FOUR E'S SCIENTIFIC

Operating Instructions
使用说明书

High-Speed Refrigerated Centrifuge
高速冷冻离心机

CF321

Contents

Please read the operating instructions in full before starting up and follow the safety instructions.
The appearance and specifications are subject to change without notice.

1. Operating Instructions

1.1 Using this manual

Please read the operating instructions completely before using the device.

It is not allowed to operate the device without reading the manual. Be sure to observe all safety instructions in this manual. If neglected, personal injury and/or instrument damage can be caused. Carefully read and fully understand the following safety notices.

1.2 Safety instructions

- Follow the instructions and precautions described in this manual to operate, repair and maintain this device safely, which if not strictly observed, will result in damage or short service life of the device.
- This device is for indoor use only. Please carefully read this manual before use to avoid personal injury or possible death.
- Only trained staff should operate this device.
- Do not open or repair the device, which will void the warranty and may also expose to the risk of electric shock. Please contact the supplier for repair.
- The device must be grounded properly to avoid electrical shock hazards. This device uses a three-pin plug, and the third pin is a ground pin. Only use earth/grounded sockets with a protective earth (PE) conductor.
- Ensure that power connection is in accordance with the

specifications on the name plate. Replace the power cord if it is broken.

- Only use a power cord with the same specs and ratings as the original cord.
- Avoid operating the device in a dusty or humid environment or close to water or strong sunlight.
- The device may only be used in a safe environment, such as in the open environment of a well-ventilated laboratory or a fume hood.
- Do not operate the device in areas where explosive substances, aggressive gases or strong magnetic field is present.
- Switch off the device if it is not used. If not in use for a long term, then disconnect the device from the power supply, and cover it with soft cloth or plastic paper to avoid dust or other materials going into the device.
- The ventilation slots of the device must not be obstructed during operation.
- Disconnect the device from the power supply immediately and contact your distributor if:
  - Liquid or water splashed on to the rotor;
  - Abnormal sound or smell during the operation;
  - Device is dropped accidentally or housing is damaged;
  - Any apparent changes in the function.

2. Unpacking

Please unpack the device carefully and check it for damage. It is important that any transport damage is detected when the device is unpacked. In the case of any damage a fact report must be sent immediately (post, rail or forwarder).

Package contains:

No	Item	QTY
1	High-speed refrigerated centrifuge	1
2	Power cord	1
3	Emergency lid release pin	1
4	Wrench	1
5	Operating instructions	1
6	Warranty card	1
7	Certificate	1

3. Product Description

The CF321 High-Speed Refrigerated Centrifuge has a maximum capacity of 24x1.5ml or 24x2.0ml (centrifuge tubes) and reach a maximum of 15,000rpm/21,130xg. Four rotors are suitable for various applications, including 24x1.5/2.0ml tubes, 18x1.5/2.0ml tubes, 4xPCR strips or 12x5ml tubes. Three adjustable speed levels allow for a wide range of lab applications.

Product features:

- 5-inch color LCD touch screen displays time, speed, and temperature.
- Lid locking offers improved safety, and the lid can be easily closed with light pressure.

- With wide temperature control range: -10°C to +40°C
- Brushless DC motor, maintenance-free and long service life.
- Strong fast pre-cooling function ensures reliable cooling at 4°C even at maximum rotor speed.
- With a fast pre-cooling speed (Room Temperature to 4°C in only 8 minutes), the centrifuge is ready for use in a very short time.
- Built-in condensate tank to prevent the accumulation of condensate in the rotor chamber.
- The rotors are made of high-strength aluminum alloy, resistant to high temperature and high pressure.

4. Specifications

4.1 Working conditions

Permissible ambient temperature：5℃~30℃

Relative humidity：≤70%

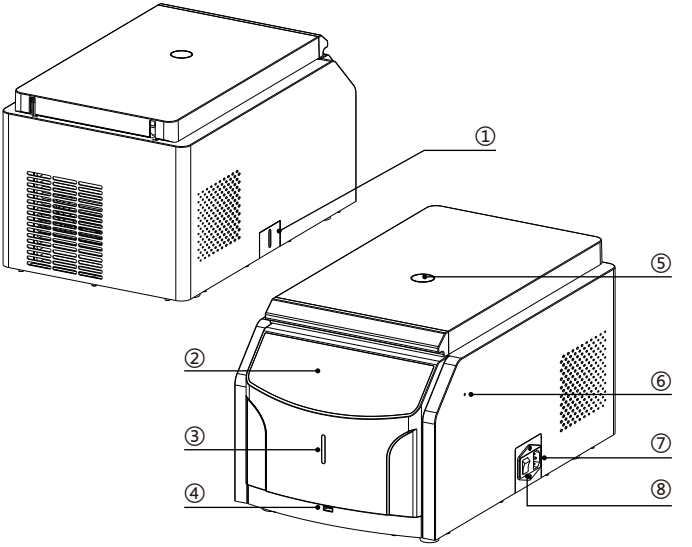
Power supply：AC100~120V/AC200~240V, 50/60HZ

4.2 Technical parameters

Model No.	CF321
Speed range	500~15000rpm (increment: 100rpm)
Temperature control range	-10 °C to +40 °C
Time Setting Range	1s-99h59min, with continuous run function
Rotor Capacity	24×1.5/2.0mL tubes (standard), 18×1.5/2.0mL tubes or spin columns, 12×5mL tubes, 4×8×0.2mL PCR strips/tubes
Max. RCF	21,300xg
Temperature control accuracy (at 4°C)	±1°C
Pre-cooling time (at speed of 15000rpm)	≤5min from RT (~21°C) to 4°C
Power	500W
Weight	30Kg
Dimension (L*W*H)	520×305×285mm

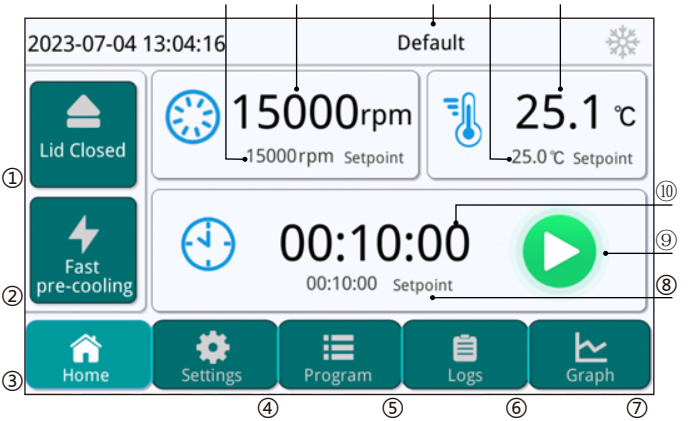
5. Product overview

5.1 Product structure



①	Condensate tank	⑤	View Port
②	Operation panel and display	⑥	Emergency lid release hole
③	Indicator	⑦	Power socket
④	USB interface	⑧	Power switch

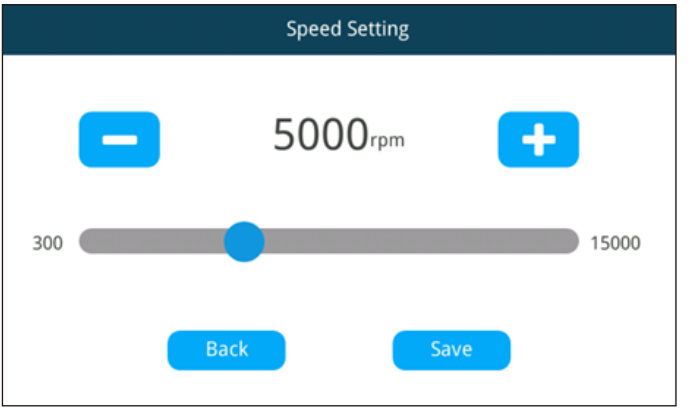
5.2 Operation Panel



①	Open/close the lid
②	Switch on/off the fast pre-cooling function
③	Back to the home screen
④	Click to enter Settings Menu
⑤	Create/Edit programs
⑥	Check the operation Logs
⑦	Display the speed and temperature
⑧	Set centrifugation time
⑨	Start/Stop Program
⑩	Display the remaining centrifugation time
⑪	Display the real-time temperature
⑫	Set the temperature
⑬	Display the running program name
⑭	Display the real-time speed
⑮	Set the speed

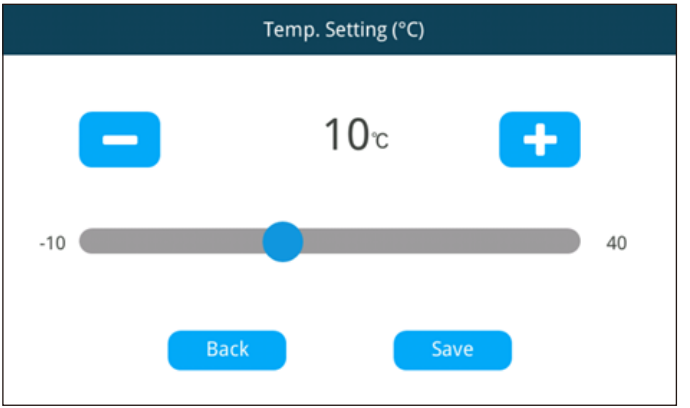
6. Operation Settings

6.1 Speed setting



Set the speed of centrifugation and adjust it by pressing “+/-” icons (increment is 100rpm) or use slide function for faster adjustment. The speed range is 300~15000rpm.

6.2 Temperature setting

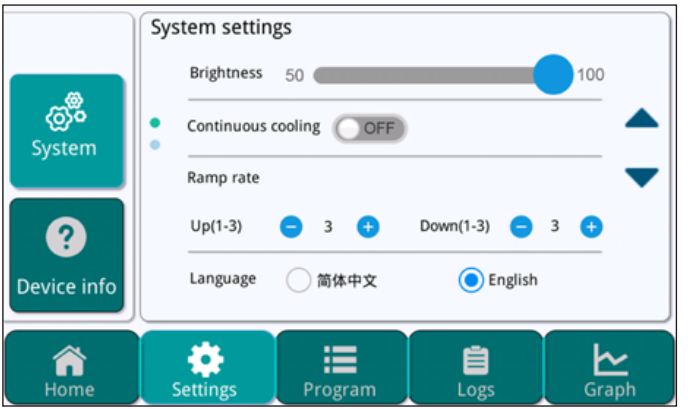


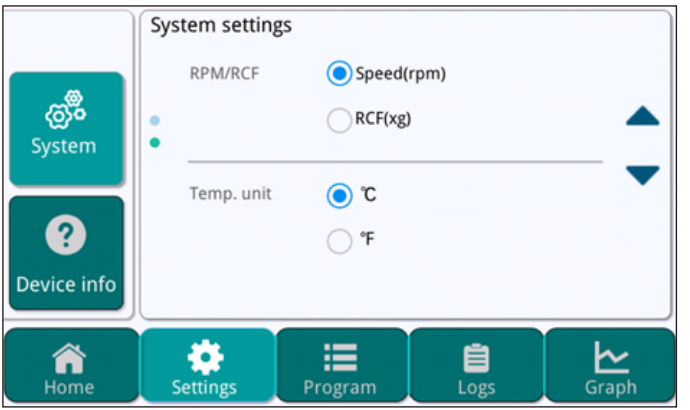
Press “+/-” icons to adjust the temperature (increment is 1°C) or use slide function for faster adjustment. The temperature control range is -10~40°C.

6.3 Time setting

Slide up and down to set the centrifugation time.

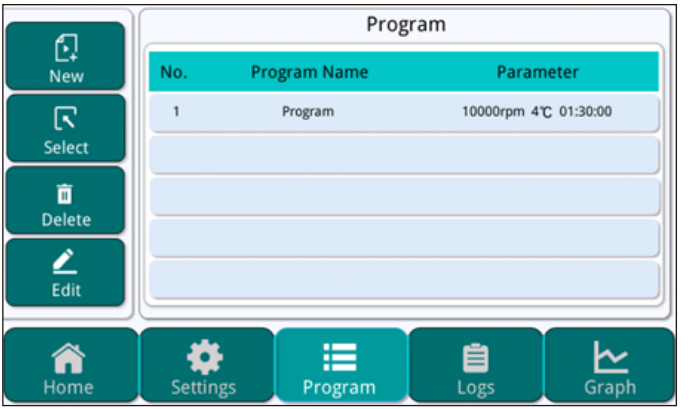
6.4 System settings





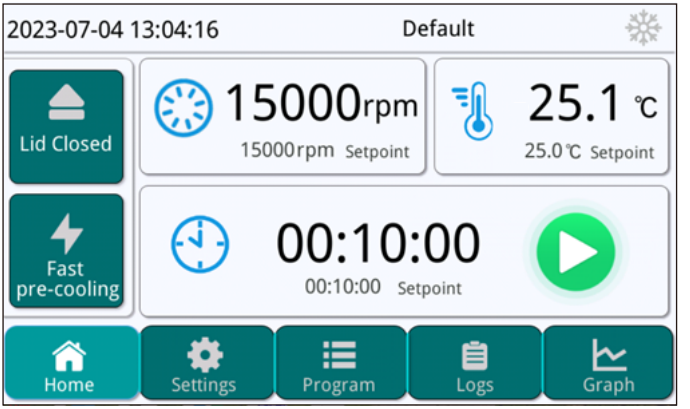
- Brightness: Slide left or right to adjust the brightness.
- Continuous cooling: Switch On and close the lid to start continuous cooling automatically.
- Three adjustable speed levels: Speed can be accelerated from 0 to 15000rpm or decelerated from 15000rpm to 0 at three speed levels. When setting 1st, 2nd, 3rd speed level, the acceleration and deceleration time is 60s, 40s, 15s respectively.
- Language: Chinese or English
- RPM/RCF: speed or RCF
- Temp. unit: ℃ or ℉

6.5 Program settings



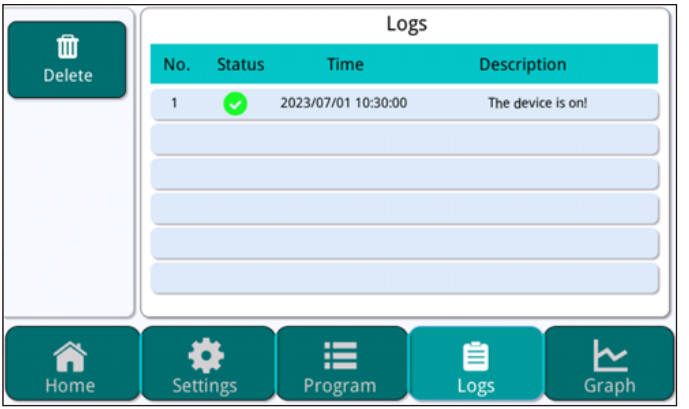
- New: click “New” button to create a new program
- Select: Choose a program to run, then click “Select” button
- Delete: Choose a program to delete, then click “Delete” button
- Edit: Select a program to edit, then click “Edit” button

6.6 Fast pre-cooling



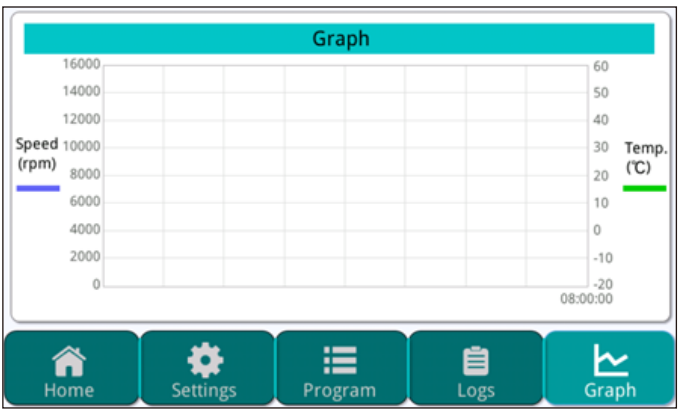
Click to start the fast pre-cooling function. The rotor rotates at the speed of 1000rpm, facilitating the chamber to be cooled down to the set temperature in a short time. The rotor chamber will be maintained at the set temperature for a while.

6.7 Logs



Logs shows program runs and can be used to monitor system performance, and for troubleshooting.

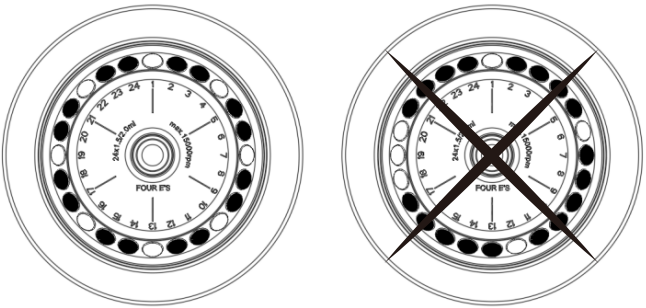
6.8 Graph



The graph helps users intuitively monitor the real-time speed and temperature.

7. Instructions for the Rotor and Tubes

- Insert the rotor to the motor shaft. Ensure the rotor is in position and connected to the shaft. Tighten the locking nut firmly by turning it clockwise with the wrench. Ensure the rotor is firmly secured on to the motor shaft without any slackness or movement. You can remove the rotor by turning the locking nut counterclockwise using the wrench.
- Attach and tighten the rotor lid.
- Insert tubes opposite each other in pairs into the rotor bores. To ensure symmetric loading, tubes that are arranged opposite each other must be of the same type and contain the same sample quantity. To minimize weight differences between filled sample tubes, we recommend balancing. This will reduce wear on the drive and also reduce operating noise.



8. Troubleshooting

8.1 Error messages

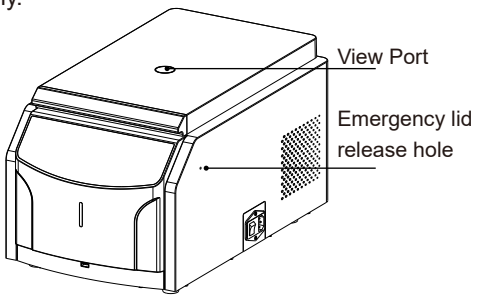
Problem	Cause	Solution
No display	No power connection	Check the power connection
	Damaged power socket	Replace the power socket
	Damaged power switch	Replace the power switch
	Others	Contact distributor/manufacturer
Centrifuge lid can't be opened.	The rotor is still running.	Wait for the rotor to stop.
	Power outage	1. Check the power supply
		2. Activate the emergency lid release.
Loud noise during operation	The rotor is not loaded properly.	Switch off the device and tighten the rotor nut and rotor lid
	The tubes are asymmetrically loaded.	Switch off the device and load the tubes symmetrically.
Temperature display doesn't match the actual temperature.	Damaged temperature sensor.	Contact distributor or manufacturer
Shows "High Rotor Temperature. Device stopped automatically."	The ambient temperature is too high.	The ambient temperature should be less than 30°C.
	No refrigerant or PCB fault.	Contact distributor or manufacturer

Note: In case of any error messages display not in above list, please contact your local distributor or manufacturer.

8.2 Emergency lid release

During power outage, the centrifuge lid cannot be opened using the “Open lid” button on the operation panel. In that case, the lid can be opened by the emergency lid release.

- Ensure the rotor is not running through the view port.
- Disconnect the device from the power supply.
- Insert the emergency lid release pin or a thin screwdriver into the emergency lid release hole and push it, then the lid will open automatically.



9. Maintenance and Cleaning

- Switch off the device and disconnect it from the power supply before starting cleaning or disinfection.
- Do not allow any liquids to penetrate the inside of the housing.
- Remove the rotor and clean it using a soft cloth soaked with diluted alcohol.
- Clean any dust deposits using a brush, but not a wire brush.
- Thoroughly clean the rotor and rotor chamber, and check the rotor for wear, damage and corrosion.

- Only use cleaning agents and disinfectants with pH between 6 and 8.
- If the device has been contaminated by aggressive chemicals, clean immediately using a mild cleaning agent.
- Do not exceed temperature of 121°C or a time of more than 20min. while autoclaving.
- Replace the seals of rotors after 50 autoclaving cycles. (Seal PN: 3.4.603440007)
- Regularly empty and clean the condensate tank.
- Regularly free the rotor chamber from ice formations by thawing, by either leaving the centrifuge lid open or by performing a short temperature control run at approx. 30°C.

10. Warranty

You have purchased an original laboratory machine which meets the highest engineering and quality standards. In accordance with our warranty conditions, the warranty period is 2 years from our shipment. For claims under the warranty, please contact your local supplier. You may also send the instrument directly to us with an invoice and a description note of the problem. The shipping costs will be borne by the user and will be confirmed prior to shipping.

The warranty does not cover natural wear and tear of parts, nor does it apply to faults or damage caused by negligence, improper operation, or failure to use and maintain the machine in accordance with the instructions in this operating manual.

We reserve the right to change or modify or improve any of our instruments without any obligation to make corresponding changes to any instruments previously sold.

目录

请仔细阅读说明书并在说明书的操作指导下安全使用本仪器。
外形和性能指标如有变动，概不另行通知。

1. 重要说明

1.1 安全说明

用户在安全操作仪器之前需要对仪器是如何工作的有一个完整的了解。用户在运行仪器之前，请仔细阅读本手册。

禁止任何人在未阅读本手册之前操作仪器。如果不按照说明书上的提示进行操作，仪器在运行时造成意外伤害，并且可能发生安全事故。请仔细阅读以下安全提示和指导，并实施其中所有的防范措施。

1.2 注意事项

在操作、维护和修理本仪器的所有过程，须遵守下面的基本安全防范措施。如果不遵守这些措施或本手册其它地方指出的警告，可能影响到仪器提供的保护及仪器的预期使用范围。

- 本仪器是室内使用的产品。在操作本仪器前请认真阅读本操作手册，否则可能会造成人身伤害。
- 只有在如何安装使用电器设备方面受过培训的合格的检验人员才能操作此仪器。
- 操作人员不要试图打开或维修仪器，这样做会失去保修资格，也可能会受到电击。如需修理，请联系本公司。
- 为避免触电事故，仪器的输入电源线必须可靠接地。本仪器使用的三芯接地插头，其中第三脚为接地脚，应配合接地型电源插座使用。
- 连接电源之前，要确保电源的电压与仪器所要求的电压一致。并确保电源插座的额定负载不小于仪器的要求。如果电源线破损，必须更换。
- 更换时必须使用相同类型和规格的电源线代替。
- 本仪器应放在湿度低，灰尘少并远离水源和避免阳光及强光源直射的地方，室内应通风良好，无腐蚀性气体或强磁场干扰、远离暖气、炉子以及其它热源。不要将仪器安放在潮湿或灰尘较多的地方。
- 停止工作时应关闭电源，长时间不使用本仪器时，应拔下电源插头，并用软布或塑料纸覆盖仪器以防止灰尘进入。

- 在使用时，仪器的通风口处不允许放置物品，会影响仪器的冷凝器散热效果，导致机器性能下降。
- 在下列情况下，应立即将仪器的电源插头从电源插座上拔掉，并与经销商联系：
  - 有液体洒落进仪器内部；
  - 仪器经雨淋或水浇；
  - 仪器工作不正常，特别是有任何不正常的声音或气味出现。
  - 仪器意外掉落或外壳受损；
  - 仪器功能有明显变化。

2. 开箱检查

请小心打开包装并检查仪器是否破损，如发现任何破损，请填写破损报告并立即通知当地代理商和货运公司。

装箱清单：

序号	配件名称	数量
1	产品主机	1
2	电源线	1
3	开门针	1
4	内六角扳手	1
5	说明书	1
6	保修卡	1
7	合格证	1

3. 产品简介

CF321是一款体积小巧、结构紧凑、安全、运行安静的24孔台式高速冷冻离心机。最高可同时离心24个1.5/2.0ml的离心管，最高转速15000rpm，最高离心力可达21130xg。四种转子可选，适用于24x1.5/2.0ml转子，18x1.5/2.0ml转子，4xPCR排管转子，12X5ml转子，有3档升降速可选，满足多种实验需求。可以满足每个分子和生物实验室的需求。最高转速时也可保持4℃。

产品特征：

- 彩色液晶大屏，可同时显示时间、转速、温度；
- 电机门锁吸附设计，单手即可关闭离心机腔门；
- 温控调节系统（-10~40）；
- 静态预冷，离心机盖门关闭状态下，压缩机自动启动制冷；
- 直流无刷电机，寿命长，免维护；
- 强大制冷能力，最高转速也可保持4°C；
- 降温速度快，8分钟内完成预冷（~21°C降至4°C）；
- 外置冷凝水槽，防止冷凝水聚集在离心腔内；
- 可存储20组用户自定义程序，方便调用常用程序；
- 高强度铝合金转子，可耐受无数次高温高压消毒；

4. 产品特性

4.1 正常工作条件

使用环境温度：5°C~30°C；

相对湿度：≤70%；

使用电源：AC220~230V，50/60HZ

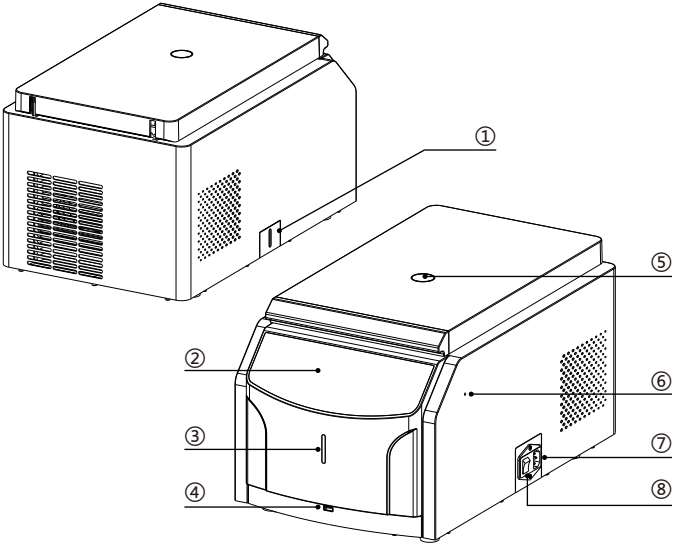
4.2 基本性能参数

产品型号	CF321
转速范围	500~15000rpm (100rpm步长)
温度范围	-10°C 至+40°C
时间设定	1 秒 - 99小时59分钟 可连续离心
最大容量	24× 1.5/2.0 mL,18× 1.5/2.0 mL, 12X5mL, 4×8×0.2mLPCR排管转子
相对最大离心力	21300xg
控温精度（4°C时）	±1°C
15000rpm下，到4°C所需时间	≤5min
功率	500W
净重	30Kg
外形尺寸（L*W*H）	520× 305× 285

5.操作说明

本章主要介绍本仪器的结构，操作面板的功能，以及在开机前的准备工作，首次使用本仪器时，请先熟悉本章内容。

5.1 产品结构



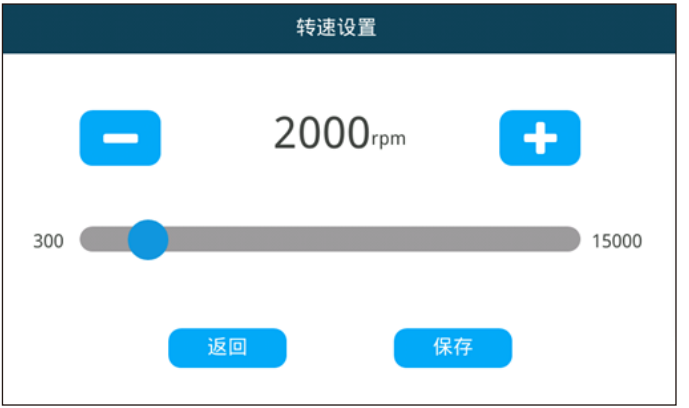
①	冷凝水槽	⑤	观察窗
②	显示屏	⑥	紧急解锁孔
③	指示灯	⑦	电源插座
④	USB接口	⑧	电源开关

5.2 操作主界面

①	打开门上盖	⑨	程序启动按键
②	快速预冷功能开关	⑩	离心剩余时间显示
③	返回主界面		实时温度显示
④	进入设置菜单		温度设定
⑤	进入程序菜单		运行程序名称
⑥	查看工作日志		实时转速显示
⑦	查看工作曲线		离心转速设定
⑧	离心时间设定		

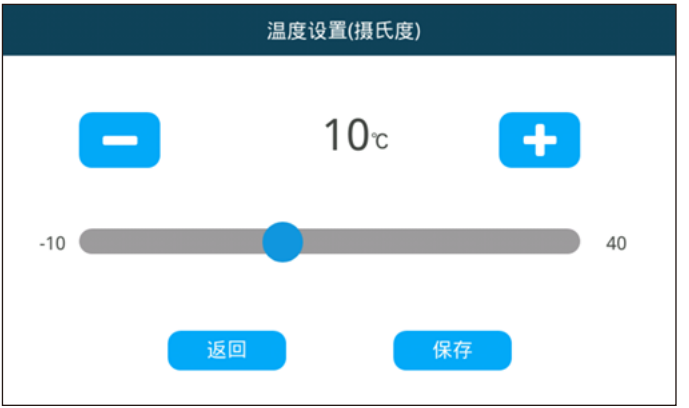
6.操作指南

6.1 转速设置



点击左右侧“-”“+”符号按钮，可实现转速加减，每次加减100rpm，拖动调节滑块，可实现快速调整，转速设定范围300-15000rpm.

6.2 温度设置



点击左右侧 -” +” 符号按钮，可实现温度调整，每次加减1°C,拖动调节滑块，可实现快速调整，温度设定范围-10~40°C.

6.3时间设置

上下滑动可设置离心时间。

6.4 系统设置

- 屏幕背光：左右滑动可调节屏幕亮度；
- 静态预冷冻：功能打开时，离心机上盖闭合时，自动开启预冷功能；
- 电机加减速度：三种加减速可调节，1、2、3档加减速时间分别为60s、40s、15s；
- 语言设置：中文、英文；
- 电机转速单位：可选转速或者离心力；
- 温度单位：可设置摄氏度或者华氏度；

6.5 程序设置

- 新建：点击后进入新建程序界面，创建新程序;
- 选择：点击想要运行的程序（例如：2号）,再点选择按键;
- 删除：点击想要删除的程序（例如：2号），再点删除按键，即可删除程序;
- 修改: 点击想要修改的程序（例如：2号），再点修改按键，进入修改程序界面;

6.6 快速预冷

启动该功能，在转子以1000rpm的转速情况下，使离心腔内快速达到设定温度，达到设定温度后会将温度保持在设定温度。

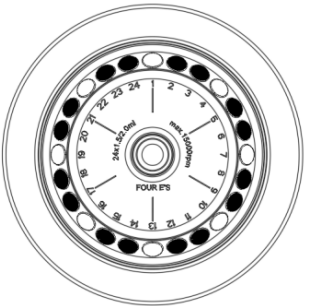
6.7 工作日志

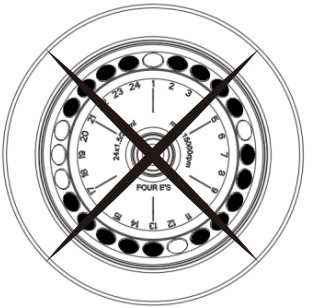
6.8 监控曲线

实时显示转速及温度变化曲线。

7. 转子安装与拆除

- 将转子竖直穿入电机轴，一只手按住转子，用内六角扳手将转子锁紧螺母顺时针拧紧。拧紧后转子与电机轴不能有任何松动或者相对滑动；如需拆除转子，逆时针松动锁紧螺母，即可取下转子。
- 装上转子盖并拧紧；
- 离心管必须成对的装在转子孔内，为保证装载对称，相对两侧的离心管型号和填充量必须相同。为缩小装有样品的离心管间的重量差异，建议用一台秤均衡重量。这样可以保护驱动装置，降低噪音





8. 故障分析与处理

8.1错误信息

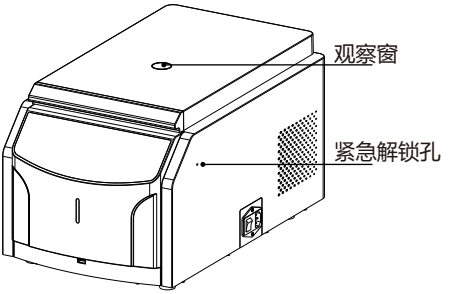
序号	故障	原因分析	解决方案
1	显示屏不亮	未通电	检查电源并接通
		电源损坏	更换电源
		开关损坏	更换开关
		其它	与供应商或厂家联系
2	离心机上盖打不开	转子还在转动	等待离心机停止工作
		停电	1、检查电源； 2、操作紧急解锁装置
3	运行噪音大	转子安装不正确	停止离心机，检查转子及转子盖是否锁紧；
		离心管放置不对称	停止离心机，将离心管对称放置。
4	温度显示与实际严重不符	传感器损坏	与供应商或厂家联系
5	提示信息“转子腔内温度过高，离心机停止工作”	离心机使用环境温度过高	使用环境温度不高于30℃
		内胆不制冷	与供应商或厂家联系

提示：如出现的错误信息不在列表中，请联系供应商或厂家。

8.2紧急解锁机构

设备断电时，无法正常通过电机驱动打开上盖。在紧急情况下，可通过紧急解锁结构打开离心机。

- 从观察窗确认转子已停止转动；
- 拔掉电源插头；
- 用开门针或细的螺丝刀插入紧急解锁孔，轻轻用力推动，上盖会自动打开。



9. 清洁与维护

- 在开始清洁或消毒工作前，关闭设备并断开电源；
- 不要让任何液体进入设备内部；
- 拆下转子，用干净的软布蘸稀释的酒精清洁；
- 对于难去除的污垢残余，可以用刷子，但不能使用钢丝刷；
- 彻底清洁后，必须检查转子有无损坏、磨损和腐蚀；
- 只能使用PH值在6-8之间的清洁剂和消毒剂；
- 如果被腐蚀性化学物质污染，立即使用中性清洁剂清洁本设备。
- 高温灭菌温度不能超过121℃，时长不超过20分钟；
- 50次高温高压灭菌后需更换气密性转子盖的密封圈；
  （硅胶O型圈零件号：3.4.603440007）
- 定期排空并清洁冷凝水槽；
- 在设备未使用时打开离心机盖，或使转子腔内温度短暂升至约30℃，以此解冻转子腔中的积冰。

10.保修

您购买的是一台符合最高工程和质量标准的原装实验室机器。根据本公司的保修规定，本机保修2年，自发货日起算。对于保修期内的索赔，请联系您当地的供应商。您也可以将仪器直接寄给我们，并附上发票和问题的描述说明。经我们事先确认，运费将由您承担。

保修不包括部件的自然磨损，也不包括因疏忽、操作不当或未按照说明书使用和维护机器而造成的故障或损坏。

我们将保留提升和改进任何仪器的权利，对于此前出售的任何仪器，我们没有进行相应修改的义务。

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