

CENTRÍFUGA DE BAJA VELOCIDAD LOW SPEED CENTRIFUGE CENTRIFUGEUSE À BASSE VITESSE

Modelo | Model | Modèle 2831



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.

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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 applicable ambient temperature range is + 5 °C ~ + 40 °C
- The applicable relative humidity range is 80%
- Working power supply AC220V, 50HZ / 60HZ, 10A
- Enough ventilation equipment must be installed in the room
- No vibration and airflow affecting the performance around it
- No conductive dust explosive gases and corrosive gases in the surrounding air

SAFETY TIPS

Using this machine for the first time, please read this manual carefully!

- The 2831 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 maintenance personnel can perform maintenance operation on the 2831 low speed centrifuge system with appropriate tools.
- Use the accessories provided by the manufacturer. If the user wants to use other accessories, the company will not be responsible for the adverse consequences caused.
- The 2831 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 instrument!



Note: High voltage danger! Danger of electric shock!

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.

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.

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1. SAFE TERMS OF USE

The 2831 centrifuge is based to 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 "2831 Low Speed Centrifuge" and must be placed with the centrifuge for inspection by the operator.

The 2831 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 $1.2g/cm^3$; when the density of the sample is greater than $1.2g/cm^3$, 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 in 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 and 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 2831 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 THE 2831 LOW SPEED CENTRIFUGE

2.1 Appearance

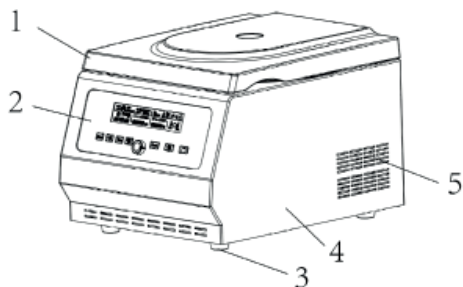


Figure 1: Exterior view of centrifuge

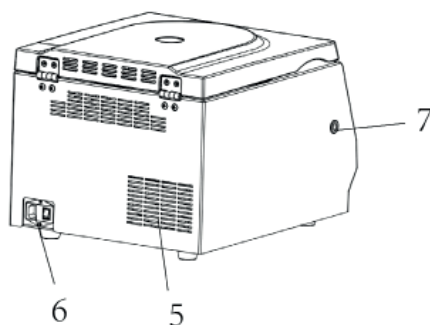


Figure 2: Rear profile of centrifuge

Figure 1, Figure 2, description:

- | | |
|-------------------------------------|----------------------------------|
| 1. Door cover | 5. Heat dissipation grids |
| 2. Control panel and display window | 6. Power outlet and power switch |
| 3. Foot | 7. Emergency opening hole |
| 4. Casing | |


2.2 Overview

2831 centrifuge is a low speed centrifuge used in medical laboratory, biochemical and molecular biology research and industrial laboratory for routine analysis. It can be widely used in clinical medicine, biology, chemistry, genetic engineering, immunology and other fields. It is a conventional instrument used for centrifugation and precipitation in the laboratory. This machine can work with nine 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.

■ Door cover system includes door cover, door hinge and damper air spring, door lock, door alarm, emergency door lock pull rope, etc. The door hinge is behind the frame and the door lock is in front of the frame. Only when the door lock is locked, the centrifuge can be started to run, otherwise the door alarm system works (the buzzer rings) and the machine cannot start.

To open the door cover, just press the door button on the machine control panel. When the door cover is opened to a certain height, the door hinge and damping air spring can support the door cover. 



If the power failure or the door button fails, and the sample must be removed in time, it is necessary to use the emergency door lock pull rope, and slowly pull out to the right to manually open the door cover.



When the rotor is rotating, it is forbidden to open the door cover manually with the emergency door lock pull rope!

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

■ The equipment uses a frequency conversion motor to directly drive the rotor of the load sample to rotate together. The drive system adopts direct drive mode, which makes the rotor and the rotating shaft cooperate with high accuracy and smooth operation.


■ The rotor system is composed of various rotors (see Table 1: Rotor types and technical parameters for details), centrifuge 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, thus achieving the purpose of separating the sample. Because the centrifugal force achieved by the rotor at low speed is more than several thousand times of the acceleration of earth gravity g , it is very important for the safe use and careful maintenance of the rotor!

■ The chassis system is composed of frame, bottom plate, fuselage shell and rubber support foot, etc.

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

■ The control system includes the setting of rotation speed and centrifugal force, the setting of operation time, the selection of lifting rate, the overall display system and the control of the alarm system. In order to ensure the normal operation of the machine and the safety of the operator, do not remove the machine!

■ The display system consists of LCD and PET touch keyboard panel (control panel). It is the medium of man-machine dialogue. It can synchronize the display of the set parameters and can track the actual changes of the display parameters, in addition, it can also carry out a variety of fault display and alarm.

■ The alarm system is equipped with door cover fault, overspeed, imbalance, overpressure and other alarms. When the machine has overspeed, door cover opening, imbalance and other faults, the system can alarm, at this time, the buzzer issued an alarm sound, the machine cannot start, the operation of the machine will automatically shut down, until the fault is removed, the machine can restart. Note: To eliminate the alarm sound from the buzzer, press the stop button on the control panel. 

2.4 Safety and protection

The 2831 centrifuge has a series of safety protection mechanisms:

- The frame and protective steel ring are made of steel plate, and the internal chamber is made of stainless steel liner.

- The door cover is made of explosion-proof structure, and the front of the door cover has a locking mechanism. Only when the centrifuge is electrified and the rotor stops, you can press the door button on the control panel to open the door cover of the centrifuge; only when the centrifuge door cover is locked, you can start the centrifuge work!



- Exceed the speed limit

When the running speed of the centrifuge rotor exceeds the set speed in 400 rpm, the machine will issue an alarm sound. When the running speed exceeds the maximum rated speed of the rotor in 450 rpm, the rotor will automatically stop running; wait until the rotor is completely stopped to open the door; after troubleshooting, it will run again.

- Out-of-balance

If the rotor rotation is unbalanced during operation, causing the motor shaft shaking beyond the specified range, the machine will stop operation in time and issue an alarm warning; generally, the rotor load is unbalanced. After the operation is terminated, open the door cover and start the operation again after troubleshooting.

- Open the door for an emergency situation

During the operation of the rotor, if the sudden power failure occurs or the machine fails, the door can be opened manually (see “Fault Handling”).

2.5 Machine placement requirements

- The machine shall be placed on a horizontal surface with sufficient rigidity and kept away from vibrations; avoid direct exposure of heat source and sunlight.

- Space shall be 10cm ~15cm all around the machine to facilitate ventilation and heat dissipation.

- After placement, the level shall be adjusted and the four supporting feet at the bottom of the equipment shall be evenly supported on the table.

- The applicable range of the instrument working power supply is AC220V 50HZ / 60HZ 10A.



The machine must be strictly and reliable grounded. The rotor is strictly prohibited to artificially power off in the process of operation, otherwise it may cause damage to the control circuit.

3 OPTIONAL ACCESSORIES

A variety of rotors are available for use with the 2831 low speed centrifuge. You can purchase 2831 centrifuge according to your actual requirements (see “Table 1: Rotor Type and Technical Parameters” for details).

Rotor (Auxilab code)	Capacity (Number of tubes x mL)	Maximum speed (rpm)	Maximum relative centrifugal force (g)	Type of tube
Swing out rotor (GLK043)	100×4	4000	2720	PP, round bottom with lid
Swing out rotor (GLK044)	50×4	4000	2665	PP, round / cone bottom with lid
Swing out rotor (GLK045)	15×8	4000	2736	PP, round / cone bottom with lid
Microplate rotor (GLH018)	Microplate 2 pieces × 2 × 96 wells	4000	2236	96 wells plate
Angle rotor (GLK041)	15×12	6000	5350	PP, round / cone bottom with lid
Angle rotor (GLH014)	15×24	5000	3690	PP, round / cone bottom with lid
Angle rotor (GLH015)	15×30	5000	4050	PP, round / cone bottom with lid
Angle rotor (GLH016)	20×12	5000	3800	PP, round bottom with lid
Angle rotor (GLH017)	50×6	6000	4346	PP, round / cone bottom with lid

Table 1: Rotor types and technical parameters

4 PREPARATION BEFORE USE

4.1 Transportation and installation

The 2831 low speed 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 20 kg. When handling, the equipment should be lifted from the left and right sides of the machine to balance the force! Please carry vertically, 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 2831 low speed 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 °C and 40 °C and ambient humidity of 80%; keep the environment clean.

4.3 Position the machine firmly

Once the centrifuge is placed, do not move at will. If you move, re-confirm or adjust the level, and make the four supporting feet at the bottom of the machine be evenly supported on the table. Confirm that the support or table of the machine is firm and without vibrations.

4.4 Connect the power supply correctly

The centrifuge power cord shall be used with a single power socket, which must be well grounded to confirm that the power cord used in the centrifuge meets the safety specifications of the country and region, and the power supply voltage and frequency applicable to the centrifuge shall meet the requirements specified in this description or the specifications marked on the centrifuge nameplate. Please use the random attached power cord, correctly access the machine power socket, and connect firmly to the network power supply, when the power switch is closed "I", "O" when the power switch is off.

5. INSTRUCTIONS FOR OPERATION

5.1 Introduction to the control panel and the display interface

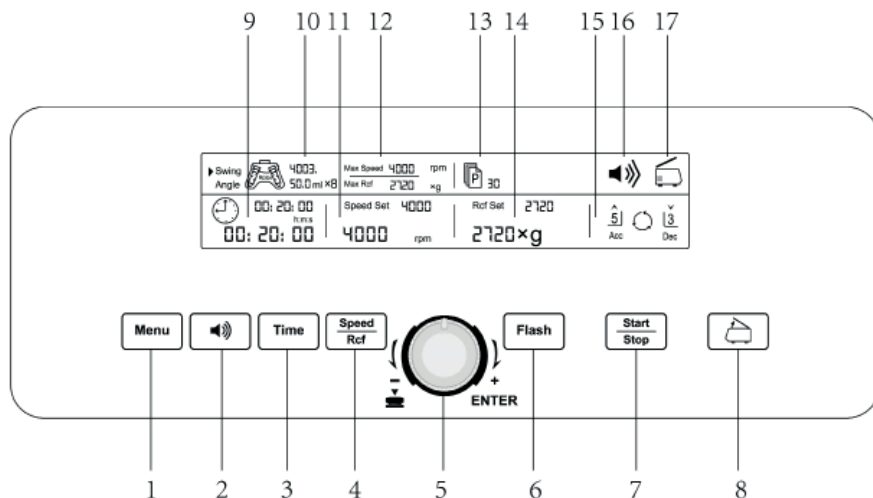


Figure 4: Schematic diagram of the control panel

- | | |
|---|---|
| 1. Setting selection key | 10. Rotor number shown |
| 2. Volume control key | 11. Speed in rpm is shown |
| 3. Centrifugation time setting key | 12. The maximum centrifugal force is shown |
| 4. Speed / relative centrifugal force setting key, switch key | 13. Storage settings, display area |
| 5. Parameter adjusting the knob key | 14. The relative centrifugal force value is displayed |
| 6. Short centrifugation key | 15. Accel / Decel: increase rate / down rate gear display |
| 7. Start / Stop key | 16. Volume settings are shown |
| 8. Lid opening key | 17. Open and close the door state is displayed |
| 9. The centrifugation time setting is shown | |

5.2 Boot

The power cord shall be connected to one end to the power socket of the rear wall of the machine, and the other end is connected to the municipal power supply. The mains power supply shall use an independent socket. The power supply range used by this machine is AC 220V 50HZ / 60 HZ. When connection, turn on the power switch on the right side of the back of the machine. The buzzer bursts short, and the LED display on the control panel lights up. After the machine completes the self-test, the main interface is entered, and now the machine can be operated to the next step.

5.3 Open the door



Press the door button on the control panel, the door cover will automatically open and bounce to a certain height under the action of the damping air spring, and then lift the door cover to fully open the door cover, the inner chamber will be presented in front of the user.

If a fault occurs, the door cover cannot be opened automatically. At this time, if the items in the chamber must be removed, the manual door opening can be used. See “fault handling” for details.

5.4 Close the door

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




When closing the door, it should be appropriately pressed down, do not force too hard, so as not to damage the lock hook!

5.5 Install 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 5 and 6)

- Turn on the power switch until the self-test is completed.
- Press the door 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 5, 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.

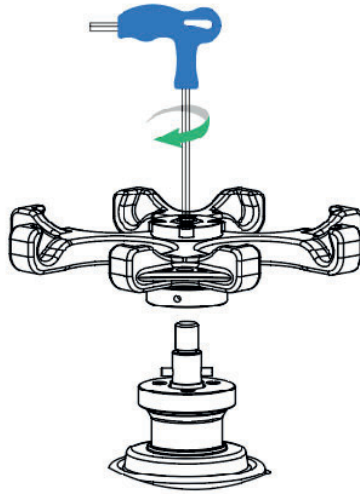


Figure 5: Schematic diagram of the mounting of the rotor body

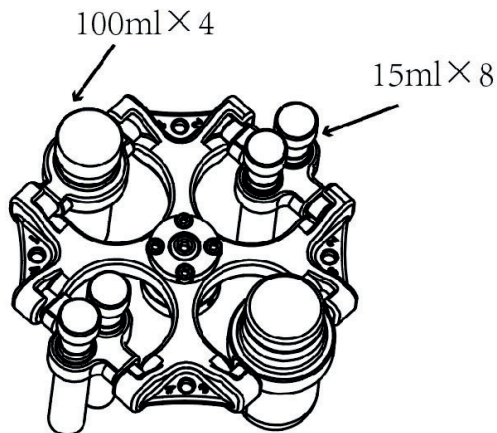


Figure 6: Schematic diagram of installing the hanging basket



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.

5.6 Calculation of the rotor load

■ Calculation of the maximum load

The 2831 low speed centrifuge has great centrifugal force at low speeds; each rotor design requires sufficient mechanical strength at the maximum rated speed—the “safety factor”; provided that the rotor load shall not exceed its maximum rated load.

When you place the samples in the container into the rotor, if the sum exceeds the maximum rated load of the rotor, you must reduce the weight of the sample or calculate the allowable running speed of the rotor (NPERM); ensure that the rotor load does not exceed its maximum rated load.

The allowable operating speed (NPERM) is calculated as follows:

$$NPERM = N_{max} \times (\text{maximum permissible load} \div \text{actual load})^{0.5}$$

N_{max} : the maximum rated rotation speed



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

5.7 Fill of samples in centrifugal containers

When the centrifuge is running, the better the balance performance, the separation area of the separated sample will not interfere with each other due to vibration, so the better the centrifugation effect is. Therefore, the centrifugal container as evenly as possible, so that a better balance effect can be achieved during the operation. Suitable containers must be used for all samples during placement.

Carefully check the centrifugal vessel (centrifugal tube, etc.) used for its allowable maximum rated acceleration (centrifugal force).

Please pay attention to the service life of the centrifugal container used, especially when running at the highest allowable load and speed; check whether the centrifugal container is damaged, and should be replaced in time.

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 r/min 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 configured in the device is S-3 (swing out 15mlx8), the specific operation is as follows: Turn on the power switch on the rear right power switch of the instrument, and the display area on the control panel will light up. For example, the following parameters should be set:

Rotor number	Speed (rpm)	Time (min)	Accel.	Decel.
S-3	4000	20	5	3


■ Rotor number setting: The centrifuge automatically detects the installed rotor.


■ Speed setting: the control panel button sets the adjustment key in the Speed Set display bar to set the speed to 4000. **Note: Rcf values are automatically converted with speed values** 

■ Time setting: The control panel button adjusts the minute number flash (2-digit time unit) in the time display bar, and the knob key sets the time to 20. 



The selected parameter adjustment is as follows: the parameter adjustment button can be pressed vertically or the system automatically flashes three times.

■ Lift speed setting (start the machine to run the rotor to the set speed and stop the speed value of 0-9, the larger the value, the shorter the time): Button  to set the speed of the digital flashing rotation parameter adjustment button in the Acc display bar to 5.

Press the key  again to set the speed to 3 in the digital flash rotation parameter adjustment button in the Dec display bar. Note: When Dec is set to 0, the shutdown is free, the system works without any brake intervention!

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

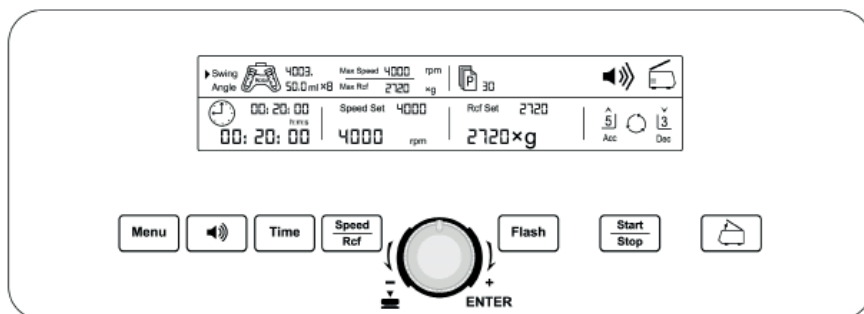







Figure 7: Example parameter set is complete

5.10 Other parameters setting

■ Relative centrifugal force setting: press the control panel button for two consecutive times to enable the digital flashing rotation parameter adjustment button at Rcf to set its value. **Note: Speed values are automatically converted with Rcf values;** 

■ In the process of setting the parameters, if the machine has an alarm due to the machine failure or the incorrect parameter setting, press the key to cancel the alarm and set it again with reference to the rotor number. 

■  Press the key, the machine starts running, the time will gradually decrease from the set value to zero, when the time value displayed is zero, the centrifuge will automatically stop, and the speed will gradually decrease from the set value to zero (the time used for decreasing from the set value to zero is related to the setting of deceleration), when the speed becomes zero, the door cover will automatically open, the machine will stop music, and the key can stop sound. The centrifugation is completed. 

■  For short centrifugation: please press the key on the control panel and the speed will increase continuously. Release the key. The maximum speed will be the set speed corresponding to the rotor number.

■ Message tone setting: Press the button to adjust the prompt volume. 

■ After the machine speed is stable, the parameters such as speed / centrifugal force, time, lifting speed can be modified again if necessary. After reset the parameters, the system automatically flashes three times for confirmation.

- Before setting the parameters with the control panel, the rotor must be properly installed on the motor shaft.

■ - If an operation error is found in the parameter setting process, you can reset the parameter.

About the calculation of the centrifugal force

The relative centrifugal force is generally thousands of times that of the Earth's gravity (g), and it is used to measure the efficiency of centrifuges to separate or precipitate objects. The calculation of the centrifugal force is related to the centrifugal speed and centrifugal radius, specifically 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 set "centrifugal force value" should take into account the radius of the rotor and the shape of the centrifugal vessel.

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.



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 them 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 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 and remove the rotor, clean the lock cover, note: clockwise direction is to rotate the lock sleeve, counterclockwise direction is to loosen the lock sleeve.
- 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.

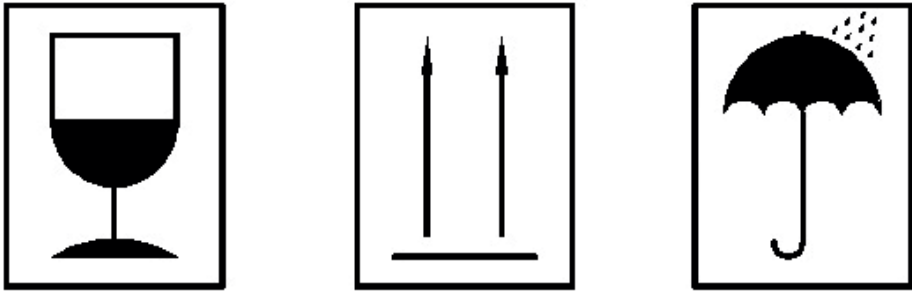


Figure 7: Cautions during transportation and storage

7 FAULT TREATMENT

7.1 Open the door in emergency

In normal use, due to the 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 of the centrifuge to open the door cover and 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 running. Please wait patiently!

The emergency door opening steps are as follows:

- Confirm that the rotor is completely stopped;
- Turn off the power supply switch;
- Pull the emergency door lock and pull the rope horizontally to the right, the door cover is opened, and then you can take out the samples.

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 of the company immediately.



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

Code shown

Abnormal phenomena, situation description

E1: Unbalanced fault

It means that the machine has severe vibration or no horizontal placement and needs to detect the working state of the unbalanced detector.

E2: Overspeed

During operation, it is detected that the speed exceeds the current rotor maximum speed in 500 rpm, which generally occurs in the rising stage. By reducing the speed up gear, the speed is prevented from rising too fast.

E3: Door cover is not closed

The door cover is found to be closed when the device is running or ready for operation. Or check whether the door cover and closing signal are normal.

E4: Hall sensor failure**E5: Brake overpressure**

Drive board failure. When braking, the brake voltage exceeds the predetermined value. Can reduce the deceleration gear.

E6: Overflow

Drive board failure. The drive board current is too large. It is generally caused by excessive load or insufficient power.

E7: No speed measurement

Unable to detect the rotation speed. Detect whether the communication discharge line is well connected.

E8: Communication failure

Unable to communicate with the lower machine. Detect whether the communication line is connected.

E9: Overvoltage

External power supply voltage over. Detect external 220V power supply.

E10: Open door fault

During the process of opening the door, the opening signal cannot be detected. Check whether the opening signal is working normally.

E11: Close failure

During the closing process, the closing signal cannot be detected. Check whether the closing signal is working normally.

E12: The rotor identification fault**E13: Abnormal lock in signal**

Enter the opening signal and the closing signal and check whether the lock signal is working normally.

E15: The rotation speed is not stable

During the operation, it is found that the rotation speed cannot reach the set rotation speed, which is generally caused by the mismatch of the motor series.

E17: No rotor recognition Hall signal is identified.**E18: Identification error****E19: The rotor identification detects only one magnetic steel signal.**

E20: The identified rotor does not match the machine rotor. For example, the machine rotor angle is 40~120°, and the identified angle is 150 degrees.

E21: Low pressure**E22: Drive plate temperature is too high****E26: Motor blocks rotation****E27: Drive detection motor overspeed****E28: Dynamic and inertia identification error****E29: Brake circuit fault**

Failure	Failure cause and troubleshooting method
Display off or suddenly the display turns off	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. May be caused by the power grid interference, please shut down, to stop for one minute before the boot; the display can be normal again.
The motor does not turn after pressing the start button	<ol style="list-style-type: none"> 1. The electrical control circuit is broken; change the electrical control board.
The machine smells burnt	<ol style="list-style-type: none"> 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	<ul style="list-style-type: none"> - 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: 2000 m - Relative humidity: 80% - Ambient temperature: +5°C - 40°C
Power supply	220VAC, 50/60Hz, 10A
Time range	1-99 h / 1-59 min / 1-59s
Maximum speed	6000 rpm
Maximum relative centrifugal force	5350 ×g
Max. capacity	450 mL
Acceleration	The time from zero to maximum speed shall not exceed 15 seconds
Deceleration	From maximum speed to zero in 18 seconds
Noise (at maximum speed)	≤65dB(A)
Size	360 mm (L)* 450 mm (W)* 308mm (H)
Approx. net weight	20 Kg

9. PACKING LIST

N°.	Name	Quantity	Remarks
1	2831 model centrifuge	1	
2	Power cord	1	
3	Rotor	1	According to the order
4	Hexagon spanner	1	
5	Lubricating grease	1	
6	User Manual	1	

10. 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.