Medical Centrifuge

BKC-TL6B

Manual

BIOBASE

Biobase Biodustry (Shandong) Co., Ltd.

Contents

Preamble

Thanks for purchasing BKC-TL6B 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-250ml 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, single-phase AC220V 50/60Hz, 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.

Work environment condition

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

- Environment temperature: 5-40℃
- Relative humidity: ≤80%
- Power supply voltage: AC220V 50/60Hz
- 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

Biobase Biodustry (Shandong) Co., Ltd (hereinafter referred to as “the 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 8 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.

Contact Information

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Chapter 1 Overview

1.1 Major Technical Parameters

Major parameters	Specification
Power supply	AC220V 50/60Hz
Machine power	500W
Maximum speed	6000r/min
Speed accuracy	±10r/min
Maximum RCF	4387xg
Capacity	4*300ml
Timing range	1min-99h59min, continuous or short time centrifugation
Timing deviation	≤±1%
Loudness of noise	≤65 dB（A）
Environment temperature	5℃~40℃
Host machine size（L×W×H）mm	430*565*410
Package size（L×W×H）mm	560*665*570
Net weight	43kg
Gross weight	52kg

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	4000	2952	
5M00025		48×5/7ml	4000	2952	2/3/4ml blood collection tube
5M00026		72×2/3/4/5/7ml	4000	2808	
5M00029		16×10/15ml	4000	2957	2/3/4ml blood collection tube, 5/7ml blood collection tube, 5ml, 7ml
5M00030		24×10/15ml	4000	2952	2/3/4ml blood collection tube, 5/7ml blood collection tube, 5ml, 7ml
5M00031		32×10/15ml	4000	2952	2/3/4ml blood collection tube,

					5/7ml blood collection tube, 5ml, 7ml
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, 5/7ml blood collection tube
5M00036		8×100ml	4000	3077	2/3/4ml blood collection tube, 5/7ml blood collection tube
5M00038		4×250ml	4000	2780	40×1.5/2ml, 40×2/3/4/5/7ml blood collection tube, 24×10ml, 28×10ml, 20×15ml, 4×50ml（sharp bottomed）, 8×50ml（round bottomed）, 4×100ml
5M00057		4×300ml	4000	3220	
5M00045	Horizontal plate rotor	2×2×96 Well	4000	2361	
5M00060	PRP special horizontal rotor	4×10ml Syringe	4300	3401	
5M00061		4×20ml 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	5000	4387 3904	2/3/4ml blood collection tube
5M00084		6×50ml		4387	50ml sharp

				3904	bottomed, 20ml, 15ml, 10ml, 5ml, 1.5ml

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:

$RCF=1.118\times10^{-5}n^2r\times g$

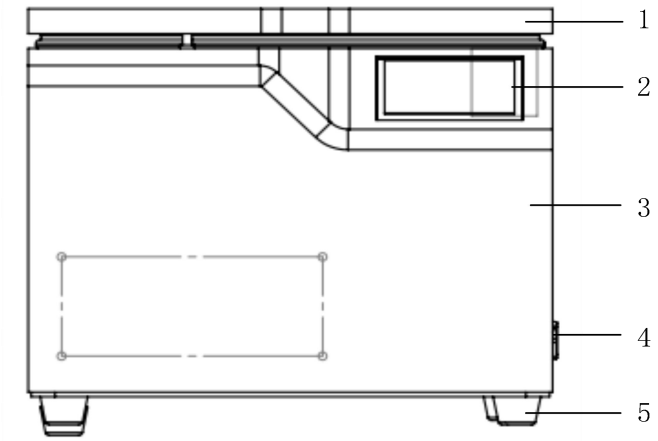
n——（r/min）speed
r——（cm）radius

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

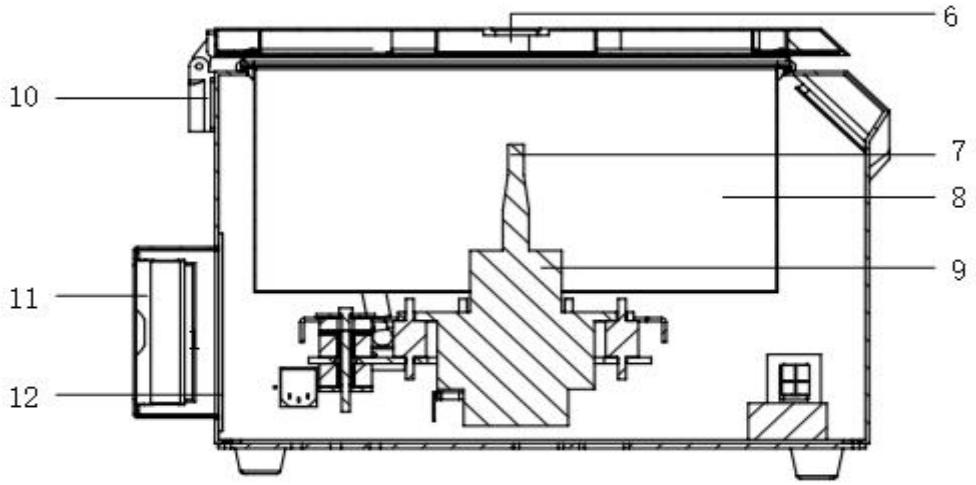
$$Ts=\frac{27.4\times(\log_e R_{max}-\log_e R_{min})\mu}{n^2r^2(\sigma-\rho)}$$

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/cm³）
μ——Mixture viscosity（P）
n——Speed（r/min）
r——Particle radius（cm）
σ——Particle density（g/cm³)

1.4 Structure and System Block Diagram of Centrifuge



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



Shown as the above: 6.Observation widow 7. Rotor mounting position 8.Centrifuge chamber 9.Motor assembly 10.Hinge 11. Fan 12.Electrical control board

1.5 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 motor	Accessories	Replace when it fails to work	Replaced by the engineer

2	Door lock	Accessories	Replace when it fails to work	Replaced by the engineer
3	Serial screen	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	Fan	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 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 figure 3-1-1.

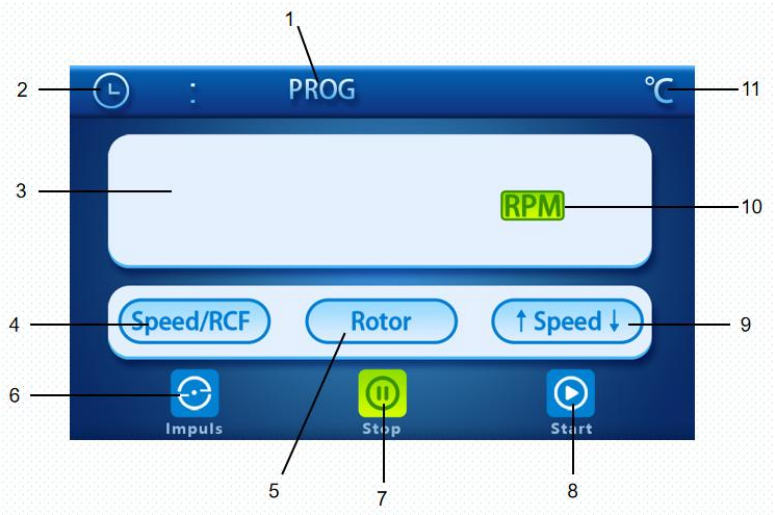


Figure: 3-1-1 Operating panel

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! The centrifuge is not allowed to operate without a rotor installed.

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 3-1-1.

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

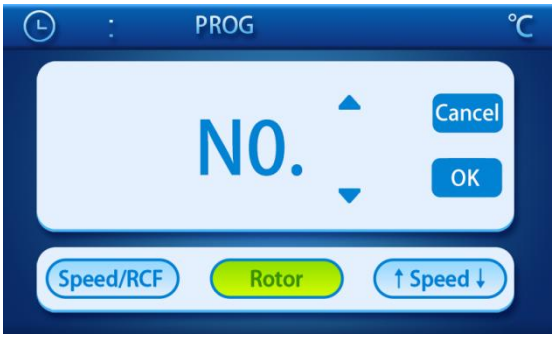
Press the "Speed/RCF" on the main page to set, as shown in the below figure:

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 following 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.	1. Unstable power supply. 2. Something in the motor impedes the motor running. 3. Motor malfunction.	1. Check the power supply stability and equip it with a regulator. 2. 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.	1. Unstable power supply. 2. Control system malfunction.	1. Check the power supply. 2. 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.
- 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.
- 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.
- The motor can run but the rotor cannot. Please check whether the rotor has been installed correctly.

 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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