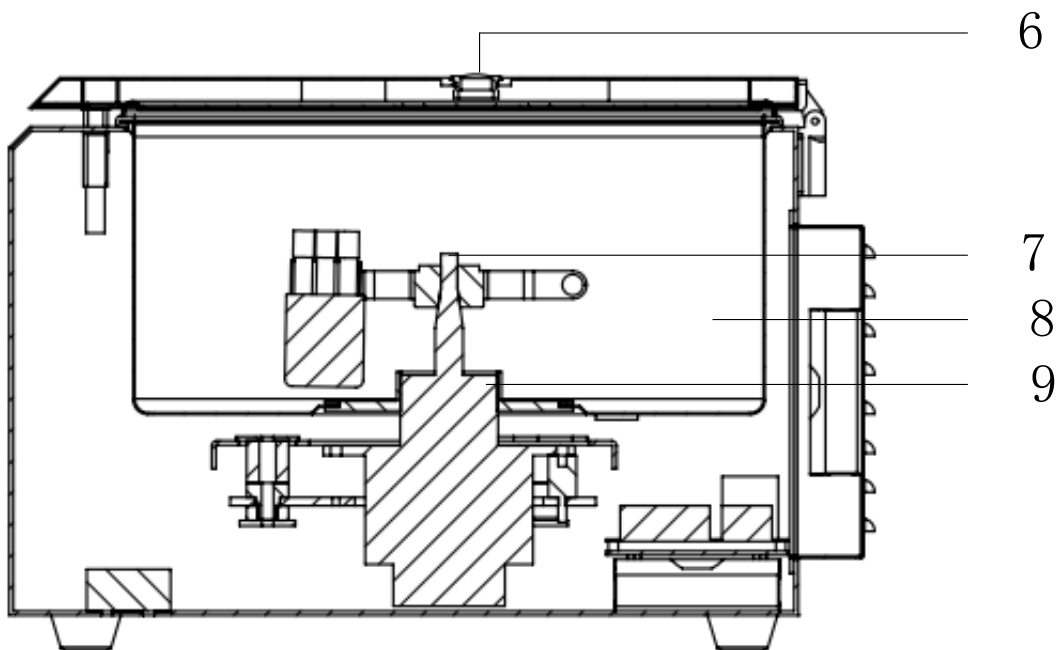
σ——Particle density (g/cm<sup>3</sup>)

### 1.4 Structure and System Diagram

MS-CE6000 Medical Centrifuge is mainly composed of control system, drive system, door lock protection system, etc. The instrument structure is shown as follows:



Shown as the above figure: 1. Top cover, 2. Operation screen 3. Shell 4. Ship-shaped switch 5- Rubber foot



Shown as the above: 6. Observation window 7. Rotor mounting position, 8. Centrifuge chamber, 9. Motor assembly

## 1.5 Product Transportation

In order to ensure that the product is not damaged by natural or mechanical damage during transportation and storage, in accordance with the requirements in GB/T 14710-2009 "Environmental Requirements and Test Methods for Medical Electrical Appliances", the centrifuge adopts three-layer packaging. Among them, inner packaging: plastic moisture-proof bag; middle packaging: rigid shockproof foam; outer packaging: three-layer corrugated carton. The special packaging provided by our company is required when transporting the centrifuge.






Transportation: The fully packaged centrifuge can be transported by automobile, rail,

air and sea transportation. The instrument must be in a packaged state during transportation. At the same time, take care to prevent rain and snow, sun exposure, strong vibration, overweight pile pressure, over-temperature and over-humidity or dumping.

Note: If the instrument needs to be moved after being unpacked, please repack the instrument before it can be transported.

Storage: The packaged instrument should be stored at -20°C~50°C, relative humidity no more than 80%, atmospheric pressure 86kPa~106kPa, no corrosive gas and well ventilated environment.

The outer packaging for transportation should contain the following symbols:

Symbol	Marker	Description
	Upwards	Indicates that the transport package should be upright during transportation.
	Fragile goods	Indicates that the transport package contains fragile items and should be handled with care when handling.
	Afraid of rain	Indicates that the transport package is afraid of rain.
	No tumbling	Indicates that the transport package cannot be rolled during transportation.
	No stacking	Indicates that the package can only be placed in a single layer.

## 1.6 Configuration List

In order to ensure personal safety and system performance, please use the spare parts and consumables made or recommended by our company. If you need instrument repair or replacement of spare parts or consumables, please contact our customer service center or local distributor.

It is recommended to store the following accessories and consumables available, so that the instrument can be handled in time:

No.	Name	Type	Replacement cycle	Replacement method
1	Brushless DC	Accessories	Replace when it	Replaced by the



	motor		fails to work	engineer
2	Door lock	Accessories	Replace when it fails to work	Replaced by the engineer
3	Fan	Accessories	Replace when it fails to work	Replaced by the engineer
4	Fuse	Accessories	Replace when it fails to work	Replaced by the engineer
5	Aluminum resistance	Accessories	Replace when it fails to work	Replaced by the engineer
6	Serial screen	Accessories	Replace when it fails to work	Replaced by the engineer

Note: The accessories in the above table can only be checked and replaced by our approved maintenance engineers, users should not operate by themselves.

## Chapter 2 Installation and Use

### 2.1 Installation Environment Condition

See details in “Safety Cautions”.

### 2.2 Installation Requirements

Before installation, the user must check whether the laboratory meets the requirements of space, power supply, and working environment.

#### 2.2.1 Space requirement

In order to ensure that there is enough space for heat dissipation, repair and maintenance, the space must meet the following requirements:

1. The distance between the instrument and its surrounding walls or other objects should not be less than 50 cm (left, right, rear), and the work table must be placed horizontally and can safely support the operation of the centrifuge to ensure that all four feet of the centrifuge are on the table and without shaking.
2. There should be enough space where the power cord plug is inserted into the socket to ensure that the power plug can be unplugged from the power socket quickly and smoothly in an emergency;
3. It is required that there be no experimental equipment that generates a large heat source and a strong vibration source near the centrifuge.

#### **Notice:**

The centrifuge must be placed steadily. When the four legs of the centrifuge are not evenly stressed, it will produce vibrations, loud noises, affect the separation effect, and even cause explosions in the centrifuge chamber, resulting in safety hazards.

#### 2.2.2 Power requirements

1. Power supply: AC220V, 50Hz, if the voltage is unstable, UPS voltage regulator equipment needs to be configured to ensure a stable 220V 50Hz power output.
2. There is a well-grounded socket within one meter of the equipment.
3. In order to reduce the risk of electric shock, this machine adopts a three-core plug, which must be connected to the three-core socket of the grounding

wire.

4. Make sure that the wall socket is well connected to the ground wire, and make sure that the power supply voltage is consistent with the voltage used by the machine.
5. It is strictly forbidden to use the extended power adapter with three holes to two holes.
6. It is strictly forbidden to use a two-wire extension socket or use a multi-purpose power adapter without a grounding wire.

**Notice:**

- The power socket should be within one meter of the analyzer to ensure that the plug can be unplugged in time when an accident occurs.
- Check whether the instrument voltage is consistent with the grid voltage.

### **2.2.3 Environmental requirements**

The centrifuge should be kept away from electromagnetic interference and corrosive indoor places. The instrument should be placed in a ventilated place to avoid direct heat and strong light. The indoor environment should be dry and clean. It is not suitable to work in an environment with excessive humidity or excessive temperature changes. The instrument is required to operate in accordance with the normal operating conditions specified in the environmental parameters in section 1.2 above.

## **2.3 Unpackage**

When you receive the centrifuge, please confirm whether the specification and model of the centrifuge are consistent with the one you ordered.

Please carefully check the equipment packaging for any damage (such as damage, water immersion, stains). If you find any problems with the packaging, please contact our company immediately. After confirming that there is no external damage, follow the steps below to unpack:

- Open the box, check the product packing information according to the packing list, and check whether the corresponding items and supporting documents are complete.
- Take out the instrument, check the appearance of the equipment carefully, if there is any damage, please contact our company in time.
- Pull out the screws on the right side of the main unit to open the door; check the centrifuge chamber, take out items except the rotor, and clean the centrifuge chamber.

## 2.4 Device Installation

1. Take out the centrifuge carefully and place it on a horizontal work table (the instrument weighs about 56 kg, and the work table is required to bear more than 75 kg).
2. Confirm that the power supply voltage is consistent with the required voltage of the machine (check the power supply voltage mark at the socket at the back of the machine, the power supply used by this machine is a single-phase three-wire AC 220V, 50Hz power supply). Connect the plug of the power cord to the socket on the centrifuge first, then insert the plug at the other end of the power cord into the external power socket, and press the centrifuge power switch to " | " to turn on the power.

## 2.5 Install the Rotor System

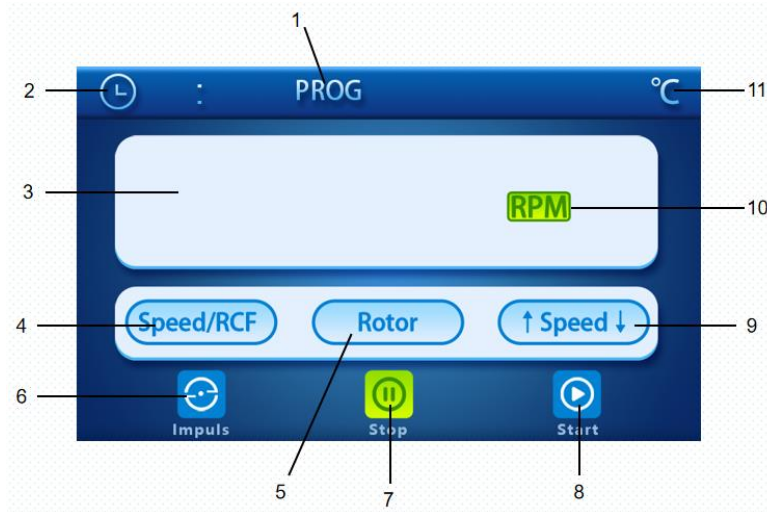
When power off, gently pull the ring under the product to unlock the door and open it upwards. Remove the top screw of the rotor and take the rotor out upwards and place it properly. Put a new rotor in the corresponding slot on the motor shaft. Then follow reversely disassembly steps to complete the installation of the rotor.

Gently and flexibly rotate the rotor by hand. The nut on the rotor should be tightened with a wrench clockwise. The test tube can be put into the device when everything is normal. Note: Tubes should be placed in the rotor symmetrically. If the quantity of centrifugal tubes is not even, the device would suffer violent vibration which may cause damages to it, or even cause it to burst causing personal and property losses. The user can put tubes filling with water into the rotor if the quantity is not even.

## Chapter 3 Operation

### 3.1 Operating Area

The operating panel of the centrifuge is just in front of the device, as shown in the below figure:



As shown in the above: 1. Parameter display, 2. Timing setting, 3. Cover condition display, 4. Speed and RCF setting, 5. Rotor setting, 6. Inching, 7. Stop, 8. Start, 9. Acceleration and deceleration setting, 10. Speed and RCF display, 11. Temperature display

### 3.2 Operating Procedure

#### 3.2.1 Check before power on

- Ensure that the table on which the centrifuge is placed is even and stable, and no liquid is near the centrifuge.
- The power switch marked with “ | ” and “O”, which means on and off respectively, is behind the device. When it is turned on to “ | ”, the indicator and the screen would light.

#### 3.2.2 Check before work

- Check whether the door works normally. Press “Stop” to close the door.
- Open the door to check whether the centrifuge chamber is immaculate.

- Check whether there is a crack in the centrifuge rotor, and whether the screw fixing the centrifuge rotor is stable and firm.



Note: The centrifuge rotor should be removed regularly to check whether there is a crack at the bottom of the connection. It is prohibited to use the cracked rotor!

### 3.2.3 Put the centrifuge tube


- Check whether the centrifugal tube cap is properly installed.
- Place the centrifuge tube evenly inside its coat.
- The liquid should be weighted to ensure the same volume being added into the tube each time. Then put them symmetrically into the rotor. The two symmetrical centrifugal tubes in the rotor should have equal weight. The maximum unbalance of a symmetrical load, 0.5g, cannot be exceeded.
- Centrifugal tubes must be placed in even symmetry, otherwise vibration and noise will be generated due to unbalance. After placing tubes, rotate the cover of the centrifugal tube if it has.



Note: If the centrifugal tube is not evenly placed, it will lead to a large swing of the rotor in the process of rotation, and even lead to centrifuge explosion!

### 3.2.4 Set centrifugal parameter

#### 3.2.4.1 Time setting

Press “” on operation panel to set time. As shown in the figure.





According to the experimental requirements, press  and  to set the time.

As shown in the figure above. Press **OK** to save. Press **Cancel** to abandon the setting or remain the last set, and to leave this page.

### 3.2.4.2 Speed setting

Press the “Speed/RCF” on the main page to set, as shown in the below figure:



The speed setting range is 100-5000RPM. Press  and  to set speed according to the test requirements. Press **OK** to save. Press **Cancel** to abandon the setting or remain the last set, and to leave this page.



Note: RCF is generated automatically without setting.

### 3.2.4.3 Rotor setting

Press “Rotor” on the main page to choose rotor. As shown in the figure below.



Rotors carried by this device are displayed on this page where the user can choose one.





Press  and  to choose rotors. Press **OK** to save. Press **Cancel** to abandon the setting or remain the last set, and to leave this page. The user can not

choose if there is only one rotor in the device.

### 3.2.4.4 Acceleration and deceleration setting

Press “↑Speed↓” on the main page to accelerate and decelerate, as shown in the below figure.







This centrifuge provides a total of 10 lifting gears. 0 is the lowest gear and 9 the highest. Press  and  to accelerate and decelerate. Press  to save. Press  to abandon the setting or remain the last set, and to leave this page.

### 3.2.4.5 Parameters setting

Press “PROG” on the main page to set parameters, as shown in the below figure.



Press  and  to set parameters. Press  to save. Press  to abandon the setting or remain the last set, and to leave this page.

Test in the same parameter number under which the change of the speed, rotor type,



gear operating under the same parameter number would be automatically saved. The user can switch different parameter numbers with saved speed, rotor type, gear.



Note: Parameters can not be changed while operating.

### 3.2.5 Start

- Close the door of the device,
- Press “Start” to run the motor. The speed displayed on the screen would continuously increase during acceleration. When the preset speed has been achieved, it would begin to time.



Note: It is prohibited to press "Start" when the door is not locked!

### 3.2.6 Halt

- When the device reached the preset time, the motor will stop running and the speed will drop steadily to 0 as the device would beep. At this time, the user can press "Stop" to open the door.
- During operation, the user can press "Stop" to halt the device and the motor. The speed will drop steadily to 0 as the device would beep. At this time, the user can press "Stop" to open the door.
- During operation, if there is a power failure in the laboratory or an accidental power failure occurs on the device, the motor would slow down naturally, which takes at least 10 minutes. When the motor stops running, gently pull down the ring at the bottom of the device. When the device clatters, the door has been unlocked and can be opened. Do not open the door in advance or attempt to stop the rotor by hands.



Note: It is prohibited to pull the ring or try to open the door while operation! The device control system can automatically monitor and alarm. When the above problems occur, the motor will automatically stop and the fault information will be displayed on the operation panel.

### 3.2.7 Maintenance after power off

- Power off first. Then turn the power switch to the "0". Next step is to unplug the power cord;

- Remove all centrifugal tubes and coats. Clean the tubes with alcohol and pure water.
- Use a wet but not dripping soft cloth dipped in alcohol to disinfect the interior of the chamber, the seal strip and the inner side of the upper cover;
- Gently wipe each key on the operating panel with a slightly wet but non-dripping soft cloth dipped in pure water;
- Install the dried tube coat inside the rotor and close the top cover of the centrifuge.



Note: When cleaning the device, it is forbidden to drop the liquid into the centrifuge operating panel or the chamber!

## Chapter 4 Maintenance

### 4.1 Maintenance of Centrifuge Chamber

After work, the chamber should be disinfected. The door should be opened for a period of time to dry. If not used for a long time, the chamber should be put in silicone (desiccant) and the door closed.

### 4.2 Maintenance of Drive Shaft

Remove the rotor vertically to prevent the rotor from falling and damaging the drive shaft. The drive shaft should be prevented from collision and the conical surface from damage. Use a soft cloth to clean the drive shaft and rotor cone hole, and coat with a little medical Vaseline or grease.

### 4.3 Maintenance of Operation Panel and Work Surface

Operation panel and work surface must be kept clean. Rotor, centrifugal tube or cup and other tools can not be on its panel, aiming to prevent screen scratches. Operation panel and work surface can only be wiped with a soft cloth and neutral detergent, to prevent the paint layer falling.



Note: Do not use highly corrosive disinfectant to disinfect the centrifuge.

### 4.4 Maintenance of Rotor

Draw the rotor out, and then clean it with neutral washing liquid. After washing, dry it and place it upside down for a better air-drying. The user can also store the rotor after high temperature sterilization, or apply some lubricating oil in the center hole of the rotor, and store it in a dry and ventilated place.

# Chapter 5 Common malfunctions and solutions

## 5.1 Causes and Solutions of Alarm

Alarm display	Causes	Solutions
Please close the door to start the motor.	The door is open. The door is not quite closed. Electromagnetic lock fault	Close the door and press the door until the electromagnetic lock sounds. Change a new electromagnetic lock
Failed to reach the set speed within the specified time due to the motor malfunction.	Unstable power supply. Something in the motor impedes the motor running. Motor malfunction.	Check the power supply stability and equip it with a regulator. Check and clean. Resort to after-sales service.
The actual speed exceeds the set due to the motor malfunction.	Overly high supply voltage. Motor damage.	Check whether the power supply meets the requirements. Resort to after-sales service.
Rotor blocks due to the motor malfunction.	Unstable power supply. Something in the motor impedes the motor running. Motor malfunction.	Check the power supply stability and equip it with a regulator. Check and clean. Resort to after-sales service.
Block fails to work.	There is something in the block. Block malfunction	Check and clean. Resort to after-sales service.
The motor supply voltage is too low.	Unstable power supply. Control system malfunction.	Check the power supply. Resort to after-sales service.
The motor supply voltage is too high.	Unstable power supply. Control system malfunction.	Check the power supply. Resort to after-sales service.

## 5.2 Common Malfunctions and Ways to Handle

The centrifuge may meet the following malfunctions during operation. Analyze the situation according to the following methods:

### **5.2.1 The screen fails to work when power-on**

- Use a multimeter to check whether the input power is the same with the rated voltage of the centrifuge.
- Check whether the power cord is well-connected and the power cord is loose.

### **5.2.2 Noise while working**

- Check whether the centrifugal tubes placed symmetrically in the rotor are of equal weight. If they are not, remeasure to ensure the equal weight of two tubes.
- Check whether the centrifugal tube is broken. If broken, clean the rotor and replace a new one with the same weight.
- Check whether the machine and its rubber feet are placed evenly on the surface and the table is solid, and there are any vibration sources around.
- Check whether the centrifugal tubes in the rotor are placed symmetrically.
- Check whether the motor shaft is deformed or cracked.
- Check whether the damping part of the motor has been damaged. If it does, please replace the damping system. (Please conduct the replacement under the guidance of professional after-sales engineers).

### **5.2.3 The centrifuge fails to work**

- Dismantle the centrifuge chamber shell to check whether the internal circuit is loose, and the wiring and components are well-connected. Please do this under the guidance of professional after-sales engineers.
- Use a multimeter to check the input and output voltages of the power supply transformer. If the power supply transformer is damaged, replace new one of the same model and specifications. Please do this under the guidance of professional after-sales engineers.
- Use a multimeter to check whether the motor is powered on. If the motor is powered on but does not run, the motor is damaged. Please replace the motor. Please do this under the guidance of professional after-sales engineers.



Note: If the power supply display is normal but the centrifuge does not work, please contact our customer service center for help to handle the malfunction under the guidance of professional engineers. It is prohibited to dismantle its components personally.

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