



High Speed Refrigerated Centrifuge

LB-14HRC

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1. Safety Measures

- To ensure safety and centrifugal effect, the instrument must be placed on a firm, shockproof, and horizontal platform, and ensure that the four machine feet are evenly stressed.
- Before starting the centrifuge, take out the foreign matter in the centrifugal chamber, and tighten the rotor and the motor drive shaft with the Allen wrench attached to the machine.
- It is strictly forbidden to operate above the maximum speed specified by the rotor design.
- It is strictly forbidden to use the rotor in an unbalanced way. The centrifugal tube must be placed symmetrically and cannot be operated in single tubes. The solution in the tube must be uniform to ensure balanced operation.
- It is forbidden to run at high speed without a rotor.
- When taking out the rotor, use the Allen wrench attached to the machine to loosen the rotor nut and pull it up to take out the rotor. It is strictly forbidden to pull the nut up hard by hand before it is fully withdrawn to avoid damaging the flexible support of the motor.
- Before use, check the rotor and centrifugal pipe for cracks, corrosion marks, and aging. If any, replace it immediately. It is forbidden to use a cracked or corroded rotor.
- The centrifugal chamber is a dynamic environment of high-speed rotation. The temperature sensor program of the host machine is to measure the dynamic air temperature after the operation of the chamber. The core of the refrigeration system is the heat energy generated after the high-speed rotation of the constant rotor surface to control the temperature rise and protect the sample! There must be a temperature difference between the temperature in the test tube hole of the rotor and the air temperature in the cavity. As the cooling time of the cavity increases, it gradually approaches! For special samples and centrifugal tests with high-temperature requirements, the rotor should be stored in 4-degree refrigerator 8 hours in advance or for a long time to ensure the low-temperature carrier of the rotor body!
- Check whether the external power supply meets the requirements and whether the instrument is grounded.
- "The centrifuge should not be moved while it is running. Do not open the door cover unless the speed on the display shows 0 rpm.
- After the instrument or rotor has been out of service for three months, it must be operated for 10 minutes at low speed before it can be operated at the maximum speed of the rotor.
- Do not mix rotors of other companies to prevent damage to the instrument and personal safety.
- Do not place a container containing liquid on the instrument. If the container is overturned, the liquid may enter the centrifuge and rust its mechanical or electrical parts.
- After separation, clean the instrument in time, turn off the power switch of the instrument, and unplug the power plug.

2. Introduction

High Speed Refrigerated Centrifuge LB-14HRC operates at a maximum speed of 20,000 rpm for effective isolation and analysis of various samples. It maintains a temperature range of -20°C to 40°C, ensuring optimal conditions for temperature-sensitive operations. It offers 10 levels of acceleration and deceleration for precise speed control. Our centrifuge includes an LED display for easy adjustment and monitoring of parameters.

3. Features

1. Noise reduction system for quiet operation
2. Electronic door lock
3. Full steel inner cavity protection
4. Five user-defined preset programs
5. Brushless motor for stable performance
6. SOP guide on the front panel

4. Specifications

Model	LB-14HRC
Maximum Speed	20000 rpm
Maximum RCF	31115 × g
Maximum Capacity	4 × 250 ml
Speed Accuracy	± 10 rpm
Temperature Range	- 20°C to 40°C
Temperature Accuracy	± 1.0°C
Timer Range	1s to 99h 59min 59s
Noise Level	≤ 60dB
Storage	99 groups of programs
Safety features	Overspeed Overheating Imbalance
Automatic Rotor Identification	Yes
Current	15A
Power Consumption	1.2KW
Power Supply	AC 220 ± 22V 50Hz
Dimensions (L × W × H)	680 × 660 × 400 mm
Weight	108kg

5. Applications

High Speed Refrigerated Centrifuge is used to separate and purify samples in biological research, pharmaceutical testing, clinical diagnostics, environmental analysis, food and beverage testing, material science, and genomics.

6. Instrument Introduction

6.1 Centrifuge Appearance and Structure

6.1.1 Overall appearance

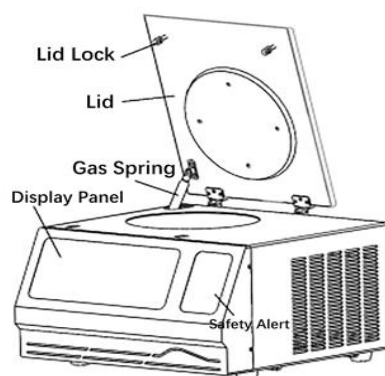


Figure-1

6.1.2 Operation Panel

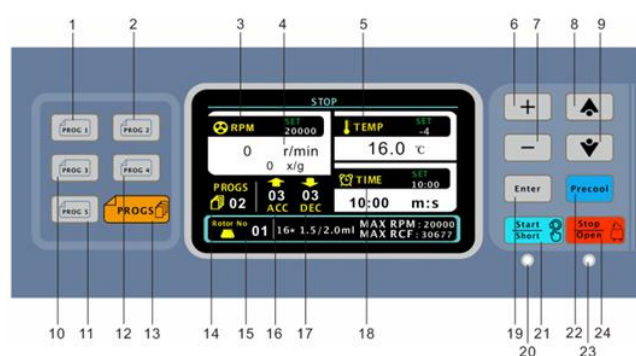


Figure-2

- | | |
|---|---------------------------|
| 1. Program 1 | 12. Program 4 |
| 2. Program 2 | 13. Program group key |
| 3. Speed/centrifugal force switch | 14. Program group display |
| 4. Speed setting, centrifugal force setting | 15. Rotor number |
| 5. Temperature setting | 16. Acceleration |
| 6. Increase key | 17. Deceleration |
| 7. Decrease key | 18. Time setting |
| 8. Up key | 19. Confirmation key |
| 9. Down key | 20. Operation indicator |
| 10. Program | 21. Start/instant key |
| 11. Program 5 | 22. Pre-cooling key |
| | 23. Stop indicator |
| | 24. Stop/open key |

7. Installation

7.1 Unpacking inspection

- Before receiving the instrument, carefully check whether there is any damage during transportation
- Check whether the goods are consistent with the packing list.
- Remove the package and take out the articles in the centrifugal chamber.

7.2 Installation

7.2.1 Installation Site Requirements

- The installation table should be firm, dry, and clean indoors, and avoid direct sunlight.
- There is no strong vibration source near the centrifuge.
- The indoor temperature of the centrifuge under normal operation shall be within the range of 10to30 °C for refrigerated machines and 5to40 °C for non-refrigerated machines, and the relative humidity shall be less than 80%.
- Heat sources shall be avoided around the centrifuge.
- There should be an independent ground wire in the room to ensure power safety.

7.2.2 Installation of host

- Install the host machine on a solid tabletop to ensure that the four feet contact the tabletop.
- The clearance between the centrifuge and the wall should be greater than 20cm to ensure good ventilation.

7.3 Power requirements

- The centrifuge shall use an AC220V 50HzAC circuit, the voltage shall be stable, and its fluctuation shall be within $\pm 10\%$. The supply voltage should be consistent with the voltage on the nameplate of the machine. Use a voltmeter to detect the voltage. If the difference between the power supply voltage and the rated voltage is more than 10%, the power supply does not meet the installation requirements. (If the power supply voltage cannot meet the requirements, it is recommended to equip the machine with an automatic electronic AC voltage regulator purifier).
- The power plug and socket or circuit breaker shall be no more than 1 meter away from the centrifuge.
- To ensure safety, the centrifuge should relate to a remote emergency switch (preferably outside the room where the centrifuge is located or near the exit), so that the connection between the centrifuge and the main power supply can be cut off in case of failure.
- Kindly make sure that the socket you want to use is properly connected and grounded. Never use a three-wire to two-wire conversion plug; It is absolutely not allowed to use a two-wire extension wire or two-wire grounding type multi-jack terminal block.

7.4 Rotar Installation and Removal

7.4.1 Angle Rotor Assembly and Disassembly Method

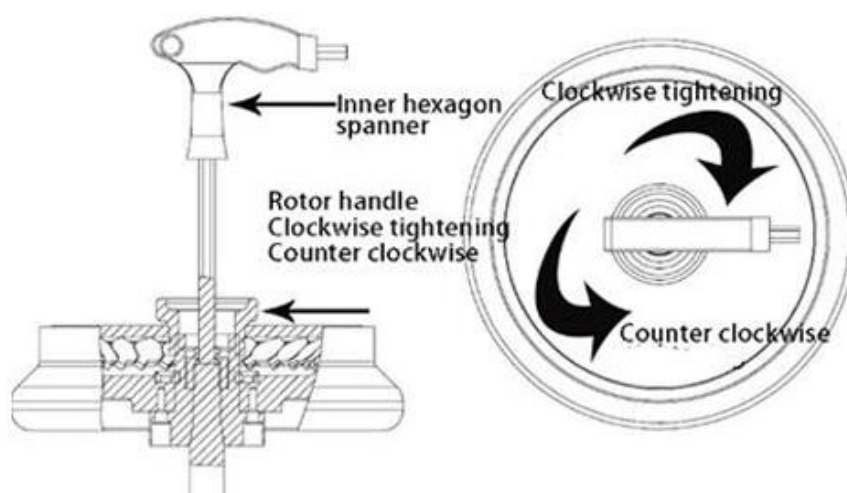


Figure-3

7.4.2 Swing-out Rotor Assembly and disassembly method

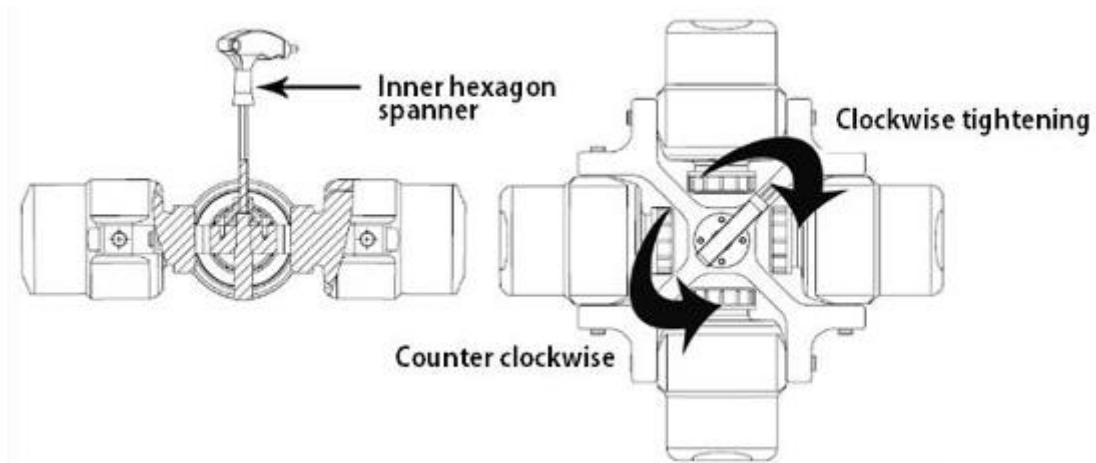


Figure-4

8. Working Principle

The centrifugal working principle is centrifugal sedimentation so that different densities of different cells (particles) in the centrifugal force achieve separation, concentration, or purification.

(RCF) produced by the low-speed rotation of the rotor, the cells are separated from the cells with different densities in the test solution, and the relative centrifugal force (RCF) depends on the location of the specimen to the horizontal distance of the axis of rotation radius (r) and speed (n), the formula is as follows:

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

N: Speed (rpm)

r: rotation radius (cm)

The time Ts for mixed solution separation and precipitation is calculated by the following formula

$$T = 27.4 \times (\log e R_{\max} - \log e R_{\min}) \mu / n^2 r^2 (\sigma - \rho) F$$

Rmax: The radius of rotation of the test solution at the furthest distance from the axis

Rmin: The radius of rotation of the test solution at the nearest distance from the axis

ρ: Mixture density (g/cm)

μ: The viscosity of the mixture (poise)

n: Speed (r/min)

r: Particle radius (cm)

9. Operations

1. Place the centrifuge on the platform, visually balance it, and gently shake it by hand to check whether the centrifuge is placed stably.
2. After confirming that the placement is stable, turn on the power supply, press the power switch, and then press the "Stop/Open" key to open the door cover.
3. Open the door cover, put the rotor gently on the motor drive shaft, screw the nut on the rotor clockwise and tightly connect it with the motor drive shaft (note that the action should be gentle and careful to avoid large left and right shaking and upward and downward pressure, so as not to damage the flexible support of the motor). If the horizontal rotor is installed, hang the lifting cup into the corresponding pin position after the horizontal rotor is fixed. After completion, rotate the rotor body slightly, and the rotor should rotate flexibly. The hanging cup (hanging basket, pipe rack) shall tilt freely on the horizontal rotor without jamming and collision.
4. Put the balanced centrifugal tube symmetrically into the rotor cup or test tube hole to ensure the balanced operation of the rotor.
5. Close the door cover and check whether it is locked properly (lift the door cover gently and forcefully after closing, and the door cover will not open. If the door cover is not closed properly, press "Start", the stop indicator will flash, and the buzzer will alarm).
6. Set operating parameters such as speed, centrifugal force, temperature, time, rotor number, speed up and down gear, etc.
 - Set the speed: Press the **"Up" or "Down"** key, move the cursor to the **"Speed setting"** column, press the "+" or "-" key to adjust the speed, and press the "Confirm" key to save the parameters.
 - Set centrifugal force: Press the **"Up" or "Down"** key, move the cursor to the "Centrifugal force setting" column, press the "+" or "-" key to adjust the centrifugal force, and press the "Confirm" key to save the parameters. Observe the "Rotation speed/centrifugal force switching" column and press the "Confirm" key to switch the rotation speed setting or centrifugal force setting.
 - Set temperature: Press the **"up" or "down"** key, move the cursor to the "temperature setting" column, press the "+" or "-" key to adjust the temperature, and press the **"OK"** key to save the parameters. (Note that the machine has a precooling function. After starting, press the "precooling" key to enter the precooling mode. After a certain time, the machine will complete precooling. When the machine stops running, you can continue to set other operating parameters.)
 - Set the time: Press the **"up" or "down"** key, move the cursor to the "time setting" column, and press. The "+" or "-" key to adjust the time and press the "OK" key to save the parameters.
 - Set the rotor number: Press the **"Up" or "Down"** key, move the cursor to the **"Rotor number"** column, press the "+" key or "-" key to adjust the corresponding rotor number, and press the **"Confirm"** key to save the parameters (the machine has the function of automatically identifying the rotor number, press the "Start" key to automatically identify the rotor

specification, and call the corresponding rotor operation parameters for operation).

- Set the speed up and down gear: Press the "**up**" or "**down**" key to move the cursor to the "acceleration" or "deceleration" column, press the "+" or "-" key to adjust the gear, and press the "**OK**" key to save the parameters.
- The system has 10 gears from 0 to 9. 0 is the fastest and 9 is the slowest. When the angle rotor or horizontal rotor with a large volume is used, the slower gear can be selected, and other gears can be selected. (Call for special purpose details, and the 14 gears reserved by the system can be enabled.)
- Set program group: After setting all parameters, press program group 1. Press the OK key again. You can save the parameters set this time with program group 1. The system can set 99 groups of program storage space. Press the "**program group**" key, move the cursor directly to the position of the program group column, and use the "up" or "**down**" key to set the new program value or call the set program value.
- The program group and rotor number cannot be set during the operation of the machine. Only "**speed**", "**centrifugal force**", "**temperature**", "**time**", "**acceleration gear**" and "**deceleration gear**" can be modified during the operation.
- Before starting the machine, check the parameters set on the screen and confirm that there is no error. Press the "**Start**" key, the machine starts to run, and the operation indicator lights up. The speed starts to rise until it stabilizes at the set value. The speed display window is the actual speed of the rotor. The temperature displayed in the temperature window is the actual temperature in the centrifugal chamber. The time of the time display window starts to count down.
- Press and hold the **start** (instant release) key for a long time to realize the instant centrifugal function and release the machine by hand to stop operation.
- When the time bar reaches 0 or the "**Stop**" key is pressed, the stop indicator will light up, and the speed display of 0 r/min indicates that the machine has been stopped. At this time, open the door cover of the centrifuge chamber and take out the centrifuge tube.
- Open the door cover, carefully take out the centrifuge tube, and the whole separation process is completed.

Note:

Don't open the door frequently. It is recommended that the interval be more than 10 seconds to avoid damage to components. Turn off the power switch and cut off the power supply of the centrifuge.

The screen of this machine has a touch function. The above parameter setting can also be completed by clicking the corresponding function area on the screen.

9.1 Centrifuge Tube and Placement

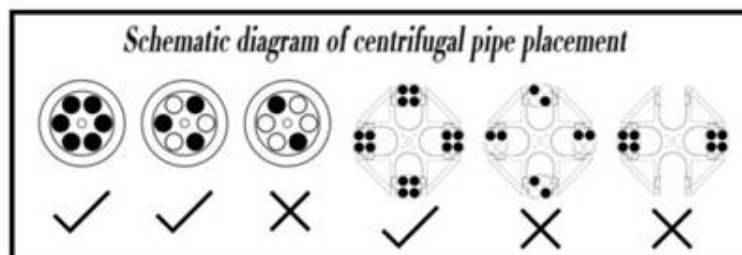


Figure-5

- Kindly place the test tube correctly according to the schematic diagram. Asymmetrical and unbalanced placement is strictly prohibited.
- The rotor shall be used and operated at the specified speed, and over-speed operation is not allowed.
- Open the centrifuge door cover and check whether there is any foreign matter in the centrifuge chamber. If there is any foreign matter, be sure to clean it before operation.
- Before the machine is started, the separated sample after the counterweight is symmetrically placed into the horizontal rotor or angular rotor, and the weighing error is less than 0.5g. All centrifuge bottles (centrifuge tubes) must be put into operation during each operation. It is not allowed to place the separated samples asymmetrically for operation. Incorrect use of centrifuge bottles (centrifuge tubes) will cause great vibration, even damage the machine, and endanger personal safety.
- After putting in the test tube, the angle rotor should confirm whether the cover of the angle rotor is tight, and the horizontal rotor should check whether the hanging cup is hung correctly.

9.2 Refrigeration system

The refrigeration system adopts a highly efficient compressor and a refrigeration and heating double circuit to control the temperature of the centrifugal chamber, which is easy to operate and simple in structure, with Fast cooling and heating speed and high efficiency. When the centrifuge is completed each time, the refrigerator door cover must be opened to evaporate the water vapor in the centrifuge cavity.

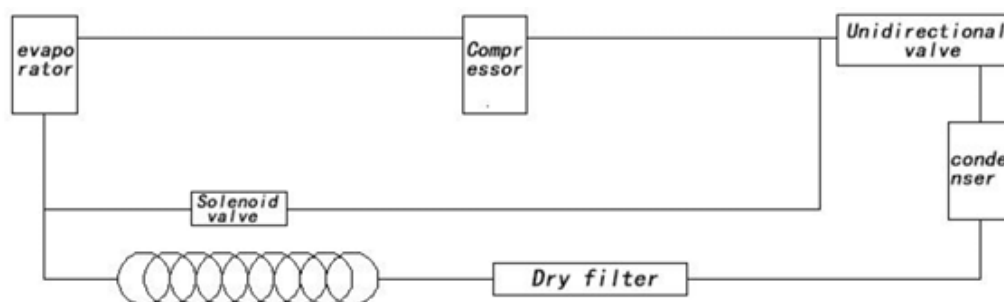


Figure-6

9.3 Centrifuge Safety System

- **Main current protection setting:** When the power supply current exceeds the rated value, the miniature circuit breaker will protect the main machine, and the "overcurrent protection" will be displayed on the top of the machine screen.
- **Over-speed protection device:** When the speed is out of control or exceeds the pre-selected speed of $\pm 300\text{r/min}$ (over-speed treatment can be carried out only after the control system confirms that the speed is stable). At this time, the buzzer will alarm, the top of the machine screen will display "over-speed", and the control system will automatically enter the shutdown step to stop the motor, prevent the machine from over-speed, and protect the machine and personal safety.
- **Unbalance protection device:** When the vibration amplitude of the machine due to unbalanced operation exceeds a certain amount, the buzzer will alarm. The top of the machine screen displays "**unbalance**". At this time, the buzzer will alarm, and the control system will automatically enter the shutdown step to stop the motor, prevent the machine from causing mechanical vibration due to unbalance, and protect the machine and personal safety.
- **Overtemperature protection:** When the temperature exceeds the set temperature ± 6 (the over-temperature treatment will be carried out only after the control system confirms that the temperature reaches the set temperature), the "over-temperature" will be displayed on the machine screen. At this time, the buzzer will alarm, and the control system will automatically enter the shutdown step to stop the motor, prevent the machine from overheating, endanger the machine and personal safety, and better protect the test sample.
- **Door opening protection:** The door cover is not closed or not closed properly, the door lock sensor is faulty, the door protection detection cannot operate when no signal is detected, the buzzer alarms, and the top of the machine screen displays "The door is not closed properly", at this time, the instrument cannot start; When the door is opened during operation, the buzzer will alarm and shut down, and the control system will automatically enter the shutdown step to stop the motor, prevent the door from running, and protect the machine and personal safety.
- When the above prompts appear on the top of the machine display screen, the buzzer will beep for a long time and shut down. The display prompt can be released only after the fault is removed, and the instrument can be started only after the fault is removed. This machine is equipped with a fault display window. When the machine fails, the following characters will be displayed in the "Information Window" column (at the top of the display frequency), with the following meanings:

10. Maintenance

- The centrifuge shall use an AC220V 50Hz AC circuit and ensure voltage stability; If the user's voltage is unstable, it is recommended to equip the machine with a fully automatic electronic AC voltage stabilizer purifier to avoid damaging the centrifuge; The centrifuge should be installed on a solid, stable and level ground, with a certain space left around the chassis to maintain good ventilation.
- The time interval between restarting after each shutdown (power off) shall not be less than 5 minutes to prevent the compressor from being blocked and damaged.
- The centrifuge shell shall be kept clean and dry and can be scrubbed with a dry/wet cloth. Neutral detergent can be used, but acid/alkaline detergent cannot be used.
- The centrifuge chamber should be kept clean and dry. When there are foreign matters in the centrifuge chamber, kindly use rags or tweezers to remove the debris in the centrifuge chamber. Wipe with dry/wet rags, use neutral detergent if necessary, and then rinse and dry with clean water. However, it is not allowed to use acidic/alkaline solvents that corrode materials and chlorinated detergent disinfectants. 70% alcohol can be used to disinfect. For radioactive contamination, use the mixture of 70% alcohol, 10% SDS, and water to clean, then use alcohol and deionized water to clean, and finally use dry soft cloth to dry.
- During normal operation, due to the contact between the air and the wall of the low-temperature centrifugal chamber, condensation occurs, which should be dried in time to prevent frosting. If frosting occurs, take out the rotor, close the centrifugal chamber door, set the temperature to 25 °C, open the chamber door when the temperature reaches 20 °C, dry the centrifugal chamber wall, install the rotor, and set the required temperature.
- After each use of the centrifuge, open the door cover, wipe off the condensate, and then dry it naturally; Before and after centrifugation, the rotor must be gently and vertically lowered or lifted to avoid collision with the motor drive shaft and the rotor itself.
- Rubber sealing rings are provided at the contact between the upper part of the centrifuge chamber and the door cover, and the rotor seat and the bottom of the centrifuge chamber. With the extension of service time, it is necessary to observe whether there is any deformation, to prevent the infiltration of external heat, which will affect the centrifuge results due to poor temperature control effect. In case of deformation or aging, replace it in time.
- Use compressed air (vacuum cleaner) regularly to remove dust from the ventilation window and condenser of the centrifuge, ensure the ventilation effect and the heat transfer effect of the condenser, and make the refrigeration and heating effect better.
- When the centrifuge is not in use for a long time, the rotor body should be taken out and coated with anti-rust oil on the rotor base (or drive shaft) to prevent the rotor base from rusting, which will affect the balance effect of the instrument during operation. If necessary, desiccant can be put into the centrifugal chamber to absorb moisture to prevent the rotor seat (or drive shaft) from rusting.

- The pneumatic support rod of the door cover shall be checked regularly to see whether it can work normally and whether the connection is in good condition. If there are cracks and other problems, kindly replace them immediately.
- Special safety protection measures must be taken when centrifuging toxic, radioactive, and contaminated samples.
- The rotor shall be fixed in the correct position, the inner nut of the rotor shall be tightened with the motor drive shaft, and the rotor and other accessories shall be checked for cracks and corrosion.
- Centrifuge function inspection
 - 1) The operator shall ensure that the important parts of the centrifuge are intact, which mainly refers to:
 - 2) The motor is installed stably.
 - 3) No deviation of the rotor seat (shaft).
 - 4) The ground wire is connected reliably.

10.1 Maintenance of the rotor

- Before using the rotor, it is best to precool it first. After each centrifugal work, wipe off the residual liquid or water on the inner and outer surfaces of the rotor and the centrifugal cup with a clean, soft cloth, and dry it for use. The rotor and centrifugal cup that are not used temporarily shall be taken out of the centrifugal chamber and stored in a clean and dry place. The rotor shall be protected with a layer of paraffin when it is not used for a long time.
- The quality of centrifuge tubes and cups used must be guaranteed, and attention should be paid to their cleaning, disinfection, and maintenance at ordinary times. Regularly check the inner and outer surface oxidation layer of the rotor and centrifugal cup. If there is peeling, corrosion, serious scratch, deformation, or a small crack, stop using.
- Use in hazardous gas or humid environments will accelerate the occurrence and expansion of centrifuge rotor corrosion and affect the service life of the rotor.
- The rotor may leak due to damage to the centrifugal pipe, overfilling, or poor sealing during use. After the rotor is used, it should be removed from the shaft, cleaned, and coated with a protective agent in time (if it is placed on the shaft for a long time, the rotor and the motor drive shaft contact under the action of compressive stress, resulting in increased corrosion, which may cause "seizure").
- To prevent corrosion and hidden dangers, attention should be paid to the sample filling amount of the centrifugal tube and the tightness of the seal during the use of the rotor, and the sealing ring should be checked regularly to see if it is in good condition. In case of aging and damage, replace it in time to avoid liquid leakage.
- Place corrosive solvent in direct contact with the rotor. After the rotor is used, wash, wipe, spray protective agent, and apply protective grease in time.
- During the use and storage of the rotor, try to prevent the rotor from being bruised, or scratched, and scratched to prevent mechanical damage.

- When the average density of the separated sample is greater than 1.2 g/ml, the rotor shall be used at a reduced speed, calculated according to the following formula.
- When using stainless steel centrifugal pipes, reduce the speed and use the appropriate rotor. The metal rotor has a maximum lifespan of 3 years, and the non-metal rotor is 1 year. Do not exceed the speed limit specified in the manual, and never use rotors with cracks or corrosion."

10.2 Anti-Pollution Measures

If the centrifuge or rotor has been used to process radioactive or pathological samples, the following steps should be followed to prevent contamination.

1. Clean the centrifuge and rotor surface as described above
2. Take out the complete set of rotors
3. Remove the sealing ring and gasket of the motor and clean it
4. Clean the centrifuge door cover, centrifugal chamber and rotating shaft
5. Clean all foreign matters and scales near the motor and rotor seat
6. Clean the rotor body and rotor shroud When such centrifuge or rotor is needed, to ensure safety take effective measures to deal with it.

11. Troubleshooting

Trouble	Reason	Method
The screen is not bright when plugged in.	Not power supply.	Check the power supply.
	Blown fuse.	Check and replace it.
	Letter of communication loosening.	Check and adjust it.
Large vibration after the start.	The inner centrifuge tube is not placed symmetrically.	Check and adjust it.
	Centrifugal pipe rupture.	Check and replace it.
	The rotor is not tightened.	Check and adjust it.
	The damping part is damaged.	Check and replace it.
The display screen shows 0000, press the start button machine does not work.	The circuit board or transformer.	Replace the circuit board or transformer.
	The control system connector is loose.	Re-insert control system connector.
	Key damage.	Replace the panel.
	Motor damage or leakage.	Replace the motor.
Capable of running but not fast, the machine has strange sounds or peculiar smells.	Control system or motor fault.	
Actual speed is different from the set or the displayed speed, out of control, or unstable.	Control system fault.	
The temperature cannot meet the set low-temperature requirements.	Without precooling insufficient precooling.	Full pre-cool.
	Compressor damaged.	Check and replace the compressor.
	The solenoid valve is damaged.	Check and replace the solenoid valve.
	Insufficient refrigerant.	Add the proper amount of refrigerant.

High Speed Refrigerated Centrifuge LB-14HRC

Error codes

Error code	Error Type	Solve
E1	Unbalanced.	Check whether the motor damping is loose.
E2	Excess speed.	Re-energize.
E3	The lid is opening.	Close the door before start.
E4	The lid is opened during the operation.	Close the door again.
E7	Zero speed.	Check whether the motor connector is loose.
E8	Communication error.	Restart.
E9	Drive fault.	Restart.
E10	Over Current.	Check whether the rotor is blocked.
E12	High voltage.	Equal voltage returns to normal.
E13	Low voltage.	Equal voltage returns to normal.

12. Rotar Selection

Rotor Type	Maximum Capacity	Maximum Speed	Maximum RCF
Angler Rotor 01	16 × 1.5/2.0 ml	20000 rpm	30677 × g
Angler Rotor 02	24 × 1.5/2.0ml	18000 rpm	31115 × g
Angler Rotor 03	12 × 5ml	16000 rpm	17344 × g
Angler Rotor 04	12 × 10 ml	16000 rpm	23068 × g
Angler Rotor 05	32 × 1.5/2.0 ml	16000 rpm	26044 × g
Angler Rotor 06	48 × 1.5/2.0 ml	16000 rpm	27762 × g
Angler Rotor 07	12 × 15ml (Conical bottom)	14000 rpm	22241 × g
Angler Rotor 08	6 × 50 ml (Conical/round bottom)	12500 rpm	17608 × g
Angler Rotor 09	4 × 100ml	12000 rpm	17016 × g
Angler Rotor 10	6 × 100 ml	12000 rpm	17548 × g
Angler Rotor 11	8 × 50ml (Conical/round bottom)	10000 rpm	12611 × g
Angler Rotor 12	60 × 1.5 ml	15000 rpm	18826 × g
Angler Rotor 13	40 × 15 ml(W)	5000 rpm	4919 × g
Swing-out Rotor 01	4 × 100 ml	5000 rpm	3717 × g
Swing-out Rotor 02	4 × 250 ml (Round bucket)	4200 rpm	3352 × g
Swing-out Rotor 03	4×250ml (Square bucket)	4200 rpm	3352 × g
Swing-out Rotor 04	2 × 2 × 96 hole (Micro-plate)	4200 rpm	2267 × g



Labotronics Scientific. 1007 N Orange St., Suite 1382, Wilmington, DE 19801, USA.
info@labotronics.com | www.labotronics.com