CENTRÍFUGA DE ALTA VELOCIDAD
HIGH SPEED CENTRIFUGE
CENTRIFUGEUSE À GRANDE VITESSE

Modelo | Model | Modèle 2811

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

SAFETY INSTRUCTIONS

In order to avoid damage to people, the surrounding objects and the environment, please follow all the safety instructions in this User Manual.

In addition, local laws and regulations for the installation of the centrifuge, accident prevention, environmental protection and recognised professional standards for occupational safety and health must be carefully observed.

- Please read this manual carefully when using this device for the first time.
- Centrifuges can only be operated by trained and authorized personnel.
- Equipment maintenance can only be done by qualified technicians.
- Do not introduce the following materials in the centrifuge:
  - Flammable or explosive substances
  - Aggressive chemicals
  - Toxic or radioactive substances
  - Pathogenic microorganisms
- If the operator encounters a situation not mentioned in this manual, please contact your distributor to request technical assistance.
- Use accessories provided by the manufacturer. If the user uses other accessories, Auxilab S.L. will not be responsible for the adverse consequences.
- This centrifuge must be inspected and maintained at regular intervals.
- Do not plug or unplug the power plug and toggle the power button when the hands are in possession of liquid.
- Do not unplug the power plug when the device is powered.
- It is strictly forbidden to maintain and clean the centrifuge under power-on state.
- It is strictly forbidden to install the device on the work surface with unevenness and vibration.

ENVIRONMENTAL CONDITIONS FOR USE

The following factors may damage the centrifuge; take them into account to assure a safe operation:

- Chemical effects
- Environmental impacts, including natural UV radiation
- Corrosion and wear of safety parts
- Indoor use only
- Altitude: ≤ 2000m
- The permissible ambient temperature range is +5°C ~ +40°C
- The permissible relative humidity is ≤80%
- There must be sufficient ventilation in the working room
- There are no vibrations and air flows around the centrifuge
- There is no conductive dust in the surrounding air, explosive gas and corrosive gas

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1. TERMS OF SAFE USE

Note: Any personnel involved in the use or maintenance of this centrifuge must read and understand the use methods and safe use rules given in this manual.

If the following incorrect or inappropriate use methods are used, equipment damage or personal injury will be caused when using this centrifuge:

- It is not used according to the design requirements
- Operators and maintenance personnel are not trained
- The user makes inappropriate changes to the device design without authorization
- Failing to pay attention to or understand the rules for safe use

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

This manual is one of the components of the device, which must be placed together with the centrifuge for the convenience of operators.
The 2811 model centrifuge is designed for clinical medicine, biology, chemistry, genetic engineering, immunology, etc. The density of the sample that can be 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 high-speed centrifuge (during rotor rotation), within 30cm around the centrifuge, ensure that there are no operators or hazardous substances standing, and no objects blocking the centrifuge vent.

If the following safety measures are not observed when using the device, it will cause injury to the operator or other personnel or damage to the centrifuge and samples:

- The design of the centrifuge is neither anti-corrosion nor explosion-proof, so the centrifuge cannot be used in the corrosive environment and the environment that may cause explosion.
- It is forbidden to introduce the following materials in the centrifuge:
  - Flammable or explosive substances
  - Aggressive chemicals
  - Toxic or radioactive substances, pathogenic microorganisms, etc.

- The separation of corrosive substances will cause damage and destruction of materials inside the centrifuge or weaken the mechanical strength of the rotor. Therefore, when separating corrosive substances, they must be placed in leak proof containers.

1.1 Operation precautions

- Before the centrifuge runs (when separating samples), it must be confirmed that a suitable rotor is installed and firmly installed.
- Never open the door and move the centrifuge manually when the centrifuge is running (when the rotor is rotating) or when it is stopped (but the rotor is still rotating).
- The parts used in 2811 model centrifuge must be provided by the manufacturer. For some common parts, such as plastic containers for separation, products that have been confirmed to meet the requirements can also be used, which should meet the requirements of the maximum speed and maximum centrifugal force of the corresponding rotor.
- Never use the centrifuge with the door open.
- When disassembling the centrifuge, do not turn on the power switch of the equipment (unplug the power cord).
- The mechanical parts and electronic components of the centrifuge must be replaced by authorized Technical Service personnel.
- When using the centrifuge, the operator must select the rotor with appropriate load, and shall not overload the rotor.
- Check the rotor frequently. If there is obvious corrosion trace or obvious damage on the rotor, stop using it.
- After being used for a period of time, the maintenance shall be carried out in strict accordance with the provisions of “cleaning and disinfection”.

1.2 Reference standards

This high-speed centrifuge is based on the 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.
- Industry standard YY/T 0657-2008 Medical Centrifuge.

2. INTRODUCTION

2.1 Appearance

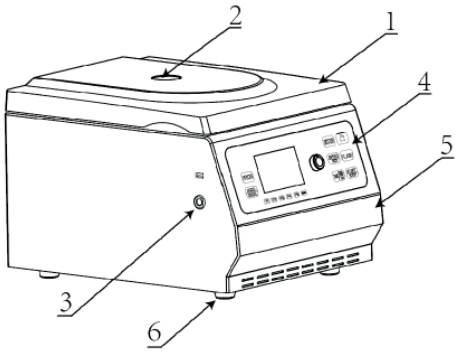

Figure 1: Front outline

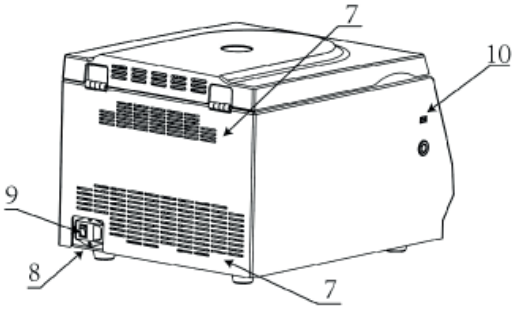

Figure 2: Rear outline

Figure 1 and Figure 2 illustrate:

1. Door cover
2. Observation window
3. Emergency door opening (be sure to operate when the machine power is off)
4. Control panel and 5-inch LCD display
5. Front cover
6. Machine feet
7. Heat sink
8. Power socket
9. Power switch
10. USB port

2.2 Summary

This device is a high-speed desktop centrifuge 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. It can be used with ten types of rotors (see “Table 1: Rotor types and technical parameters” for details).

2.3 Introduction to equipment structure

The equipment consists of door cover system, chamber system, drive system, rotor system, base system, power supply system, control system, display system, alarm system and other components.

■ Door cover system includes door cover, door hinge, damping gas spring, door lock, door alarm, emergency door lock mechanism, etc. The door hinge is inside the rear of the rack, and the door lock is in front of the rack. Only when the door lock is locked, the centrifuge can be started, otherwise the door alarm system will work (the buzzer will sound), and the machine cannot be started.

Note: To open the door cover, just press the door 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.

In case of power failure or door opening key failure, if the samples must be taken out in time, it is necessary to use the supplied tool, insert it into the emergency door opening hole and turn clockwise for one and a half turns until the door cover is opened.

Do not use emergency tool to open the door cover when the rotor is rotating and the power is turned on!

■Chamber system includes stainless steel liner and rubber seal ring. It can provide a stable working environment.

■This 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, so that the rotor and shaft have high matching accuracy and stable 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 role of the rotor is to rotate the load sample at a certain speed, resulting in a relative centrifugal force field, so as to achieve the purpose of sample separation. Since the centrifugal force reached when the rotor rotates at low speed is thousands of times more than the gravity acceleration g value of the Earth, it is very important the safe use and careful maintenance of the rotor.

■The base system is composed of frame, base plate, body shell, rubber support feet, etc.

■The power supply system includes power sockets and switches, which are responsible for the mains power 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 acceleration/deceleration rates, the control of the whole machine display system and alarm system. In order to ensure the normal operation of the machine and the personal safety of the operator, do not dismantle the machine at will.

■The display system consists of a 5-inch color LCD touch screen and a PET touch keyboard panel (control panel). It is the medium of man-machine conversation. It can synchronously display the set parameters and track the actual changes of the parameters. In addition, it can display and alarm various faults.

■The alarm system is equipped with door cover fault, overspeed, imbalance, overvoltage and other alarms. In case of overspeed, door cover opening, imbalance and other faults, the system will give an alarm. At this time, the buzzer will give a sound, and an error message box will appear in the middle of the screen. The running machine will automatically stop until the fault is removed, and the machine can be restarted. Note: To eliminate the alarm sound from the buzzer, press the Stop button on the control panel 

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2.4 Safety protection

This 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 of explosion-proof structure, and the front of the door cover is provided with a locking mechanism. Only when the centrifuge is powered on and the rotor is stopped you can press the door opening key on the control panel. Only when the door cover is locked you can start the centrifuge.

■Overspeed

When the running speed of the rotor exceeds the set speed by 600rpm, the machine will give an alarm. When the running speed exceeds the maximum rated speed of the rotor by 600rpm, the rotor will automatically stop running. The door can be opened only after the rotor is completely stopped. After the fault is eliminated, the machine will run again.

■Unbalance

If the rotor is unbalanced during operation, causing the shaft to shake beyond the specified range, the machine will stop running in time and give an alarm. 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 in case of emergency

In case of sudden power failure or machine failure during rotor operation, if the door cannot be opened by pressing the key, the door can be opened manually (see 2.3.1).

2.5 Machine placement requirements

- It shall be placed on a level, sufficiently rigid and vibration-free platform. Avoid exposure to direct heat and sunlight.
- There should be a space of 20cm-25cm on all sides of the machine to facilitate ventilation and heat dissipation.
- Adjust the levelness after placement and make the four support feet at the bottom of the equipment evenly supported on the table.
- Applicable range of power supply: AC220V ± 10% 50/60Hz, 10A.

Note: The machine must be grounded strictly and reliably, and the machine power grounding wire must be reliably connected with the power grid grounding wire. It is strictly forbidden to cut off the power manually during the operation of the rotor, otherwise the control circuit may be damaged.

3. OPTIONAL ACCESSORIES

Various rotors for 2811 model high-speed centrifuge are available for users. You can purchase the centrifuge according to your actual use requirements (see "Table 1: Rotor types and technical parameters" for details).

Rotor (Auxilab code)	Capacity	Speed (rpm)	RCF (×g)	Tube type, pp
18G A-1 (GLK016)	1,5/2 mL×24	16000	24100	Round/conical bottom with cover
18G A-2 (GLK042)	1,5/2 mL×36	14000	17970	Round/conical bottom with cover
18G A-3 (GLK020)	0,5 mL×36	15000	16350	Conical bottom with cover
18G A-4 (GLK022)	5 mL×12	16000	18890	Round bottom with cover
18G A-5 (GLK019)	0,2 mL×8×4	14800	16200	Conical bottom PCR tube with cover
18G A-6 (GLK024)	15 mL×8	13000	17570	Conical bottom with cover
18G A-7 (GLK025)	50 mL×6	12000	14750	Conical bottom with cover
18G A-8 (GLK026)	100 mL×4	12000	15940	Round bottom with cover
18G A-9 (GLK023)	10 mL×12	13000	15315	Round bottom with cover
18G A-10 (GLK021)	1,5/2 mL×12	18000	22530	Round/conical bottom with cover

Table 1: Rotor types and technical parameters

Other accessories:

- Code GDF001: Adapter for 0.2mL microtube (to be used with rotors GLK016, GLK021 and GLK042).
- Code GDF002: Adapter for 0.5mL microtube (to be used with rotors GLK016, GLK021 and GLK042).
- Code GDF014: Adapter for 15mL tube (to be used with rotor GLK025).
- Code GDF015: Cushion for 50mL round bottom tube (to be used with rotor GLK025).

4. PREPARATION BEFORE USE

4.1 Transportation and installation

The centrifuges are transported in boxes with protection materials inside. After opening the box, take out the protection materials inside.

Note: The net weight of the machine is about 35kg. When carrying, lift the equipment from the left and right sides of the machine and balance the force. Please carry it vertically and do not shake the machine. During transportation or long-distance transportation, please use special packing boxes, properly fix them firmly and keep them vertical, and handle them with care.

4.2 Location requirements

This centrifuge can only be used indoors, and the location should meet the following requirements:

■ When the centrifuge is running, a safe distance of 30cm must be kept around. No hazardous substances shall be placed within this safe distance, and personnel shall not stay.

■ The platform or table on which the centrifuge is placed shall be firm without shaking and vibration. If movable supports or trolleys are used, those with locking devices shall be used, to ensure the safe operation of the centrifuge.

■ If the centrifuge is placed at the wall edge or corner, in order to ensure smooth air circulation and good heat dissipation, please ensure that the distance between the back side of the centrifuge and the left and right sides of the centrifuge from the wall is not less than 15cm and 20cm respectively.

■ Centrifuge shall be placed away from windows to avoid direct heat and sunlight.

■ After the centrifuge is placed, the four support feet shall be evenly supported on the table and adjusted horizontally.

■ The room where the centrifuge is placed must be a constant temperature room with the ambient temperature between +5ºC and 40ºC and the ambient humidity ≤ 80%, and the environment must be kept clean.

4.3 Securely place the centrifuge

Once the centrifuge is placed, do not move it at will. If it is moved, reconfirm or adjust the level, and make the four support feet at the bottom of the machine evenly support on the table. Make sure that the platform or table on which the machine is placed is firm and can not shake or vibrate.

4.4 Connect the power supply correctly

The centrifuge power cord shall use a separate power socket, which must be well grounded. Confirm that the power cord used by the centrifuge complies with the safety specifications of the country and region where it is located. The power voltage and power frequency applied to the centrifuge shall comply with the requirements specified in this instruction or the specifications marked on the centrifuge nameplate. Please use the power cord supplied with the machine, correctly connect it to the machine power socket, and firmly connect it to the network power supply. When the power switch is closed, it is “|”, and when disconnected, it is “O”.

5. OPERATING INSTRUCTIONS

5.1 Introduction to control panel and display interface

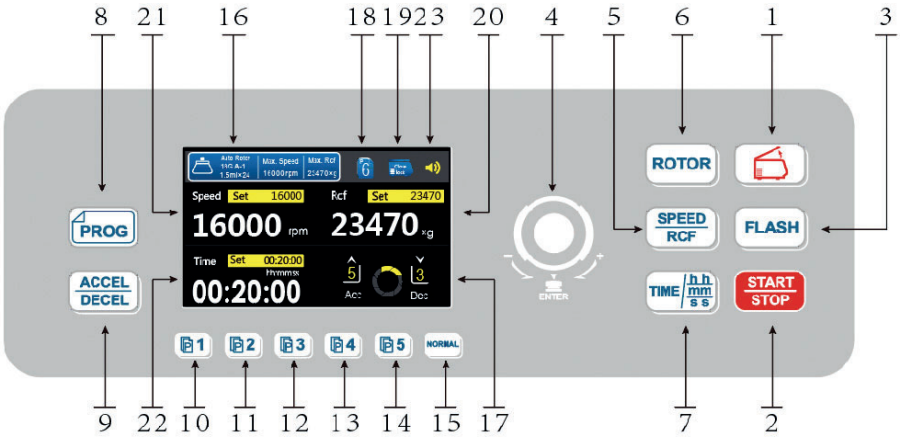

Figure 3: Schematic diagram of control panel/display interface

1. Door opening key
2. Start/Stop key
3. Quick centrifugation key
4. Parameter adjustment knob
5. Speed/relative centrifugal force setting key, switching key
6. Rotor number setting key
7. Centrifugation time setting key (in hours/minutes/seconds)
8. Stored program setting key (until 10 custom programs can be stored)
9. Accel/Decel: Speed up/speed down gear setting key
10-14. Stored program shortcut call key
15. Press this key during non-program operation to instantly set various centrifugation parameters (NORMAL)
16. Rotor data display area
17. Display area for acceleration and deceleration rate setting
18. Stored program startup or corresponding program number display area
19. Door cover status display area
20. Display area of set relative centrifugal force and real-time relative centrifugal force
21. Display area of set speed and real-time speed
22. Display area of set centrifugation time and real time
23. End warning sound status display area

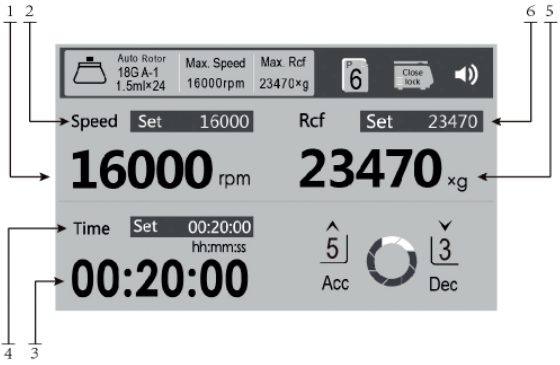

Figure 4: Schematic diagram of running parameters

1. Real time speed
2. Set speed
3. Real time
4. Set time
5. Real time relative centrifugal force
6. Set relative centrifugal force

5.2 Start up

Connect one end of the power cord to the power socket at the rear 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 of the machine is AC220V ± 10%, 50/60Hz. After connection, turn on the power switch. The LCD color display on the control panel lights up. After the self-inspection is completed, enter the main interface, and now you can proceed to the next step.

5.3 Opening the door

Press the door open key on the control panel, the buzzer will give a prompt tone.
The door status display area shows the door cover opening symbol and then the door cover needs to be lifted up by hand to fully open the door cover, and the inner chamber will be displayed in front of the user.

Note: In case of failure, the door cover cannot be opened automatically. At this time, if it is necessary to take out the samples in the chamber, the method of manually opening the door can be used. See section 2.3.1 for details.

5.4 Closing the door

Please hold both sides of the door cover with both hands at the same time and close the door cover gently. After the door cover is locked, the machine will give a prompt tone and the door cover status display area shows the closed door symbol

Notes: When the door cover is not closed properly, the centrifuge does not operate. Please confirm that the door cover is closed properly.
When closing the door, please close it slowly with both hands, and do not use too much force to prevent the door cover from hurting the palm or damaging the lock hook.

5.5 Rotor installation

The rotor used must be supplied by the centrifuge manufacturer. The specifications of various available rotors from manufacturer are included in this manual (see “Table 1: Rotor types and technical parameters” for details).

Note: The use of inappropriate rotors and centrifuge tubes will lead to a poor centrifuge performance, or even damage the centrifuge.

The steps for installing the rotor are as follows (as shown in Fig. 5 and Fig. 6):

- Turn on the power switch until the self-inspection is completed.
- Press the door open key, open the centrifuge door cover, and confirm that the chamber is clean, clean and free of foreign matters.
- Clean the surface of motor shaft.

■Install the tension sleeve on the motor shaft as shown in Fig. 5, and turn it clockwise for 5 turns with the Allen wrench (Note: it must only be turned for 5 turns, otherwise the rotor will not be installed on the tension sleeve).
■Prepare the rotor you want to use at the position shown in Figure 6. Hold the rotor with both hands, align the central hole of the rotor with the motor spindle, put it down vertically, place it at the bottom of the shaft, release both hands, and then press the rotor down with your hands.
■Use the special hexagonal wrench to tighten the lock nut clockwise.

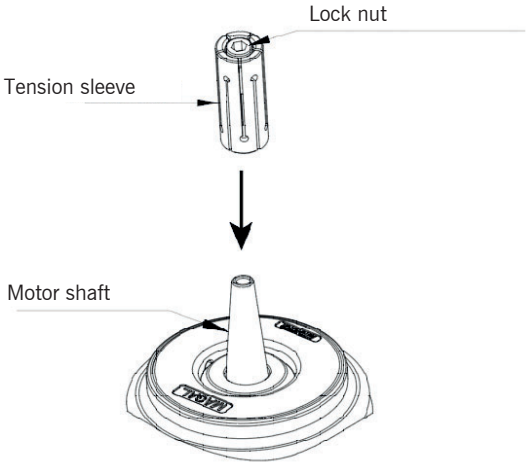

Figure 5: Schematic Diagram of Installation Angle Rotor

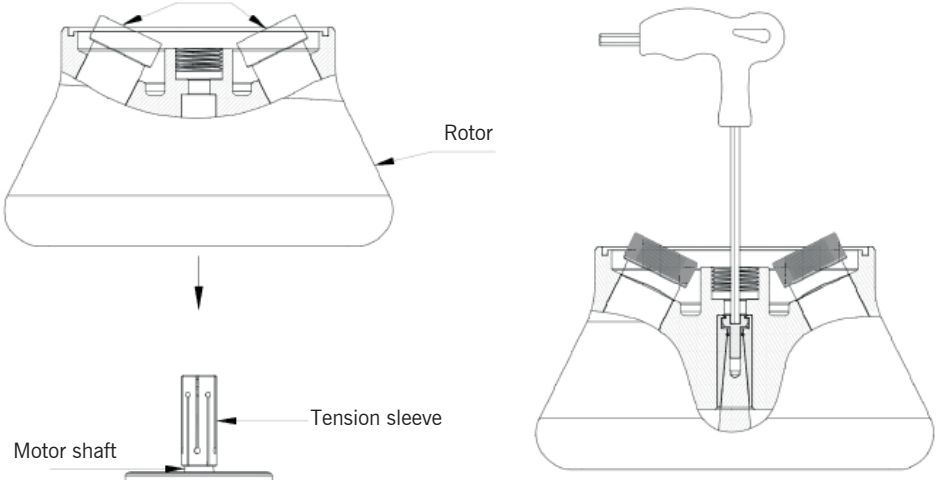

Figure 6: Schematic Diagram of Installation Angle Rotor

Note: After installing the rotor, check whether the position of the rotor changes before or after each use. If necessary, screw the lock nut again to ensure that the rotor is firmly installed.

5.6 Calculation of rotor load

■Calculation of maximum load

When the high-speed centrifuge operates at low speed, there is a huge centrifugal force; when each rotor is designed, it is required to have sufficient mechanical strength when working at the maximum rated speed - namely, “safety factor”; however, this “safety factor” regulation requires that the rotor load shall not exceed its maximum rated load.

If you separate the samples and put them into the rotor together, and the total exceeds the maximum rated load of the rotor, you must reduce the weight of the samples 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 running speed (NPERM) of the rotor is calculated as follows:

NPERM = Nmax × (maximum permissible load÷actual load)0.5

Nmax: maximum rated speed

Note: Do not overload the rotor, or the rotor will explode, and the debris generated by the explosion will damage the centrifuge.

5.7 Filling of sample in container

When the centrifuge is running, the better the rotor balance performance is, so the better the centrifugation effect achieved. Therefore, the samples shall be filled into the centrifuge containers as evenly as possible, to achieve a better balance effect during operation. All samples must be placed in suitable containers.

Carefully check whether the container (centrifuge tube) used complies with its maximum allowable rated acceleration (centrifugal force); if the requirements are met, please reduce the running speed for use.

Note: 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 containers used are damaged, and replace them if needed.

5.8 Safe use of rotor

■Samples shall be loaded accurately and symmetrically and the tubes shall be placed before rotor operation.

■If the centrifuge needs to be operated repeatedly, check whether the lock nut is loose after several times of use. If it is loose, it must be tightened before starting the centrifuge.

■Centrifuge tubes can not load samples at the same time, but they must be loaded symmetrically (allowable weight error ≤ 1.5g). If samples are loaded asymmetrically, it is not allowed to start the machine.

5.9 Example of parameter setting

■When the centrifuge is configured with 18G A-1 rotor (1.5/2 mL × 24). The specific operation is as follows: turn on the power - turn on the power switch at the rear of the device - the color LCD display will light up. For example, the following parameters need to be set:

Rotor	Speed (rpm)	Time (min.)	Acc	Dec
18G A-1	16000	20	5	4

If the normal operation mode is used instead of stored program, press NORMAL

■ NORMAL set up: Press this key to cancel the memory operation, and set various centrifugation parameters immediately. At this time, the stored program icon "P+number" on the display screen P 2 will be hidden.
■Rotor number setting: Press ROTOR Turn the parameter adjustment knob to set the rotor number to A-1.
■Speed setting: Press SPEED RCF - Flash the value in the Speed display column - Turn the parameter adjustment knob to set the speed to 16000rpm. Note: Rcf value is automatically converted with speed value.
■Time setting: Press TIME - Flash the value in the time display column (corresponding 2-digit time unit) - Turn the parameter adjustment knob to set the time to 20 minutes.

Note: The parameter set value confirmation is as follows: press the parameter adjustment knob vertically downward or the system automatically flashes three times, which is the default value.

■Speed up and down setting (for the acceleration and deceleration setting, the value is 0~9, and the greater the value is, the shorter the time is): Press ACCEL DECEL , - turn the parameter adjustment knob to set the Acc value to 5. - Press again ACCEL DECEL , - Turn the parameter adjustment knob to set the Dec value to 4.

Note: When Dec is set to 0, the shutdown is free, and the system does not have any brake intervention.

5.10 Other parameters setting

■Automatic rotor recognition: Select the Auto option during rotor number setting.
■After the machine speed is stable, if necessary, the parameters such as speed/centrifugal force, time, acceleration/deceleration can be modified again.
■End prompt tone/key tone: the machine is equipped with four end tone and mute states for selection, and the key tone can also be turned on and off manually.
■Language selection: The machine has Chinese interface and English interface for selection.
■Screen brightness setting: The screen brightness can be adjusted on the second page of the menu interface; 0-100 adjustable.
■Timing mode: There are two modes of timing, namely startup timing and stable speed timing.

Menu function is as shown below:

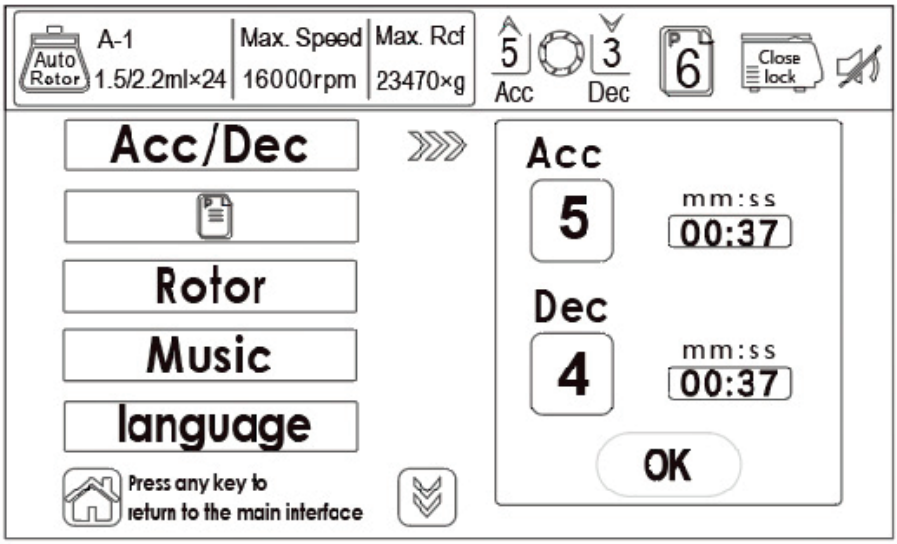

Figure 7: Menu function

- **Before setting parameters, the rotor must be correctly installed on the motor shaft.**
- **If an error is found during parameter setting, reset the parameters.**

6. MAINTENANCE

6.1 Cleaning / Decontamination

Do not attempt to clean the centrifuge when the power cord is plugged in or the power switch is turned on. If the equipment or accessories are contaminated by pathogenic, toxic or radioactive materials, it is the responsibility of the user to perform proper cleaning/decontamination. The selected cleaning/ decontamination method could damage the equipment; consult with your supplier first. If you plan to send equipment or accessories to the Technical Service for repair, you must ensure that are clean and harmless to the human body.

Do not use organic solvents because it can decompose the grease in the motor bearings; during the cleaning process, liquids, especially organic solvents, cannot be contacted to the motor shaft and the bearings.

Regular cleaning and maintenance work should include centrifuge shell, inner chamber and rotor. This is to prevent pollutants from being left on the surfaces, causing corrosion and environmental pollution.

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.
- 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 sharp objects to collide with the rotor. Prevent bumps during handling and disassembly. Prevent cracks in the rotor during use due to scratches or trauma.

■ Regularly check the rotor assembly for corrosion spots, grooves, and small cracks. If any of the above conditions are found, stop using the rotor and contact the Technical Service.

Note: When disassembling the rotor, hold the rotor with both hands and lift it up vertically without shaking it from side to side.

■ Normally, the rotor should be cleaned once a week. If it is used for salt solutions or other corrosive samples, please wash it immediately after use. If the sample is found to be spilled on the rotor, it should be immediately drained and partially 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 rags or tweezers to remove the dirty debris in the centrifuge chamber.

■ The connecting parts of motor shaft and rotor shaft hole shall be coated with lubricating oil.

■ Steps for motor shaft maintenance:

- Turn on the power switch and wait until the self-inspection is completed; press the key to open the centrifuge door cover.
- Use the supplied special tool for disassembling and assembling the rotor, unscrew the locking nut, take out the rotor, and clean the tension sleeve. Note: the clockwise direction is to tighten the locking nut, and the counterclockwise direction is to loosen the locking nut.
- 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 disassembling and assembling the machine, the power must be cut off first, and the power cord connected to the back wall of the machine must be unplugged. Live operation is not allowed to prevent the relevant personnel from getting electric shock or damaging the machine. Note: This operation can only be carried out by specially trained maintenance personnel.

■ Only use spare parts supplied by the manufacturer.

■ The power supply shall be cut off when the centrifuge is not in use.

■ Transportation and storage

This machine is a precision device. During transportation and storage, please pay attention to moisture-proof and shockproof. Do not place it horizontally or upside down.

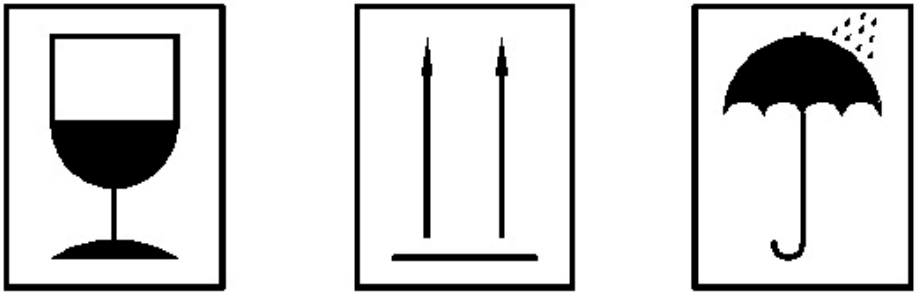

Figure 8: Precautions for transportation and storage

7. TROUBLESHOOTING

7.1 Emergency door opening

During normal use, due to accidental power failure or door opening failure, you cannot use the automatic door opening function. In this case, you can use the centrifuge's manual door opening method to open the door cover and take out the samples. Note: This method is only allowed to be used in an emergency and must not be used casually.

Note: In case of power failure, the rotor stops running without braking function. It takes a long time to stop completely. Please wait patiently.

Emergency door opening steps are as follows:
- Confirm that the rotor stops completely.
- Turn off the power switch.
- Use the supplied tool, insert it into the emergency door opening and turn it clockwise until the door cover is opened; then you can take out the samples.

7.2 Fault alarm information

The following list shows the alarm information indicated by the centrifuge, the causes of related faults and solution methods, so you can eliminate the faults according to the prompts. If the user is still unable to eliminate the fault after trying or the indicated alarm information is not in the following list, the user should immediately contact the Technical Service.

Note: In case of any abnormality, turn off the power supply first, and then identify the failure according to the error message and act accordingly.

Fault alarm information

E1: Unbalance fault
It indicates that the machine is seriously vibrating or not horizontally placed, and it is necessary to detect the working state of the unbalance detector.
E2: Overspeed
During operation, it is detected that the speed exceeds the maximum rotor speed by 500 revolutions, which generally occurs in the acceleration phase. Reduce the speed rising level to prevent the speed rising too fast.

E3: Door cover is not closed
The door cover is found not closed during operation or preparation for operation. Check whether the door cover and closing symbol are normal.
E4: Hall sensor fault (brushless motor)
The motor Hall sensor is faulty. Check whether the sensor wire is connected properly or the sensor is damaged.
E5: Brake overpressure
The drive board is faulty. When braking, the brake voltage exceeds the preset value, and the downshift gear can be reduced.
E6: Overcurrent
The drive board is faulty. The current of the drive board is too high. It is generally caused by excessive load or insufficient power.
E7: No speed measurement
Unable to detect the speed. Check whether the communication gray flat cable is connected properly.
E8: Communication failure
Unable to communicate with the lower computer. Check whether the communication gray flat cable is connected properly.
E9: Overvoltage
The external power supply voltage is too high. The external 220V power supply must be detected.
E10: Door opening fault
During door opening, the door opening in place signal cannot be detected. Check whether the door opening in place signal works normally.
E11: Door closing fault
During the door closing process, the door closing in place signal cannot be detected. Check whether the door closing in place signal works normally.
E13: Abnormal lock in position signal
Detect that the door opening in place signal and door closing in place signal are input at the same time. Check whether the lock in place signal works normally.
E19: Low voltage fault (frequency conversion)
Drive board fault. Power input voltage too low.
E20: Rotor recognition Hall signal is not detected.
E21: Rotor identification only detects one magnetic steel signal.
E22: The identified rotor does not match the rotor of the machine. For example, the rotor angle is 40～120°and the identified angle is 150°
E23: The rotor cannot be identified.

8. TECHNICAL DATA

Function / Parameter	Technical data
Operating environment	- Indoor use only - There is no vibration and airflow affecting the centrifuge performance. There is no conductive dust, explosive gas and corrosive gas in the surrounding air. - Altitude: ≤ 2000m - Relative humidity: ≤80% - Ambient temperature: +5ºC - 40ºC
Power supply	AC220V±10%, 50/60Hz, 10A
Power	500W
Power protection system	Electronic short-circuit overload protector
Set time range	1-99 hours/1-59 minutes/1-59 seconds. Three modes are available for selection. Accuracy ± 1 second.
Max. speed	18000 rpm±20 rpm The rated maximum speed of different rotors is different
Max. RCF	24100 ×g
Max. capacity	400 mL (8100 mL×4)
Acceleration time	≤18s
Deceleration time	≤20s
Motor	Maintenance-free brushless variable frequency induction motor
Noise (at max. speed)	≤65dB(A)
Protection class	IP20
Size	500 mm (L)×390 mm (W)×330 mm (H)
Weight (without rotor)	35 Kg
Interference suppression standards	EN 61010-1, EN 61010-2-020, EN 61326-1, EN 61010-3-2/A2

9. PACKING LIST

Nº.	Name	Quantity	Remarks
1	2811 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.