CENTRÍFUGA DE BAJA VELOCIDAD MEDIBAS+
MEDIBAS+ LOW SPEED CENTRIFUGE
CENTRIFUGEUSE À BASSE VITESSE MEDIBAS+

Modelo | Model | Modèle 2741/2742

Ref. | Code | Réf. GLC001 / GLC008

Este manual es parte inseparable del aparato por lo que debe estar disponible a todos los usuarios del equipo. Le recomendamos leer atentamente el presente manual y seguir rigurosamente los procedimientos de uso para obtener las máximas prestaciones y una mayor duración del mismo.

This manual should be available for all users of these equipments. To get the best results and a higher duration of this equipment it is advisable to read carefully this manual and follow the processes of use.

Ce manuel est une partie indissociable de l'appareil et doit être mis à la disposition de tous les utilisateurs de l'équipement. Nous vous recommandons de lire attentivement ce manuel et de suivre scrupuleusement les procédures d'utilisation afin d'obtenir des performances maximales et une plus longue durée de vie de l'appareil.

LANGUAGE INDEX

DEVICE WORKING ENVIRONMENT

To ensure the safety of the machine, consider the following factors that may damage the centrifuge:
-Chemical effect.
-Environmental impacts, including natural ultraviolet radiation.
-Corrosion and wear of protective cover parts and other safety parts.

- Indoor use
- Altitude ≤2000m
- The temperature range for using the centrifuge is +5 ºC~+40 ºC
- Relative humidity ≤80%
- Working power supply is 220VAC, 50/60Hz
- Adequate ventilation should be available indoor
- No vibration or airflow around which may affect the performance of the centrifuge
- No conductive dust, explosive or corrosive gases in the surrounding air

SAFETY TIPS

- Before using this machine for the first time, please read this manual carefully.
- The low-speed centrifuge can only be operated by trained and authorized personnel.
- The repair of the equipment can only be completed by the authorized Technical Service.
- Never use the following materials in the centrifuge:
  -Inflammable and explosive materials
  -Strong chemical-action materials
  -Toxic or radioactive substances, or pathogenic microorganisms, etc.
- Only qualified personnel can perform maintenance operation on the low-speed centrifuge with appropriate tools.
- Use the accessories provided by the manufacturer. If the user wants to use other accessories, the supplier will not be responsible for the adverse consequences caused.
- The low-speed centrifuge must be inspected and maintained at specified time intervals.

DESCRIPTION OF THE SAFETY WARNING SIGNS

Note: Please read the instructions carefully before using the centrifuge!

Note: High voltage danger! Danger of electric shock!

THE MEANING OF THE SAFETY INSTRUCTIONS

In order to avoid damage to personnel, surrounding objects and environment, please observe all safety instructions in this user manual.

In addition to the recognized occupational rules on accident prevention, environmental protection and in terms of safety and occupation, the local laws and regulations of the country of the user of the centrifuge must be carefully observed

CONSEQUENCES OF IGNORING THE SAFE OPERATING PROCEDURES

Any neglect of safety operating procedures, laws and regulations and various rules will lead to harm to personnel, objects and the environment.

TABLE OF CONTENTS

1 SAFE TERMS OF USE

This centrifuge is based on current technical and safety standards:

- **IEC61010-1:2001** Safety Requirements for Electrical Equipment for Measurement and Control Laboratories - Part 1: General Safety Requirements.
- **IEC61010-2-020:2006** Safety Requirements for Electrical Equipment Used in Measurement and Control Laboratories. Special Requirements for Centrifuges Used in Laboratories.
- **ISO780-1997** Pictorial Marks for Packaging, Storage and Transportation.
- **ICS19.040** Transportation Test of Electronic Measuring Instruments.
- **IEC60601** Environmental Requirements and Test Methods for Medical Electrical Equipment.

With the following incorrect or inappropriate use methods, equipment damage or personal injury may occur:

- Centrifuge is not used according to the design requirements.
- User and maintenance personnel are not trained.
- User makes inappropriate changes to the design without authorization.
- User did not notice or understand the safe use rules.

Any relevant personnel involved in the use or maintenance of the centrifuge must read and understand the use method and safe use rules in this manual.

In addition, to prevent accidents, the following rules must be strictly implemented:

This manual is one of the components of the “Medibas+ Low Speed Centrifuge” and must be placed with the device for inspection by the operator.

The Medibas+ low-speed centrifuge is designed for use in clinical medicine, biology, chemistry, genetic engineering, immunology, etc. The density of the sample separated at the maximum speed shall not exceed 1.2g / cm3; when the density of the sample is greater than 1.2g / cm3, the maximum speed of the rotor must be reduced accordingly.

During the operation of the centrifuge and within 30cm around the centrifuge, there shall be no operator or harmful dangerous substances, and the centrifuge vent.

Take into consideration the following:

- The design of the centrifuge is neither corrosion-proof nor explosion-proof, so the centrifuge can not be used in the environment with corrosion or possible explosion.
- Never use the following materials in the centrifuge:

  Flammable and explosive materials

  Strong chemical-acting materials

  Toxic or radioactive substances, or pathogenic microorganisms, etc.
- For the isolation of corrosive substances and easily pathogenic microbial cells, effective sealing measures should be taken in advance, and effective disinfection measures should be carried out in time after use. For details, see “Maintenance matters- -disinfection”.
- Separation corrosive substances will cause damage and damage of the material inside the centrifuge or weaken the mechanical strength of the rotor, so when separating corrosive substances, corrosive substances must be placed in a protective container.

1.1 Operation precautions

■ Before the centrifuge operation, it must confirm the installation of suitable rotor and ensure firm installation.
■ Centrifuge in the operation process (the rotor rotation) or centrifuge in the stop process (but the rotor is still rotating), do not manually open the door and move the centrifuge.
■ The parts used in Medibas+ centrifuge must be special parts provided by the manufacturer. For some general parts, such as plastic separation containers, must meet the requirements of the maximum speed of the rotor and maximum centrifugal force.
■ Do not use a centrifuge or separate samples when the door is open.
■ When the centrifuge is removed, please do not open the power switch of the equipment (remove the power cord).
■ The replacement of the mechanical parts and electronic devices of the centrifuge must be implemented by the relevant personnel designated by the company.
■ Using the centrifuge, operators must choose the appropriate load rotor, and must not overload the rotor.
■ Often check the rotor; if the rotor is found to have obvious corrosion traces or obvious damage, must stop using.
■ After use for a period of time, maintenance should be strictly in accordance with the “cleaning and disinfection” regulations.

2. INTRODUCTION TO MEDIBAS+ LOW SPEED CENTRIFUGE

2.1 Appearance

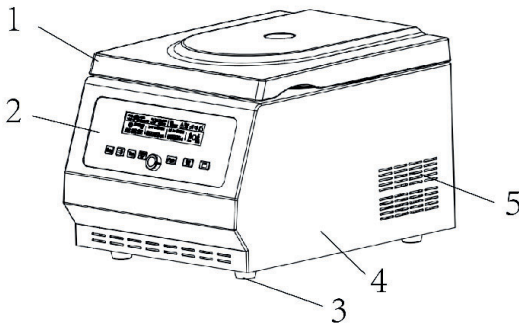

Figure 1: Exterior view of centrifuge

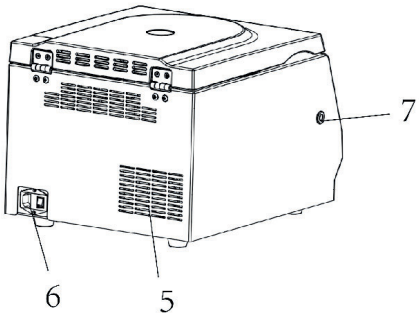

Figure 2: Rear view of centrifuge

Description of Figures 1 and 2:

1. Door cover
2. Control panel and display window
3. Foot
4. Housing
5. Heat dissipation holes
6. Power socket and power switch
7. Emergency opening hole

2.2 Overview

The Medibas+ centrifuge is a low-speed centrifuge used for routine analysis in medical laboratories, biochemical and molecular biology research, and industrial laboratories. It can be widely used in clinical medicine, biology, chemistry, genetic engineering, immunology, and other fields. This machine can work with eight types of rotors (see Table 1: Rotor Types and Technical Parameters for details).

2.3 Introduction to the equipment structure

The equipment is composed of door cover system, chamber system, drive system, rotor system, seat system, power supply system, control system, display system, alarm system and other components.

2.3.1 The door cover system includes door cover, door hinge and damping gas spring, door lock, door alarm, emergency door lock pull rope, etc. The door hinge is located inside the rear of the rack, and the door lock is in front of the rack. Only when the door lock is locked can the centrifuge be started, otherwise the door alarm system will work (the buzzer will sound) and the machine will not start.

To open the door cover, simply press the open key on the machine control panel. When the door cover is opened to a certain height, the door hinge and damping gas spring can support the door cover. If there is a power outage or the door opening key fails, and the sample must be taken out in a timely manner, it is necessary to open the door cover manually.

When the rotor is rotating, it is strictly prohibited to manually open the door cover!

2.3.2 The chamber system includes a stainless steel inner liner and a rubber sealing ring. The chamber system can provide a stable working environment.

2.3.3 This device uses a variable frequency motor to directly drive the rotor of the load sample to rotate together. The drive system adopts a direct drive method, which ensures high precision in matching the rotor with the shaft and smooth operation.

2.3.4 The rotor system is composed of various rotors (see Table 1: Rotor Types and Technical Parameters for details), centrifugal test tubes and other related accessories. The function of the rotor is to

rotate the load sample at a certain speed, creating a relative centrifugal force field, thereby achieving the purpose of separating the sample. Since the centrifugal force reached when the rotor rotates at low speed is thousands of times more than the Gravitational acceleration g value of the Earth, it is very important for the safe use and careful maintenance of the rotor!

2.3.5 The base system consists of a frame, a base plate, a body shell, and rubber support feet.

2.3.6 The power supply system includes power sockets and switches, which are responsible for the supply of mains electricity required for the normal operation of the machine.

2.3.7 The control system includes settings for rotational speed and centrifugal force, operating time, selection of lifting and lowering rate, control of the entire machine display system, and alarm system. To ensure the normal operation of the machine and the personal safety of the operator, please do not disassemble the machine!

2.3.8 The display system consists of an LCD with bright black background and white text, as well as a PET touch keyboard panel (control panel). It is a medium for human-machine dialogue. It can synchronously display various parameters set and track the actual changes of various parameters. In addition, it can also display and alarm various faults.

2.3.9 The alarm system is equipped with alarms for door cover failure, overspeed, imbalance, overvoltage, etc. When the machine experiences faults such as overspeed, door cover opening, or imbalance, the system will alarm. At this time, the buzzer will sound an alarm, and the machine cannot start. The running machine will automatically stop until the fault is resolved. Note: To eliminate the alarm sound emitted by the buzzer, press the stop button 

on the control panel.

2.4 Safety and protection

The Medibas+ centrifuge has a series of safety protection mechanisms:

The frame and protective steel ring are made of steel plates, and the internal cavity is made of stainless steel inner liner.

The door cover adopts an explosion-proof structure, and there is a locking mechanism at the front of the door cover. Only when the centrifuge is powered on and the rotor is stopped, can the door cover of the centrifuge be opened by pressing the open key on the control panel. Only when the centrifuge door cover is locked can the centrifuge be started!

■ Overspeed

When the operating speed of the centrifuge rotor exceeds the set speed in 400 rpm, the machine will sound an alarm. When the operating speed exceeds the maximum rated speed of the rotor in 450 rpm, the rotor will automatically stop running. The door can only be opened after the rotor has completely stopped. After troubleshooting, the machine will restart.

■ Imbalance

If the rotor rotates unevenly during operation, causing the shaft to shake beyond the specified range, the machine will stop running in a timely manner and issue an alarm prompt; Generally, the rotor load is unbalanced. After the operation is terminated, open the door cover, and after troubleshooting, the operation can be restarted.

■ Emergency opening

During the operation of the rotor, if a sudden power outage or machine malfunction occurs and the door cannot be opened by pressing the button, manual door opening can be adopted (see “Fault Handling”).

2.5 Machine placement requirements

- This machine should be placed on a level table with sufficient rigidity and away from vibration and impact equipment, avoiding direct exposure to heat sources and sunlight.
- There should be a space of 10cm to 15cm on all sides of this machine for ventilation and heat dissipation.
- After placement, the level should be adjusted and the four supporting feet at the bottom of the equipment should be evenly supported on the table.
- The working power supply of the device is 220VAC, 50/60Hz.

The machine must be strictly grounded.

3. COMPATIBLE ROTORS

A variety of rotors are available for use with the Medibas+ centrifuge.

Rotor (code)	Capacity (mL×Number of tubes)	Max. speed (rpm)	Max. RCF (×g)	Type of tube
Swing out rotor (GNP003)	100×4	5000	4108	PP, round bottom with lid
Swing out rotor (GNP004)	50×4	5000	4135	PP, round/cone bottom with lid
Swing out rotor (GNP005)	50×8	4000	2720	PP, round/cone bottom with lid
Swing out rotor (GLK002)	15×16	4000	2790	PP, round/cone bottom with lid
Swing out rotor (GLK005)	5×24	4000	2540	Vacutainer 13×100mm
Microplate rotor (GNP017)	4 microplates × 2 × 96 holes 2 deep hole plates × 2 × 96 holes	4000	2860	-
Angle rotor (GLK006)	15×12	6000	5150	PP, round/cone bottom with lid
Angle rotor (GLK007)	50×8	5000	3435	PP, round/cone bottom with lid

Table 1: Rotor type and technical parameters

Note:
The model 2741 is supplied with rotors GNP003, GNP005 and GLK002.
The model 2742 is supplied with rotors GNP005, GLK002 and GLK005.

4. PREPARATION BEFORE USE

4.1 Transport and installation

The centrifuge is transported using a packing box with a buffer protection material inside. After opening the packing box, the internal buffer protection material is removed.

The net weight of the machine is about 30kg. When handling, the equipment should be lifted from the left and right sides of the machine to balance the force! Please, do not shake the machine!

For transport or remote handling, use a special packing box and properly it firmly and vertically, and should be carefully placed.

4.2 Select a reasonable settlement site

The centrifuge can only be used indoors, and the location shall meet the following requirements:

- When the centrifuge is running, a safe distance of 20cm must be kept around, and hazardous substances shall not be placed within this safe distance, and relevant personnel shall not stay.
- The support or table for the centrifuge shall be firm and not shaking or vibration; if movable support or trolley, a locking device shall be used to ensure the safe operation of the centrifuge.
- If the centrifuge is placed on the wall or in the corner, in order to ensure smooth air circulation and good heat dissipation, please ensure that the distance between the rear and left sides of the centrifuge from the wall is not less than 10cm and 15cm respectively.
- Centrifuge should be placed away from the window to avoid direct exposure to heat and sunlight.
- The four supporting feet should be evenly supported on the table and the level should be adjusted.
- The room for the centrifuge must be a constant temperature room with temperature between + 5 ºC and 40 ºC and ambient humidity of 80%; keep the environment clean.

4.3 Position the machine firmly

Once the centrifuge is placed, do not move it at will. If it is moved, it should be reconfirmed or the level should be adjusted, and the four support feet at the bottom of the machine should be evenly supported on the table. Make sure that the support or table on which the machine is placed is firm and can not shake or vibrate.

4.4 Connect the power supply correctly

A separate power socket shall be used for the power line of the centrifuge. This power socket must be well grounded. Confirm that the power line used by the centrifuge conforms to the safety specifications of the country and region where it is located, and the power voltage and power frequency applicable to the centrifuge shall conform to the requirements specified in this instruction or the specifications marked on the centrifuge nameplate. Please use the attached power cord, correctly connect it to the machine power socket, and firmly connect it to the network power supply.

5. OPERATING INSTRUCTIONS

5.1 Introduction to the control panel and the display interface

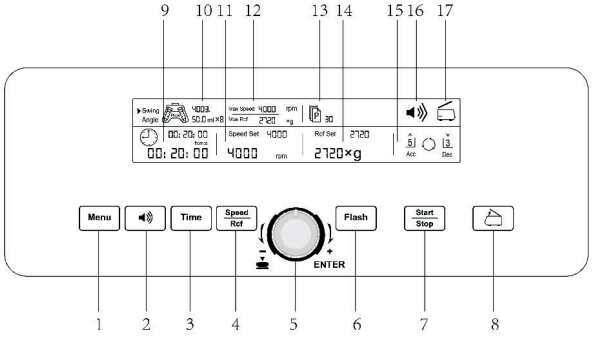

Figure 3: Schematic diagram of control panel

1. Setting selection key
2. Volume control key
3. Centrifugation time setting key
4. Speed / relative centrifugal force setting key, switch key
5. Parameter adjustment knob
6. Short duration centrifugation key
7. Stat / Stop key
8. Door opening key
9. Centrifugation time display
10. Rotor type display
11. Speed display
12. Display of the maximum centrifugal force at the maximum speed
13. Storage setting display area
14. Relative centrifugal force display
15. Acceleration/Deceleration display
16. Volume setting display
17. Lid opening and closing status display

5.2 Boot

Connect one end of the attached power cord to the power socket on the rear wall of the machine, and the other end to the mains power supply. The mains power supply should use an independent socket. The power supply range used by this machine is 220VAC, 50/60Hz. After connecting, turn on the power switch located on the right side of the rear of the machine. The buzzer gives a short sound, the LCD display on the control panel lights up, and after the self-test of the machine is completed, enter the main interface, and now you can carry out the next operation.

5.3 Opening the door

Press the door open key  on the control panel, the door cover will automatically open and pop up to a certain height under the action of the damping gas spring, and then you need to lift the door cover up by hand to fully open the door cover, and the inner cavity will be presented to the user.
In case of failure, the door cover cannot be opened automatically. At this time, if the objects in the chamber must be taken out, the method of manually opening the door can be adopted. See “failure treatment” for details.

5.4 Closing the door

Press the door cover down until the front door hook on the door cover slides over the lock pin and hears a click. The bottom of the door hook will contact the travel switch and the door is locked.

When closing the door, press the door cover properly and do not use excessive force to avoid damage to the locking hook!

5.5 Installing the rotor

The rotor used must be the original rotor of the centrifuge manufacturer. This manual contains various rotor models from manufacturer (see Table 1: Rotor Type and Technical Parameters for details).

Using inappropriate rotors and centrifuge tubes can lead to poor centrifugation results and even damage to the centrifuge!

The steps for installing the rotor are as follows (as shown in Figures 4 and 5):

- Turn on the power switch until the self-test is completed.
- Press the button to open the door cover of the centrifuge to confirm that the chamber is clean and free of foreign matter.
- Clean the surface of the motor shaft.
- As shown in Figure 4, prepare the rotor you want to use. Hold the rotor with both hands, point the center hole of the rotor at the spindle of the motor, put it vertically, put to the bottom of the cone, open your hands, and then press the rotor down with your hands.
- Use the tool to assembling the rotor (special hexagon wrench), and tighten the lock nut in the clockwise direction.

After the installation of the rotor, check whether the installation position of the rotor has changed before each use or after a period of use. If necessary, tighten the lock sleeve again to ensure that the rotor is installed firmly.

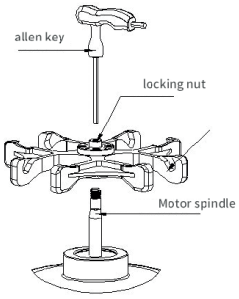

Figure 4: Schematic diagram of installing the rotor body

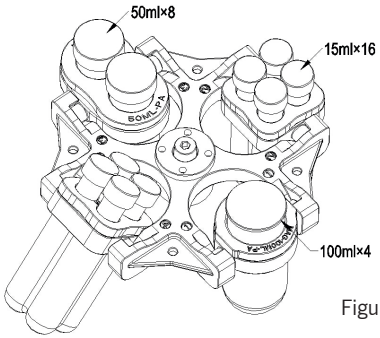

Figure 5: Schematic diagram of installing the hanging baskets

5.6 Calculation of the rotor load

■ Calculation of the maximum load

When the centrifuge runs at low speed, there is a huge centrifugal force. When designing each rotor, it is required to have sufficient mechanical strength when working at the maximum rated speed - that is, a “safety factor”. However, this “safety factor” requires that the rotor load should not exceed its maximum rated load.

If the total sample exceeds the maximum rated load of the rotor, you must reduce the weight of the sample or calculate the allowable running speed (nPERM) of the rotor to ensure that the rotor load does not exceed its maximum rated load.

The allowable operating speed (Nperm) of the rotor is calculated as follows:

Nperm=Nmax × (maximum allowable load ÷ actual load) 0.5

Nmax: maximum rated speed

Do not overload the rotor, otherwise it will cause the rotor to explode, and the debris generated by the explosion will damage the centrifuge!

5.7 Filling samples in centrifugal containers

When the centrifuge is running, the better the balance performance is, the better the centrifugation effect is. Therefore, the sample should be filled into the centrifugal container as evenly as possible, so as to achieve a better balance effect during operation. All samples must be placed in suitable containers. Carefully check the allowable maximum rated acceleration (centrifugal force) of the container (centrifuge tube, etc.).

Please pay attention to the service life of the centrifugal containers used, especially when running under the maximum allowable load and speed. Check whether the centrifugal containers used (plastic and glass containers) are damaged, and replace them in time if any.

5.8 Safe use of the rotor

- Samples and tubes shall be loaded accurately and symmetrical before rotor operation.
- When installing the swing out rotor tube rack, please pay attention to whether the pin shaft on the tube rack is reliably inserted into the grooves on both sides in the rotor body.
- The swing out rotor shall not operate for a long time in the 900 rpm critical speed area, otherwise the machine will produce large vibration and affect the service life.

When the rotor lock sleeve is not tightened on the motor shaft, do not boot!

- If the centrifuge needs to be run repeatedly, check whether the lock sleeve is loose after using it for several times. If it is loose, it must tighten it and then start it up.
- The centrifuge tubes can be loaded at the same time, but they must be loaded symmetrically (allowable weight error of 1.5g), and it is not allowed to start up when loading samples asymmetrically.

5. 9 Parameter setting, operation example

- If the rotor to be used in the device is 4003 (swing out 50ml × 8), the specific operation is as follows: turn on the power (turn on the rear right power switch), the LCD display on the control panel will light up. For example, the following parameters need to be set:

Rotor number	Speed (rpm)	Time (min)	Acc	Dec
4003	4000	20	5	3

- **Rotor number setting:** Press the Menu key on the control panel - make the number in the display window of the rotor number flash - turn the parameter adjustment knob to set the rotor number to 4003.
- **Speed setting:** Press the Speed/Rcf key on the control panel - make the numbers in the Speed Set display flash - turn the parameter adjustment knob to set the speed to 4000. Note: The Rcf value is automatically converted with the speed value.
- **Time setting:** On the control panel, press the Time key - make the minute number in the time display column flash (the corresponding two digits unit of time) - turn the parameter adjustment knob to set the time to 20.

The parameter value confirmation is as follows: the parameter adjustment knob can be pressed vertically downwards, or the system will automatically flash three times as the default.

- Speed up and down setting (the acceleration and deceleration settings for starting the machine to run the rotor to the set speed and stopping the machine from running, with values ranging from 0 to 9. The higher the value, the shorter the time it takes): Press the Menu key continuously to make the numbers in the Acc display flash - turn the parameter adjustment knob to set the speed to 5. Press the Menu key again to make the numbers in the Dec display flash. Rotate the parameter adjustment knob to set the speed to 3. Note: When Dec is set to 0, the shutdown is free, and the system has no brake intervention!

After setting up, display is as shown in the following figure:

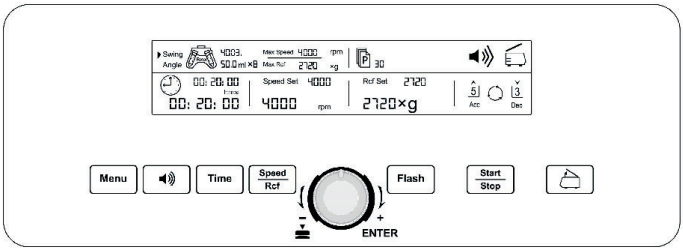

Figure 6: Example of parameter setting completed

5.10 Other parameters setting

■Relative centrifugal force setting: Press the Speed/Rcf key twice continuously on the control panel, causing the number at Rcf to flash - turn the parameter adjustment knob to set its value. Note: The speed value is automatically converted with the Rcf value.

■During the parameter setting process, if an alarm occurs due to a machine malfunction or incorrect parameter settings, press the Start/Stop key to cancel the alarm and then refer to the rotor number again for setting.

■Press the Start/Stop key and the machine will start running (if you need to stop halfway, please press the Start/Stop key). The set time will gradually decrease from the set value to zero. When the time value shows zero, the centrifuge will automatically stop, and the speed will gradually decrease from the set value to zero (the time required for the speed to decrease from the set value to zero is related to the speed reduction setting). When the speed becomes zero, the door cover will automatically open and the machine will emit shutdown sound. Press the Start/Stop key to stop the sound. Centrifugation is completed.

■**If a short centrifugation is required:** Please press and hold the FLASH key on the control panel, and the speed will continue to increase. Release the key to stop. The maximum speed during this time will be the set speed corresponding to the rotor number.

■**Tone settings:** Press the 🔊 key to adjust the prompt volume.

■After the machine speed stabilizes, if necessary, the parameters such as speed/centrifugal force, time, and lifting speed can be modified again. After resetting the parameters, there is no need to manually confirm, and the system will automatically flash three times to confirm the settings.

Before setting parameters using the control panel, the rotor must be correctly installed on the shaft.
If an error is found during the parameter setting process, the parameters can be reset.

■About the calculation of centrifugal force

The relative centrifugal force is generally thousands of times the gravitational force (g) of the Earth, and it is a unit used to measure the efficiency of centrifuges to separate or precipitate objects. The calculation of centrifugal force is related to centrifugal speed and centrifugal radius, and is calculated according to the following equation:

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

r: Is the centrifugal radius, in cm

n: Centrifugal speed in rpm (revolutions per minute)

Note: “The maximum centrifugal force value is related to the maximum centrifugal radius”.

The “centrifugal force value” set should take into account the radius of the rotor and the shape of the centrifugal container.

6. MAINTENANCE

6.1 Cleaning/decontamination

If the hazardous material overflows or enters the device, the user is responsible for proper decontamination.

Users shall clean according to the methods described in this manual to ensure that the equipment is not damaged; the use of improper detergent and incorrect disinfection steps may cause damage to the centrifuge and internal parts.

■ Implementation of cleaning/decontamination

Before cleaning and maintaining the centrifuge, turn off the power switch and unplug the power cord!

Regular cleaning and maintenance mainly cover the centrifuge shell, inner chamber, rotor, etc.

Do not use organic solvents because it can decompose the lubricating grease in the motor bearing; during the cleaning process, the liquid, especially organic solvents, cannot contact the motor spindle and the ball in the bearing!

6.2 Maintenance

Basic maintenance to be carried out by the user of the centrifuge:

- Check that the rotor body and its components are in good condition. If you notice any damage, for safety reasons, do not continue working with them and consult the Technical Service.
- Grease the swing out rotor brackets and check that the tube holders swing freely.
- Check rubber parts.
- Clean the centrifuge inside and out with non-abrasive products.
- Check the power cable. If any damage is found, replace it immediately.
- Ensure that ventilation openings are not obstructed and allow normal airflow.

■ Do not use pointed objects to collide with the rotor, in its handling and disassembly avoid bumping, to prevent scratches or trauma cracks.

■ Regularly check the rotor components (especially the bottom of the holes) for corrosive spots, grooves and small cracks. If any of the above conditions is found, please stop using the rotor and contact your distributor.

When removing the rotor, hold the rotor with both hands, lift it vertically, do not shake it left or right!

- Usually, wash the rotor once a week. If you work with salt solution or other corrosive samples, wash the rotor immediately after use. If the sample is found to splash out and drop on the rotor, it should be immediately dried and locally cleaned.
- When cleaning the rotor, clean it with a mild detergent dampened with a sponge or cotton cloth, then wash off the detergent with distilled water. Do not sprinkle or spray the rotor with water as the liquid may be left somewhere and cause corrosion. Allow to invert and dry after washing.
- Use a rag or tweezers to remove debris from the centrifugal chamber.
- The connecting parts of the motor shaft and the rotor shaft hole shall be coated with grease.
- Steps for maintaining the motor spindle:
  - Turn on the power switch and wait until the self-test is completed.
  - Press the key  to open the centrifuge door cover.
  - With the special tool to dismantling the rotor, loosen the lock sleeve (in counterclockwise direction) and remove the rotor.
  - Clean the taper surface of the motor shaft, and do not leave dirt. Add proper amount of lubricating oil or use lubricating paper to coat it.
- When dismantling the machine, the power supply must be cut off first, and the power cord connected to the back wall of the machine must be removed. No live operation to prevent personnel from getting electric shock or damaging the machine. Note: This operation can only be carried out by the specially trained maintenance personnel!
- This machine can only use the parts provided by the manufacturer.
- The power supply shall be cut off when the centrifuge is not used.
- Transportation and storage

This machine is a precision equipment, in the process of transportation and storage, please pay attention to moisture, shock, do not cross or reverse.

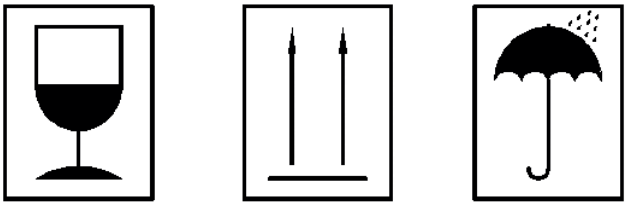

Figure 7: Cautions during transportation and storage

7. FAULT TREATMENT

7.1 Open the door in emergency

In normal use, due to accidental power failure or the failure of the door opening operation, you can not use the function of automatic door opening. In this case, you can use the manual door opening method to take out the samples. Note: This method is only allowed in emergency cases!

During the power failure, the rotor stops running with no braking function, and it takes a long time to completely stop. Please wait patiently!

The emergency door opening steps are as follows:
- Confirm that the rotor is completely stopped.
- Turn off the power supply switch.
- Insert the hexagonal wrench into the emergency opening hole and turn the wrench clockwise to open the door cover.

7.2 Fault alarm information

The following table lists the alarm information about the machine. You can eliminate the fault according to the prompts; if the user cannot eliminate the fault or the alarm information is not in the following list, the user should immediately contact the maintenance personnel.

After any abnormality occurs, the power supply should be turned off first and then started after the fault is removed.

Table 3: Fault alarm information

Fault code	Description	Troubleshooting
Error 1	Unbalance, a strong vibration has been detected and operation has been stopped	- Permissible error for reweigh ≤ 1.5g. - The placement of the instrument is tilted and the force is inconsistent. Adjust the instrument level to ensure that the force is consistent. - The motor spindle is bent, please contact the distributor to replace the motor.
Error 2	Overspeed, instrument detects rotor overspeed and shuts down	- Microcomputer control failure, contact the distributor. - Speed sensor malfunction, contact the distributor.
Error 3	The door cover is not closed	- Close the door cover. - The door cover switch is damaged, please contact the distributor for replacement.
Error 4	Input voltage too low	- Please check the external power supply voltage.
Error 5	Brake overpressure	- External input voltage too high or brake resistance malfunction or braking too fast.
Error 6	Overcurrent	- External input voltage too high or acceleration too fast.
Error 7	No speed measurement	- Speed sensor failure, contact the distributor.
Error 8	Communication error	- Check if the cable between the display board and the driver board is properly connected.
Error 9	Overvoltage	- External input voltage too high.

Table 4: Failures, causes and their elimination methods

Failure	Failure cause and troubleshooting method
Display off or suddenly the display turns off	1. Check whether the power socket and the connection are good, and whether the power socket is charged. 2. Check whether the power switch has no good contact. 3. Check the fuse. If it is blown, please replace the fuse. 4. If the cause cannot be found, please contact the Technical Service.
The machine is suddenly stopped in operation	1. The speed is over the maximum rated speed of the rotor. 2. Once the rotor exceeds the rated speed of the rotor in more than 450 rpm, the overspeed alarm will work immediately. At this time, the speed must be reset after the shutdown. 3. The speed is over the set speed. 4. When the motor is overheated, the power is cut off inside the machine and the machine stops running. 5. If the keyboard panel does not work, please check the power supply system of the machine. 6. The voltage may be too low; check whether the power supply voltage meets the requirements.
The door can't be opened	1. Rotor has not stopped completely; the door should not be opened. 2. Check the door lock components. 3. Check the electrical wiring of the door lock. 4. Open the door by manual method. 5. If the cause cannot be found, please contact the Technical Service.
The machine vibrates greatly	1. The rotor over the critical speed, some machine vibration is normal. 2. Check whether the rotor is locked. 3. Check the symmetry of the rotor load and check the level of the machine. 4. Check whether the rotor is properly installed. 5. Check the drive shaft and rotate by hand. If it cannot rotate smoothly, there may be a problem with the drive shaft or motor.
The display shows an exception	1. May be caused by the power grid interference. Please shut down, to stop for one minute before the boot; the display will be normal again.
The motor does not turn after pressing the start button	1. The electrical control circuit is broken; replace the electrical control board.
The machine smells burnt	1. Cut off the power supply. 2. Check whether the motor is burned down. 3. Check whether the electrical components are burned down.

8. TECHNICAL DATA

Parameter	Specifications
Working environment	- Indoor use - There is no vibration and airflow affecting the performance and no conductive dust, explosive gases and corrosive gases in the surrounding air - Altitude: ≤ 2000m - Relative humidity: ≤ 80% - Ambient temperature: +5 ºC - 40 ºC
Power supply	- 220 VCA, 50/60 Hz
Time range	- 1-99 hours/1-59 minutes/1-59 seconds
Maximum speed	- 6000 rpm
Maximum relative centrifugal force	- 5150 ×g
Maximum capacity	- 400 mL
Acceleration	- The acceleration time from zero to maximum speed shall not exceed 30 seconds
Deceleration	- The time to decelerate from maximum speed to zero shall not exceed 25 seconds
Noise (at maximum speed)	- ≤ 65 dB(A)
Size	- 390 mm x 500 mm x 320 mm
Approx. net weight	- 30 Kg

9. WARRANTY

AUXILAB S.L. guarantees this centrifuge against manufacturing defects for a period of 24 months from the date of purchase, under the following assumptions:

- It covers any manufacturing defect, including the labour necessary to locate and change the defective parts at AUXILAB S.L. Technical Service.
- This warranty DOES NOT COVER breakdowns which, in the opinion of AUXILAB S.L. Technical Service, have been caused by incorrect installation, incorrect treatment, improper use or manipulation by personnel outside AUXILAB S.L. Technical Service.
- Spare parts with a limited life, such as fuses, batteries, etc., are not covered by the guarantee.
- Any device whose serial number has been removed or altered is considered out of warranty.
- It is expressly excluded any recognition of direct or indirect damages of any kind suffered by persons or things.