

# USER MANUAL

Multi-purpose Low-speed Centrifuge



Before using centrifuge, please carefully read this user manual for its efficient operation and safety.

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We can not be responsible to inform at real-time if the outline and specifications of centrifuge is subject to change for improvement.


*VERSION201510*

## Safety Reminder


### Common safety precautions

Carefully read the following safety precautions for a thorough understanding.

- Follow the instructions and procedures described in this manual to operate this centrifuge safely.
- Carefully read all safety messages in this manual and the safety instructions on the instrument.
- Safety messages are labeled as indicated below. They are in combination with signal words of “WARNING” and “CAUTION” with the safety alert symbol  to call your attention to items or operations that could be dangerous to you or other persons using this instrument. The definitions of signal words are as follows:

 **WARNING:** Personal Danger

Warning notes indicate any condition or practice, which if not strictly observed, could result in personal injury or possible death.

 **CAUTION:** Possible damage to instrument

Caution notes indicate any condition or practice, which if not strictly observed or remedied, could result in damage or destruction of the instrument.

**NOTE:** Notes indicate an area or subject of special merit, emphasizing either the product’s capability or common errors in operation or maintenance.

- Do not operate this centrifuge in any manner not described in this User manual. When in doubt or have any troubles with this centrifuge, ASK FOR HELP.
- The precautions described in this User manual are carefully developed in an attempt to cover all the possible risks. However, it is also important that you are alert for unexpected incidents. Be carefully operating this centrifuge.



**WARNING:**

- This centrifuge is not explosion-proof. Never use explosive or flammable samples.
- Do not install the centrifuge in or near places where inflammable gases are generated or chemicals are stored.
- Do not place dangerous material within 30cm around the centrifuge.

- Make sure to prepare necessary safety measures before using samples that are toxic, radioactive or contaminated with pathogenic micro-organisms at your own responsibility.
- If the instrument, rotor and/or accessories that has been contaminated by solutions with toxic, radioactive or pathogenic materials, clean it according to the decontamination procedure that you are specified.
- If you require services at site, please sterilize and decontaminate it in advance, and then notice the service center involved in the details of the particular materials.
- Do not handle the power cord or turn on or off the POWER switch with wet hands to void electrical shocks.
- For safety purposes, do not enter within 30cm around this centrifuge while it is in operation.
- While the rotor is rotating, never forcedly release the door lock.
- Unauthorized repairs, disassembly, and other services to the centrifuge except by our service center are strictly prohibited.

 **CAUTION**

- This centrifuge must be located on one firm and level table.
- Make sure the centrifuge is horizontal before running.
- Make sure the angle between the door and cover is greater than 70 degrees when open the door.
- Be careful not put your fingers or hands between the door and cover when the door off.
- Do not move or relocate this centrifuge while it is running.
- If fluid spills in the rotor chamber, please promptly clean and dry with a dry cloth to avoid sample contamination.
- Ensure to remove any objects and fragments of the tubes dropped inside the rotor chamber before running this centrifuge.
- Cautions on rotors
  - (1) Always check for corrosion and damages on the rotor surface before using it. Do not use the rotor if an abnormality is found.
  - (2) Do not set the centrifuge speed beyond the allowable minimum speed of the rotor kits (rotor or adapters). Make sure to run it below the allowable minimum speed.
  - (3) Do not exceed the allowable imbalance.
  - (4) Use the rotor and tubes within their actual capacities.
  - (5) If the rotor is attached with a lid, ensure it is tightened before operation.
- If any abnormal condition occurs during operation, please stop it immediately and contact our service center. Notify the service center is a warning code if displayed.
- Vibrations are likely to damage the centrifuge, contact our service center if abnormality observed.

# 1. Specifications

Maximum speed	6000rpm(300-6000rpm), increment: 10rpm
Speed accuracy	±20rpm
Maximum RCF	4020×g, increment: 10×g
Maximum capacity	100ml×4(swing out rotor), 50ml×6 (angle fix rotor)
Rotor types	Swing out rotor: 100ml×4, micro plate rotor
	Angle rotor: 2.0ml×30, 2.0ml×60, 5.0mlV×18, 50mlV×6, pcr8×12, 15ml×30, 50ml×8,
Timer	30seconds -99minutes-HOLD, continuous operation
Driving Motor	Brushless DC motor
Memory	9
Acceleration / Deceleration	9 ↑ /10 ↓ (deceleration10: free braking)
Safety devices	Dual door interlock、Over-speed detector、Chamber over-temperature detector、Motor over-temperature detector、Imbalance protection, Error code runtime display
Power requirements	Single-phase, 220V-240V, 50Hz/60Hz, 8A. 110V-120V, 50Hz/60Hz, 12A
Dimensions (mm)	(L) 280× (W) 364× (H) 266
Weight	30kg
Additional features	Speed/RCF switch、Pulse operation、LCD display of runtime status, buzzer notification & alert

# 2. Declaration of Conformity

<b>Construction in accordance with the following safety standards:</b>
EN 61010-1
EN 61010-2-020
<b>Construction in accordance with the following EMC standards:</b>
EN 61326-1/ FCC Part 15 Subpart B/ IECS 001
<b>Associated EU guidelines:</b>
EMC-guidelines: 2004/108/EC
Instrument guidelines: 2006/95/EC
This ISM device complies with Canadian ICES-001.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.



**NOTE:** This centrifuge has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the centrifuge is operated in a commercial environment. The centrifuge generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the user manual, may cause harmful interference to radio communications. Operation of centrifuge in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference.

## 3. Required Operational Condition

### 3.1 Basic operational Conditions

- (1) Power:
  - Single-phase, 220V-240V, 50Hz/60Hz, 8A;
  - Single-phase, 110V-120V, 50Hz/60Hz, 12A;
- (2) Ambient temperature: 2°C ~ 40°C.
- (3) Relative humidity: ≤ 80%.
- (4) No vibration and airflow around.
- (5) No electric dust, explosive and corrosive gases around.

### 3.2 Transport and storage condition

- (1) Storage temperature: -40°C ~ 55°C.
- (2) Relative humidity: ≤ 93%.

## 4. Installation

This section describes the instructions that you should abide when install the centrifuge to ensure your safety and the optimum performance. Before moving the centrifuge, the rotor must be removed.

 **WARNING:**

- Improper power supply may damage centrifuge.
- Make sure the power source conforms to the required power supply before connecting.



## 4.1 Location

(1) Place the centrifuge on a firm, flat and level table, ensure the four feet of this centrifuge stand on the table firmly. Avoid installing on the slippery surface or surface prone to vibration.

(2) Ideal ambient temperature is  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , avoid placing the centrifuge in direct sunlight if temperature exceeds  $30^{\circ}\text{C}$ .

(3) Keep clear of the centrifuge at least 10cm on both sides and at least 30cm behind it to guarantee the cooling efficiency.

(4) Keep away from heat or water to avoid sample temperature issues or centrifuge failures.

## 4.2 Connection of the power cord and grounding

**⚠ WARNING:**

- To avoid electrical shocks, ensure your hands are dry when touching the power cord.
- This centrifuge must be grounded properly.

A minimum 10A outlet providing a sufficient ground is required, and this must meet with local safety requirements.

## 5. Structure

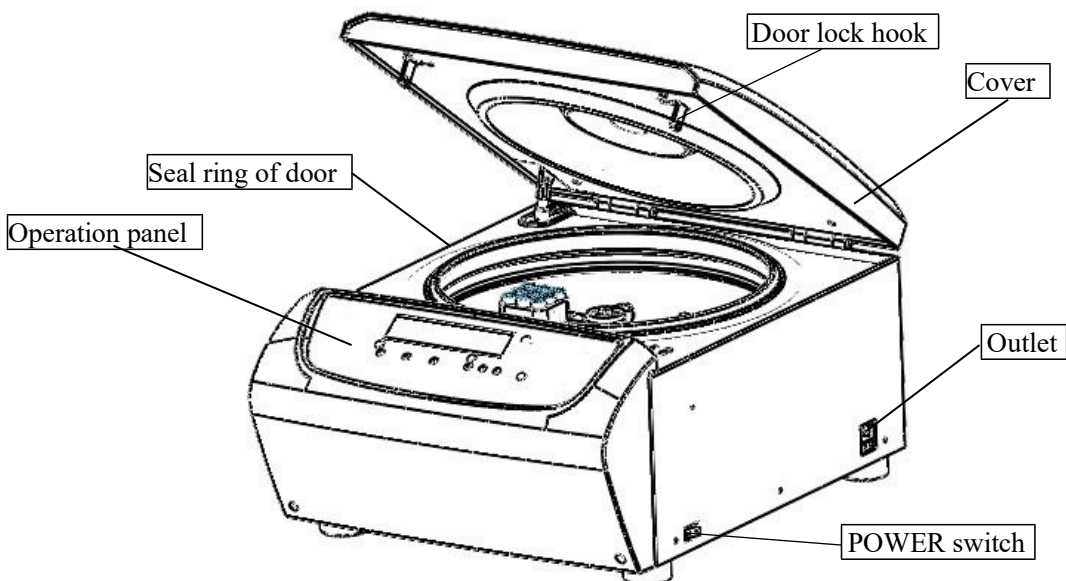


Figure 5.1 D1536 Front view of the centrifuge

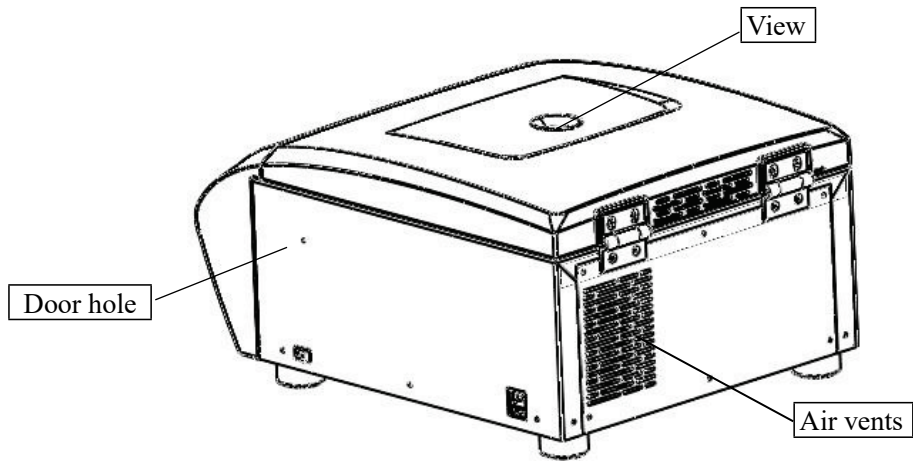


Figure 5.2 D1536 back view of the centrifuge

## 6. Operation panel

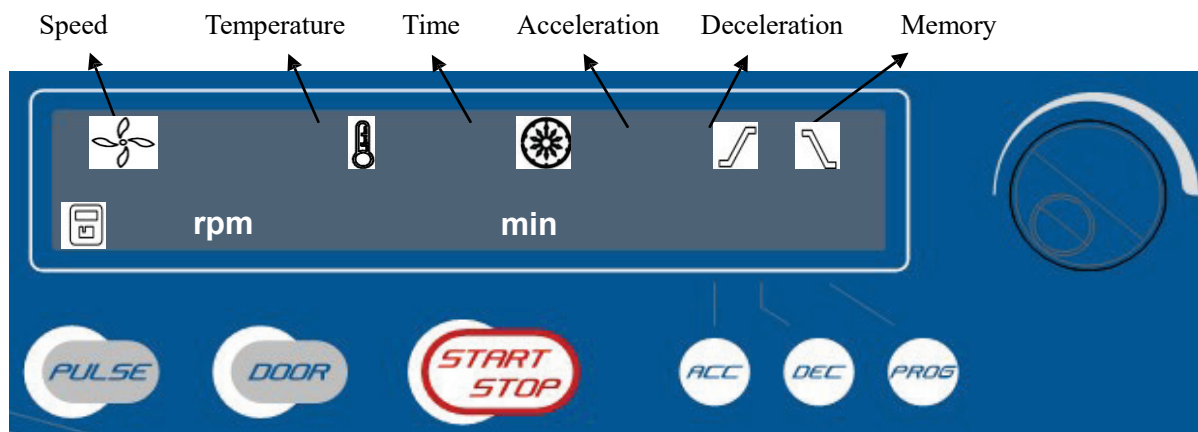


Figure 6-1 Operation Panel

Item	Symbol	Name	Function
1		Pulse key	When the door closed, press and hold the key to accelerate running, release the key to stop it.
2		Open/ lock key	Press the key to open the door The key is not available when the centrifuge is running.
3		Start/ Stop key	Press the key to start running. The centrifuge will brake to stop running if press the key during centrifugation.
4		Acceleration key	Press the key to set the acceleration curve. 1: the slowest acceleration. 9: the fastest acceleration






5		Deceleration key	Press the key to set the deceleration curve. 0: inertial braking. 9: fastest braking.
6		Memory key	Load program: Press the key shortly to load the program Save program: Press and hold key for 5 seconds
7		Parameter key	Clockwise rotate to increase parameter values. counter-clockwise rotate to decrease parameter values. Press down the key, shift between speed , RCF and time display.




Figure 6-2 the main interface

Main interface is as figure 6-2. The speed is set to be 6000rpm, temperature of centrifugal chamber is 20°C, and the running time is 30 minutes, acceleration curve is 9, and deceleration curve is 9, memory program is 7. When speed symbol  is rotating, indicating the centrifuge is running, the rotation is faster, the speed is higher. Temperature only displays the temperature of chamber and can not be controlled. Time symbol  displays the ratio of working to time setting. The total time setting is divided into 10 scales.

## 7. Rotor Preparation

### 7.1 Prepare the samples

### 7.2 Inject the samples into tubes.

<p> CAUTION:</p> <ul style="list-style-type: none"> <li>● Do not overload samples into the centrifuge which will cause leaking.</li> <li>● Do not exceed the actual capacity allowed in the user manual.</li> </ul>
--


### 7.3 Keep the tubes balance

- Although the centrifuge can accept sample balancing by eye, we recommend that you keep this centrifuge in a well-balanced condition to extend its life expectancy.
- Never intentionally run the centrifuge under unbalanced condition even though the allowable


imbalance is not exceeded.

## 7.4 Inspect the rotor


Check the rotor for corrosion or scratches before using.

-  CAUTION:
- If any abnormality such as corrosions or scratches are found, stop using the rotor and contact our service center.
  - Only manufacturer's rotors must be used with the unit.

## 7.5 Symmetrically load centrifuge tubes in rotor

-  CAUTION:
- Make sure the rotor lid is securely fixed on the rotor, as well as the rotor and shaft are tightened. Otherwise, the rotor may be moved off while rotating and cause damage of the centrifuge and rotor.
  - Firmly tighten the rotor door with rotor.

# 8. Operation

-  CAUTION:
- Do not push or lean against the centrifuge while it is running.
  - Do not run the centrifuge when fragments or sample solutions are left in the centrifuge chamber. Always keep the centrifugal chamber clean.
  - If the centrifuge makes strange noise during operation, stop it immediately and contact our service center. Notify them of the warning code if displayed.

## 8.1 Normal Operation

Turn on the power switch, centrifuge will start self-diagnostic checks, see figure 8-1 below:

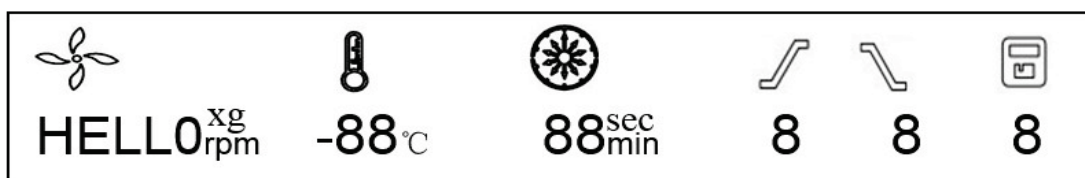


Figure 8-1 Self-checking interface

After self-checking, instrument will display accumulative running time, see figure below:

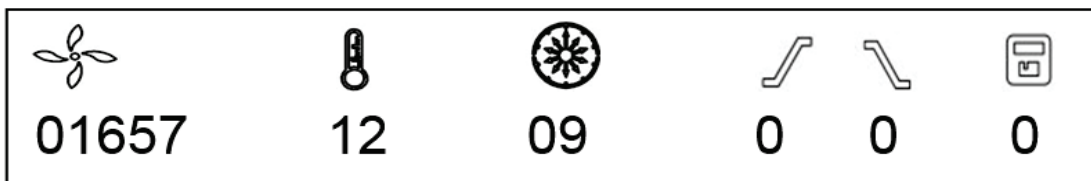


Figure 8-2 Accumulative running time interface

Figure 8-2 indicates the centrifuge has accumulated running time 1657 hours 12 minutes and 9 seconds, and then the centrifuge displays the last running values, see figure 8-3 below:



Figure 8-3 Last running interface

- Speed: 6000rpm. Running time: 30 minutes.
- The door lock is released.

### 8.1.1 Load and replace the rotor

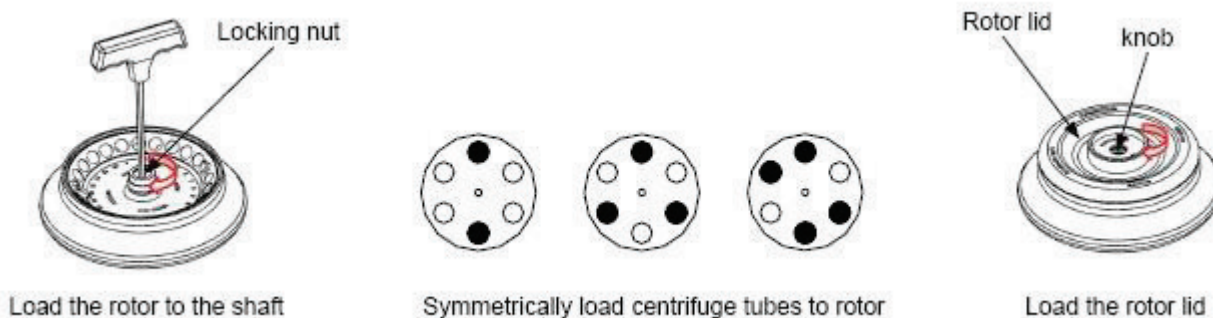


Figure 8-2 Load the rotor

**CAUTION**





- Attach the rotor to the rotor shaft. Ensure the rotor is in position and connected with the shaft, tightening the locking nut to secure the rotor with shaft, to prevent the rotor damaging the centrifuge.
- Ensure the rotor lid is firmly tightened to the rotor.

- Load the rotor to shaft to ensure rotor is in position until it connected with the shaft.
- You should feel a „click“ when the rotor is properly loaded to the shaft. If not, there may be something







stuck between the rotor and the shaft. Double check and clean it if necessary.

- Rotate the rotor slightly with your fingers to check if the rotor vibrates. If so reinstall the rotor again.
- Rotate the nut clockwise using the wrench to tighten the rotor to the shaft firmly.
- Close the rotor lid, firmly tighten clockwise the lid to the rotor and ensure is in position. Close the door and then start running.
- The method of removing the rotor is as same as the above mentioned by turning the locking nut counterclockwise.



### 8.1.2 Set the operation parameters

Press the  key to select required parameters. The parameter can be modified when the parameter is flashing. Clockwise rotate the parameter key  to increase parameter value; counter-clockwise rotate the parameter key  to decrease parameter value. Parameter key  rotate faster, parameter value increase faster. The minimum speed increment is 100 rpm, the minimum time increment is 1 second.



#### (1) Set the speed

- Press the key  until the speed rpm is displayed.
- When the speed is selected, the speed symbol will flash the speed value.
- The minimum speed value you can set 300rpm, the minimum increment is 100rpm.
- Rotate parameter key  clockwise to increase speed value, rotate the parameter key  anti-clockwise to decrease speed value.
- You can speed-up set the speed value by rotating parameter key  quickly.
- There is a circulating function to increase/decrease the speed values. Rotate the parameter key clockwise  to change settings from small → large → maximum → minimum. Rotate the parameter key anti-clockwise  to change settings from large → small → minimum → maximum.



#### (2) Set the time

- Press key , time value flashes in the time setting mode.
- Rotate the parameter key  to set running time from 10 seconds to 99 minutes.
- When time displays HD, this is a continuous running mode.

#### (3) Set acceleration and deceleration

- Press key  (ACC), acceleration value flash, press the  (ACC) again, the value will increasing.the value will change from 1 to 9, then from 9 to 1.

1 acceleration: the slowest acceleration; 9 acceleration: the fastest acceleration.

- Press key  (DEC), deceleration value flash, press the  (DEC) again, the value will increasing.the value will change from 0 to 9, then from 9 to 0.


0 deceleration: free braking;

1 deceleration: the slowest deceleration; 9 deceleration: the fastest deceleration.


(4) Set program

There are 1 ~ 9 program groups.

- Saving the program

Press and hold the key  more than 5 seconds, the current parameters are saved under the selected program number.

- Loading the program




Press the key  shortly, the program number will be increasing, from 1 to 9, then from 9 to 1, the corresponding parameters changing as well.

### 8.1.4 Start the operation

(1) Press key  to start running

- The door should be locked before rotor starts rotating.
- Timer will operate once the speed setting value is reached, the screen displays the remaining run time.


(2) View and modify the operation programs

- Pressing key , returns the display to the program interface and displays settings programs. Press the key  to the desired program. When flashing, rotate the key  to modify values. Release the key after 5 seconds, and the centrifuge will return to normal operation mode and run according to the new value.
- If the set time value has been modified, the operation time is not affected and will continue.

(3) Warning display


- If an error occurs during the operation, the centrifuge will brake to stop automatically, and display the error code on the time/display area. The error code can be checked in the table 10-1, and corrective actions can be applied accordingly.

### 8.1.5 End the operation

(1) The centrifuge will brake when it reaches the setting time or  key is pressed.

- When the rotor stops rotating, centrifuge will start beeping to alert the operation has finished.

(2) Open the door



- The door can be released automatically when the operation has stopped.
- With the door closed, you are able to press the  key to open it.
- After ending the operation, the program will store the setting parameters of this operation, and will recall these parameters when restart the program.

(3) Open the door and take out the rotor and samples.

## 8.2 RCF Operation

- (1) Turn on the power switch.
- (2) Set a RCF (Relative Centrifugal Force) value.

 CAUTION:

- Do not exceed the allowable maximum RCF value of the rotor and adapters.
  - Press the key  and choose speed unit  $\times g$ , the speed symbol will flash into RCF value input status.
  - If no key is pressed after the speed value has flashed for 5 seconds, the input mode will be shut down.
  - Rotate the key  to input a RCF value, RCF increment is  $100\times g$ .
- (3) Set operating conditions



The other operation, please refer to the section 8.1.

## 8.3 Pulse Operation

This function is used to remove the residual samples adhered on the interior of the tubes.

Note: The key works only when the rotor stopped and the door is locked.

- (1) Turn on the power switch and load the rotor to the shaft, tighten the rotor lid and make sure it is in secured position, and then close the door.
- (2) The centrifuge gets into preparation mode and displays last running values. The values can be reset.

- (3) Press  key and hold, the centrifuge will speed up to the setting speed. While releasing  key during acceleration, the centrifuge will start to decelerate and stop.

# 9. Maintenance

## 9.1 Cleaning

 CAUTION


- If do not follow the recommended instructions for cleaning or disinfecting may damage the centrifuge.

- (1) Centrifuge

- If the centrifuge is exposed to ultraviolet rays for a long time, the color of the doors may be changed or the label may be came off. After using, cover the centrifuge with a piece of cloth to protect it from direct exposure.



- If the centrifuge needs cleaning, clean it with a cloth or sponge moistened with a neutral detergent solution.
  - Sterilize the centrifuge by wiping with a cloth moistened with 70% ethanol solution.
- (2) Rotor chamber

 CAUTION

- Do not directly pour water, neutral detergent or disinfectant solution into the rotor chamber. Otherwise fluids may leak into the drive units and cause corrosion or deterioration to the bearings.

- If the rotor chamber needs cleaning, clean with cloth or sponge moistened with a neutral detergent solution. Sterilize the centrifuge by wiping with a cloth moistened with 70% ethanol solution.

(3) Drive shaft

- We recommend regular maintenance for drive shaft. You can wipe the drive shaft with soft cloth, and then apply a thin coat of silicon grease.

(4) Door

- Clean and sterilize the door using the same method as the step (1) above.

(5) Rotor

- To prevent corrosion, remove the rotor from rotor chamber. If not in use for a lone term, then detach the rotor lid and turn upside down to dry the tube holes and keep clean.
- For sample leaks in the rotor, rinse the rotor with water. Apply a thin coat of silicon grease to the rotor when it is completely dry.
- The rotor should be regular maintenance, recommend to cleaning it each 3 months to ensure tube and rotor holes keep clean, and then apply a thin coat of silicon grease.

(6) Drain (D1536R)

- The centrifuge is equipped with drain pipe for excess water. Drain off water when water is in drain pipe.

## 9.2 Consumables

Replaceable wearing parts listed below. It is recommended to replace these according this table.

Item.	Replacement parts	Replacement conditions
1	Rubber block of temperature sensor	Cracked
2	Seal ring of centrifuge chamber (3024R)	Cracked

## 9.3 The replacement of rotor seal rings

### 9.3.1 Instructions

There are three high-temperature rubber seal rings that equipped into rotor to achieve bio-safe. The seal

rings may fall off or aging after several autoclaving, need to be replaced or re-installed.

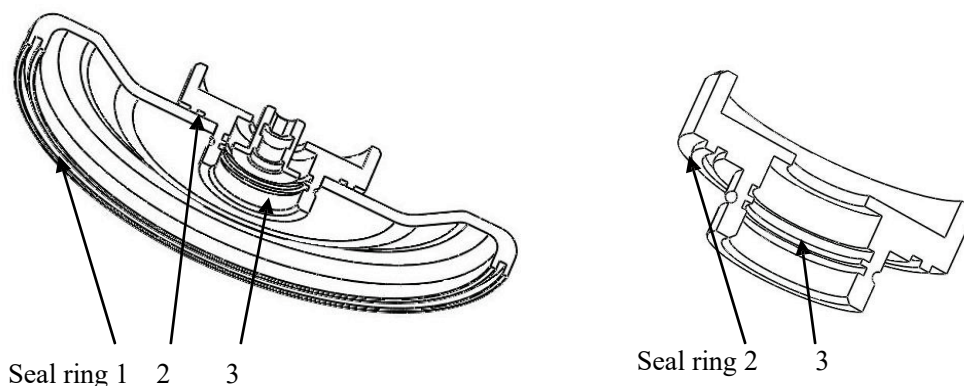


Figure 9-1 Seal rings of rotor

### 9.3.2 Replacement methods

- (1) Clean the seal ring slot with neutral detergent solution and make it dry.
- (2) Evenly coated with glue (501) in the seal ring slot and keep the seal ring into slot, press evenly to make it contact enough with the slot bottom and bond firmly.
- (3) Place for 20 minutes and waiting for the glue to completely solidified.

## 9.4 Routine inspection

- (1) Check that if the centrifuge is on a firm, flat and level table, ensure the four feet stand on the table firmly.
- (2) Check if the centrifuge grounded properly: Use multi-meter to check if is short circuit between the power cord grounding pin and the motor shaft. If yes, indicating grounded properly; if is open circuit, need to check failure reason first and make troubleshooting before use.

# 10. Troubleshooting

## 10.1 Possible problems and solutions

This centrifuge has a self-diagnostic function. If a problem occurs, an error/warning code will be displayed on the time display screen and the operator can determine the malfunction with the warning code below.

Symptom	Causes	Solutions
Nothing appears on the screen when the POWER is turned on.	Building power circuit breaker trips. the fuse was blown out.	Remove the trouble and turn on the POWER. Replace the fuse.



Error code appeared on the time display screen	E-02 Door fault	The door opened in running. Press the key  while the door opening.	Close the door immediately. Close the door , and then start to operate.
	E-03 ROTOR ID	•The centrifuge can not identify the rotor ID.	• Reconfirm the ID code of the rotor and make a correct selection.
	E-04 Temp sensor fault	the connection fault. the sensor fault.	reconnect Replace temperature sensor
	E-06 Set wrong parameter	The setting parameter exceed the allowable range.	Modify the parameter value.
	E-08 Chamber over hot	The air inlets are blocked. cooling fan is damaged.	Clean air inlets. Replace the cooling fan.
	E-09 imbalance	<ul style="list-style-type: none"> <li>• the allowable imbalance is exceeded.</li> <li>• some wrong in the drive system</li> </ul>	<ul style="list-style-type: none"> <li>• Balance the sample</li> <li>• checked by professional person.</li> </ul>
	E-10~86	Read the service manual.	Contact with service center.


Table 10-1 Possible problems and solutions

## 10.2 How to open the door

### 10.2.1 In the case of power on

 CAUTION

- The door just can be opened while the power on and rotor stops rotating.

- (1) Turn on the POWER switch, the door lock will release automatically.
- (2) The door lock will release automatically once the operation finished.
- (3) It is available to release the door by pressing key  once the rotor stops.

### 10.2.2 In the case of power outage

The door cannot be opened automatically if there is a power outage. It is available to be opened manually.

- (1) Ensure if the rotor has stopped rotating.
- Listen carefully to ensure no rotating sound can be heard.
- (2) Insert a screw driver into the hole to open the door.

- Two holes are located on the both sides in the top right corner of the cover.
- Insert a screw driver into the hole and push forward to release the door.

### 10.3 Replacement of fuses

- (1) There are two fuses, 250V, 6.3A time-delay type, size:  $\Phi 5 \times 20$ .
- (2) The fuse holder is located in the power inlet. Pull out the fuse holder from power inlet and replace the fuses if necessary.

## 11. Instructions of rotor and tube

### ⚠ CAUTION:

- Read the instructions thoroughly, correct use rotor.
- Do not exceed the allowable maximum speed of rotor, tube and adapters etc., be care that the allowable maximum speed of some adapters are lower than the rotor's maximum speed.

### 11.1 The rotor instructions

#### 11.1.1 Rotor structure

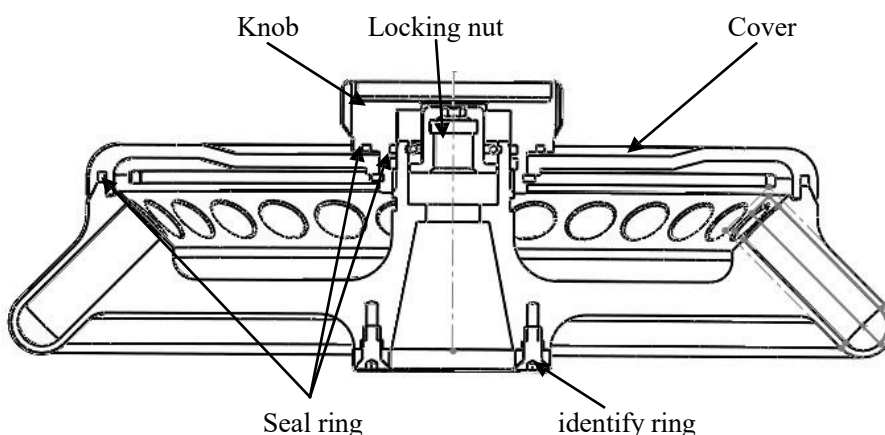


Figure 11-1 The rotor structure

#### 11.1.2 Available rotors and adapters

Closed angle rotors, such as AS30-2, AS18-5V, AS60-2, AS12-PCR8, AS6050V, are used for bio-safe when the rotor lid was tightened with the rotor, centrifuge tubes will be enclosed into rotor to ensure the sample does not leak in centrifugal process. If rotor lid is not available, the rotor would be no bio-sealing function. The rotors can be used as follows:

Rotor type	ID code	Tube/bottle	Adapter	Max. speed (rpm)	Max. centrifugal radius $r_{max}$ (cm)	Max. RCF Rcf ( $\times g$ )
1	AS30-2	2/1.5ml $\times 30$		6000	10	4020
		0.2ml $\times 30$	A02P2	6000	8.5	3415
		0.5ml $\times 30$	A05P2	6000	9	3618
2	AS60-2	2/1.5ml $\times 60$		6000	10	4020
		0.2ml $\times 60$	A02P2	6000	8.5	3415
		0.5ml $\times 60$	A05P2	6000	9	3618
3	AS18-5V	5mlV $\times 18$		6000	10	4020
4	AS12-PCR8	8-PCR $\times 12$		6000	10	4020
		0.2ml $\times 96$		6000	10	4020
5	AS6-50V	50mlV $\times 6$		6000	10.7	4306
6	A30-15	15mlV $\times 30$		4500	R1=14.2 R2=12.2	3210 2760
7	A8-50	15mlV $\times 16$ 50mlV $\times 8$		5000	12.4	3460
8	SE4-100A	100ml $\times 4$		4000	15.9	2840
		85ml $\times 4$	A85P100	4000	15.9	2840
		50mlV $\times 4$	A50VP100	4000	15.9	2840
		15mlV $\times 8$	A15VP100	4000	15.1	2700
		3~10ml $\times 8$	A10P100	4000	14.7	2630
9	S2-MP (dimension) mm	MTP (128 $\times$ 85.6 $\times$ 15)		4000	12.1	2160
		Cell culture (128 $\times$ 85.6 $\times$ 21)		4000	12.1	2160
		DWP (128 $\times$ 85.6 $\times$ 45)		4000	12.1	2160
		Kits (128 $\times$ 85.6 $\times$ 60)		4000	12.1	2160

\* : 15mlV means 15ml conical tube, as well as 5mlV and 50mlV.

Table 11.1 Rotors and adapters

### 11.1.3 Notice

(1) The centrifuge rotor can separate sample which density lower than 2.0g/ml, if the samples density is over 2.0g/ml, please calculate allowable speed depending on the following formula.

$$\text{Allow Speed (rpm)} = \text{Maximum speed} \times (2.0(\text{g/ml}) / \text{Sample density (g/ml)})^{1/2}$$

(2) To prevent corrosion, remove the rotor from rotor chamber if do not use for a long time, then detach the rotor lid and upside the rotor down to dry the tube holes.

- (3) If some samples leaked in the rotor hole, wash the hole with water, apply a thin coat of silicon grease on the rotor surface after drying.
- (4) It is necessary for a regular maintenance for rotor, recommend to clean it each 3 months to keep cleaning of tube hole and shaft hole, and then apply a thin coat of silicon grease on it.

**11.1.4 Autoclaving**

- All rotors are manufactured in high-strength aluminum alloy material or stainless still and can be autoclaved: 121°C (1.0kg/cm<sup>2</sup>), 20 minutes.
- But some adapters are made of plastics, these adapters can be deformed after autoclaving, so you’d better use other disinfecting methods.

**11.1.5 Bio-safe seal ring**

The rotor is sealed by bio-safe structures, achieved using three high-temperature rubber seal rings. The seal rings may fall off or aging after several autoclaving, need to be replaced or re-installed. The replacement methods please refer to the section 9.3.

**11.2 Tubes**

**11.2.1 Cleaning and sterilizing tubes**

Condition		Material	PA	PC	PP
Cleaning	Cleaning fluids	Acidic (pH5 or lower)	X	X	X
		Acidic (higher than pH5 )	O	O	O
		Alkaline (higher than pH9 )	O	X	O
		Alkaline (pH9 or lower)	O	O	O
		Neutral (pH7)	O	O	O
		Warm water(up to 70°C)	O	O	O
	Ultrasonic cleaning	Neutral detergent (pH7)	O	O	O
Sterilization	Autoclaving	115°C (0.7kg/cm <sup>2</sup> ) 30minutes	O	O	O
		121°C (1.0kg/cm <sup>2</sup> ) 20 minutes	X	O	O
		126°C (1.4kg/cm <sup>2</sup> ) 15 minutes	X	X	X
	Boiling	15 to 30 minutes	O	O	O
	Ultraviolet sterilization	200-300nm	X	X	X
	Gas sterilization	Ethylene oxide	O	X	O
	Formaldehyde	O	O	O	

PA: Polyallomer; PC: Polycarbonate; PP: Polypropylene

### 11.2.2 Cleaning PC tubes

PC materials are low in chemical resistance against alkaline solutions. Avoid using neutral detergents with pH higher than 9. Note that pH of some neutral detergents are still higher than 9 even if diluted according to the instruction in the maker's catalog. Use detergent with its pH between 7 and 9.

### 11.2.3 Autoclaving PA, PC and PP tubes

PA begins softening at about 120°C, PC and PP at about 130°C. Autoclave PA tubes at 115°C (0.7kg/cm<sup>2</sup>) for 30 minutes and PC and PP tubes at 121°C (0.1kg/cm<sup>2</sup>) for 20 minutes. If a certain temperature is exceeded, the tubes may be deformed.

When using a sterilizing chamber, please operate as follows:

- (1) Place tubes in vertical position, mouths upward. If tubes are placed sideways, they may deform into an oval shape due to gravity.
- (2) Remove screw nuts and inner covers to prevent from deformation or rupture.
- (3) Wait until the sterilizing chamber cools down to the room temperature before the tubes are removed.

### 11.2.4 Condition and life expectancy of tubes

The life expectancy of plastic tubes depends on the characteristics of samples, speed of the rotor used, and temperature applied, and so on. When the plastic tubes are used for centrifuge of ordinary aqueous samples (pH between 5 and 9), their life expectancies are defined as follows.

Be operated at the maximum speed:

High quality tubes (PA, PC, PP): 30-50 operations

Ordinary tubes (PA, PC, PP): around 10 operations (Using in low speed can extend the tube life) .

Life expectancy of tubes also depends on the pretreatment conditions such as cleaning and sterilization, lifetime can be cut down.

**Notice: Do not use damaged or cracked tubes.**

## 12. Calculate Relative Centrifuge Force(RCF)

Relative Centrifuge Force (RCF) can be determined with the following calculation formula.

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

R—rotating radius, unit: cm; n—rotating speed, unit: rpm

## 13. Ordering information

Cat. No.	Model	Descriptions
912015137777	THE CENTRIFU	Multi-purpose Centrifuge, with SE4-100 rotor kits, US plug, 110V/50Hz/60Hz
91211517777	THE CENTRIFU	Multi-purpose Centrifuge, with SE4-100 rotor kits, Cn plug, 220V/50Hz/60Hz
912215127777	THE CENTRIFU	Multi-purpose Centrifuge, with SE4-100 rotor kits, Euro plug, 220V/50Hz/60Hz
912315127777	THE CENTRIFU	Multi-purpose Centrifuge, with SE4-100 rotor kits, UK plug, 220V/50Hz/60Hz
<b>Accessories</b>		
19400002	AS30-2	Rotor kits with cover, fixing clips and O'ring, 6000rpm, 2ml*30, used with D1536 & D1536R
19400002	AS18-5V	Rotor kits with cover, fixing clips and O'ring, 6000rpm, 5mlV*18, used with D1536 & D1536R
19400003	AS60-2	Rotor kits with cover, fixing clips and O'ring, 6000rpm, 2ml*60, used with D1536 & D1536R
19400002	AS12-PCR8	Rotor kits with cover, fixing clips and O'ring, 6000rpm, PCR8*12, used with D1536 & D1536R
19400002	AS6—50V	Rotor kits with cover, fixing clips and O'ring, 6000rpm, 50mlV*6, used with D1536 & D1536R
19400002	A30-15	30-Φ 17stainless tubes, 4500rpm, 30-15mlV tubes, used with D1536 & D1536R
19400004	A8-50	16-Φ 17stainless tubes and 8-Φ 31stainless tubes, 5000rpm, 16-15mlV tubes and 8-50mlV tubes, used with D1536 & D1536R
19400004	SE4-100A	4-Φ 45stainless tubes and 4-45 stainless rings, 4000rpm, 4-100ml tubes, used with D1536 & D1536R
19400004	S2-MP	2-buckets and 2-stainless carrier, 4000rpm, used with D1536 & D1536R
	A85P100	85ml rotor adapter, used with SE4-100 rotors, 4pcs/pk
	A50VP100	50mlV rotor adapter, used with SE4-100 rotors, 4pcs/pk
	A15VP100	15mlV rotor adapter, used with SE4-100 rotors, 4pcs/pk
	A10P100	3~10ml rotor adapter, used with SE4-100 rotors, 4pcs/pk
19500001	A02P2	0.2ml rotor adapter, used with AS30-2 & AS60-2 rotors, 30pcs/pk
19500002	A05P2	0.5ml rotor adapter, used with AS30-2 & AS60-2 rotors,





		30pcs/pk
		9 hole-bucket assembly
		4 hole-bucket assembly
		2 hole-bucket assembly
		1 hole-bucket assembly

## 14. Warranty

### 14.1 Warranty of the centrifuge

This centrifuge is guaranteed for two years from the date of delivery provided that it has been operated and maintained properly.

### 14.2 Warranty of the rotor

The rotor is guaranteed for 5 years from the date of delivery upon manufacture. Please pay attention, do not use the rotor once it has been corrosion or fatigue damage. We do not guarantee this centrifuge and the rotor under the following conditions even if within the guarantee period expires:

- (1) Failures caused by incorrect installation.
- (2) Failures caused by rough or improper handling.
- (3) Failures caused by conveyance or relocation after installation.
- (4) Failures caused by unauthorized disassembly or modification.
- (5) Failures caused by using parts of the other companies, such as rotors and adapters.
- (6) Failures caused by natural disasters including fire, earthquakes and so on.
- (7) Consumables and parts have a limited guarantee period

## 15. After-sales Service

In order to ensure to operate centrifuge safely and efficiently, it is necessary for regular maintenance. If centrifuge has problems, do not attempt to repair it by yourself. Contact our sales or service center.

# 用户使用手册

多功能低速离心机



在操作使用离心机之前，请认真阅读本使用说明书，充分理解与安全有关的注意事项。

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## 安全警示

符号 $\triangle$ 是国际通用的安全标志，请仔细阅读并充分理解下面的安全细则：

请仔细阅读和充分理解以下安全事项

- 请严格按照本手册的操作说明使用离心机以保证安全
- 请仔细阅读本手册上的所有安全信息
- 手册中的安全提示标识解释，“警告”和“注意”统一由此 $\triangle$ 图示表示。有此项图示的操作或事项表示可能会引起危险，务必注意操作方法。详细解释如下：

$\triangle$  警告：人员伤亡 该警告表示任何操作或使用，如果不严格遵循操作手册进行，可能会导致人员伤亡或死亡。

$\triangle$  注意：可能会造成设备 该注意表示任何操作或使用，如果不严格遵循操作手册进行，可能会导致仪器的永久损坏或破坏。

- 不要以任何操作手册没有指导或描述的方式对离心机进行操作，如果有任何使用上的问题，请联系原始设备制造商。
- 本手册的中描述力图涵盖所有可能的操作风险提示，如果在使用时遇到没有在本手册中提及的突发状况，请联系原始设备制造商。



### 警告：

- 该离心机非防爆设计，不要进行易爆易燃样本的操作。
- 不要把离心机放置在或靠近易燃气体和化学物质的区域。
- 离心机放置的 30cm 范围内不要有危险物质。
- 在使用有毒有害样本前，请先准备好必要的安全措施。放射性或致害微生物的样本操作请用户自行承担风险。
- 如果离心机，转子和附件被有毒有害以及放射性物质污染，清理程序请参照相关操作规程进行清理。
- 如果清理工作需要客服进行，请在将需要清理物转交客服人员前进行必要的无害化处理，并且将相关细节信息告知交接的客服人员。
- 不要在湿手状态下碰触离心机电源开关，以免造成电击伤害。
- 安全起见，在离心机工作期间，不要进入离心机半径 30cm 的区域内。
- 离心机工作期间，不要强行打开离心机舱门。
- 不要对离心机进行未经授权的维修，拆卸和其他维修。如有问题请联系厂商服务处或距离您最近的经销商。



## 告 诫

- 确保该离心机置于坚实而平整的水平桌面上。
- 离心机运行前要确保离心机水平。
- 打开上盖时要确保上盖与机壳角度大于 70 度。
- 当关上盖时，不要将手放在上盖和机壳之间。
- 当离心机运行时不要移动离心机，也不要依靠离心机。
- 当离心腔内有液体时，请及时用干布擦干，以避免污染样品。
- 在运行离心机前要保证离心腔清洁，务必取走离心腔中的异物，如离心管碎片等。
- 对于转子的提示：
  - (1) 在使用转子前检查转子表面是否有腐蚀或损坏，若有此类问题，则停止使用。
  - (2) 离心机设定转速不能超过转子组件及附件（转子、适配器）中所允许的最小转速，务必使离心机运行在最小允许转速以下。
  - (3) 不要超出所允许的不平衡量。
  - (4) 所使用的离心管应在它们的允许容量以内。
  - (5) 如果转子有盖子，运行前确保将盖子旋紧。
- 在运行过程中出现奇怪噪音等异常现象，请马上停机，与服务中心联系，并告知所显示的故障码。
- 地震有可能对离心机造成损坏，如果出现不正常情况，请与服务中心联系。

## 1. 性能指标

最高转速	6000 转(300-6000 转), 步长: 10 转
速度精确	±20 转
最大相对离心加速度	4020×g, 增量: 10×g
容量	100ml×4(甩平转子), 50ml×6 (固定角度转子)
转子类型	甩平转子: 100ml×4, 微孔板
	固 定 角 : 2.0ml×30, 2.0ml×60, 5.0mlV×18, 50mlV×6, pcr8×12, 15ml×30, 50ml×8,
定时	30 秒 -99 分钟-按住, 持续操作 步进: 30 秒-1 分为 1 秒; 1 分~99 分为 1 分钟
电机类型	无刷电机
程序存储	9
加速 / 减速	9↑/10↓ (降速 10: 惯性减速)
安全性能	双门锁、失速监控、离心舱温度监控、电机过热保护、不平衡保护, 全自动自检
电源	单相, 220V-240V, 50Hz/60Hz, 8A. 110V-120V, 50Hz/60Hz, 12A

尺寸 (mm)	(L) 280× (W) 364× (H) 266
重量	30kg
附加特性	速度/RCF 开关、点动控制、状态显示、声音提醒

## 2. 符合声明

符合以下安全规格:
EN 61010-1
EN 61010-2-020
符合以下 EMC 规格:
EN 61326-1/ FCC Part 15 Subpart B/ IECS 001
符合相关欧盟指标:
EMC-guidelines: 2004/108/EC
Instrument guidelines: 2006/95/EC
This ISM device complies with Canadian ICES-001.

## 3. 环境条件

### 3.1 基本运行条件


- (1) 电源:
  - 单相, 220V-240V, 50Hz/60Hz, 8A;
  - 单相, 110V-120V, 50Hz/60Hz, 12A;
- (2) 工作温度: 2°C ~ 40°C.
- (3) 工作湿度: ≤80%.
- (4) 周围无影响性能的振动和气流存在。
- (5) 周围空气中无导电尘埃、爆炸性气体和腐蚀性气体存在。

### 3.2 运输和贮存条件

- (1) 储存温度: -40°C ~ 55°C.
- (2) 储存湿度: ≤93%.

## 4. 安装

为确保用户正常安全的使用离心机，务必严格按照操作手册说明进行。在移动离心机前，务必确保已经取出转子。


 警告：

- 不正确的电源连接会损坏离心机。
- 在连接电源前请检查供电电源是否满足要求。

### 4.1 安置

- (1) 离心机必须安装在坚实、平整和水平的台面上，且保证离心机四个脚与台面接触。不要将离心机安装在滑动台面上，否则容易引起较大振动。
- (2) 理想环境温度为 20°C±5°C，环境温度不宜超过 30°C，避免阳光直接照射该离心机。
- (3) 确保离心机两侧 10cm 间隙，离心机后侧 30cm 间隙，以确保离心机的风冷效果。
- (4) 离心机附近不能有热源或水源泄漏，否则容易导致样品温度升高或离心机故障。

### 4.2 电源线与地线的连接

 警告：

- 不要用湿手接触电源线，以防止电击。
- 该离心机必须良好地接地。

电源插板额定电流应为 10A 以上，并且要满足地方电气安全要求，保证具有良好的保护地端。



用户使用手册  
5. 结构

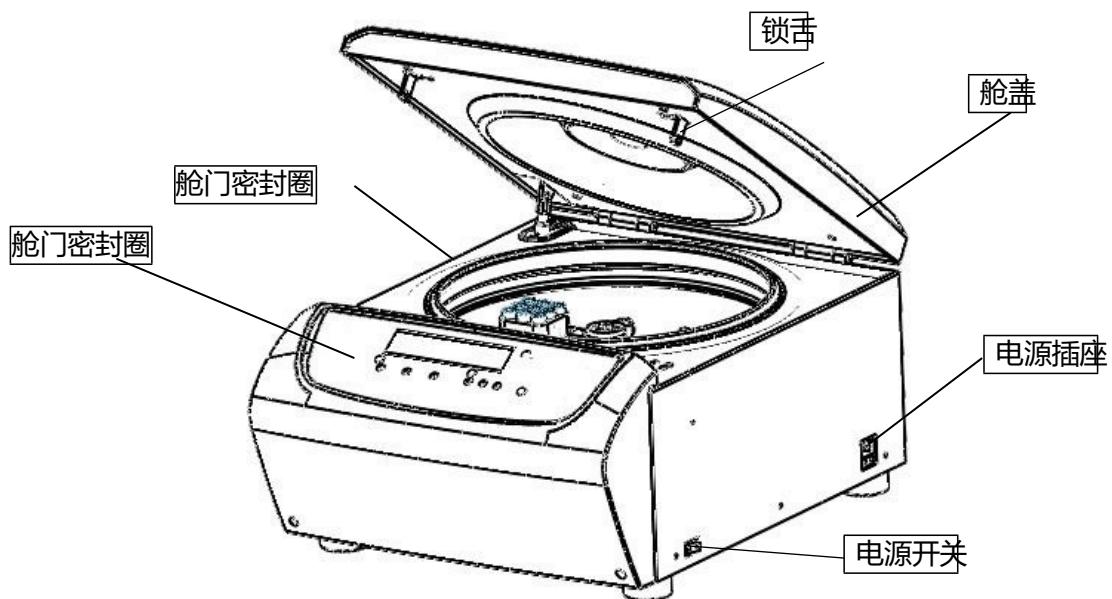


图 5.1 正视图

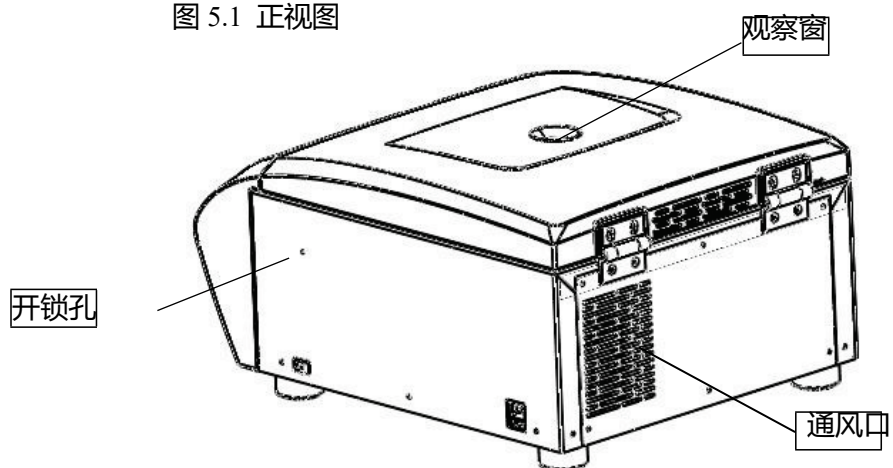


图 5.2 b 后视图

## 6. 操作面板

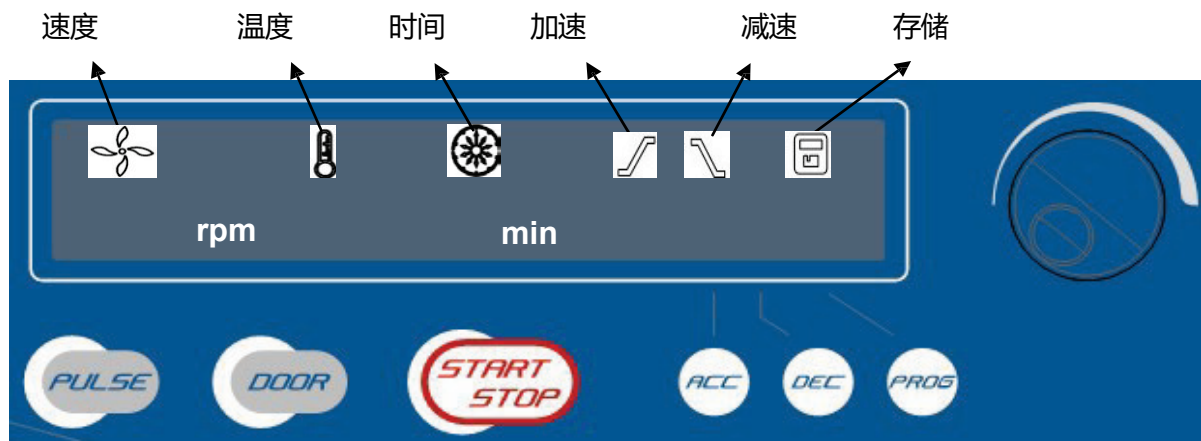





图 6-1 操作面板

编号	标识	名称	功能
1		点动	点动控制离心机运转，按住运行，松开停止
2		舱门开启	开启舱门，离心机运转期间此按键无功能
3		运转/停止	点按离心机按照既定设定运转 运转期间点按，离心机停止运转
4		加速	设定加速度（范围 1-9）
5		减速	设定减速度（范围 0-9） 0: 慢减速 9: 最快速制动
6		编程	载入程序: 点按载入程序 存 储程序: 长按 5 秒存储程序
7		参数旋钮	顺指针旋转数值增加，逆时针旋转数值减少 按压旋钮在速度，制冷和时间功能间进行切换



图 6-2 主界面

主界面如图 6-2 所示。速度设置为 6000rpm，温度设置为 20°C，运行时间设置为 30 分钟，加速度设置为 9，减速设置为 9，调用存储程序 7。当速度标识  开始转动，标示离心机已经开始运转。该图示转动频率会实时标示离心机实际转速。温度标识  只会显示离心舱内实时温度，并且在运转后无法再进行调整。时间标识  会显示设定的运转时间。

## 7. 转子准备

### 7.1 准备要分离的样品

### 7.2 将样品注入离心管中

#### 告诫:

- 在离心管中加入过量样品会引起泄露，因此不要加入过量样品。
- 样品总量不要超过转子实际负载量。

### 7.3 确认离心管平衡

- 尽管该离心机允许目测平衡方法使用，但是，为了延长离心机使用寿命，建议样品使用天平称量，确保平衡。
- 尽管不平衡量是允许的，也不要在不好的平衡条件下运行该离心机。

### 7.4 转子检查

使用前需要检查转子是否有腐蚀或划痕。

#### 告诫:


- 如果发现转子上存在腐蚀或划痕等，请停止使用。
- 禁止在本机上使用其它牌号或规格的转子。

### 7.5 确保将平衡好的离心管对称地放入转子孔内

#### 告诫:

- 确保将转子与主轴旋紧，盖子安全固定在转子上。否则，在离心机运行时转子可能脱落，造成离心机或转子损坏。
- 转子盖与转子旋紧牢固。

## 8. 操作

-  告诫：
- 切勿在离心机运转期间进行推拉
  - 切勿在离心舱内有残留物时运转离心机，在运转前要确保离心舱的洁净
  - 在运行过程中出现奇怪噪音等现象，请马上停机，与我服务中心联系，并告知所显示的故障代码。

### 8.1 开始操作

打开电源，离心机将开始自检，参见图 8-1：



图 8-1 自检界面

自检完成后，会显示离心机累积状态，参见图 8-2：

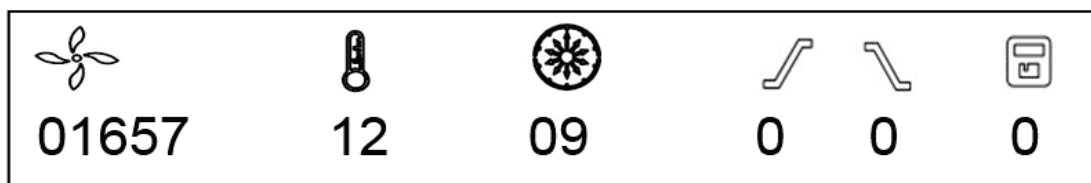


Figure 8-2 Accumulative running time interface

图 8-2 显示离心机已经运行时间 1657 小时 12 分钟 9 秒，稍后离心机显示当前设定状态，参见图 8-3：



图 8-3 当前运行界面

## 用户使用手册

- 速度： 6000rpm. 运行时间： 30 分钟.
- 舱门开启

### 8.1.1 装卸转子

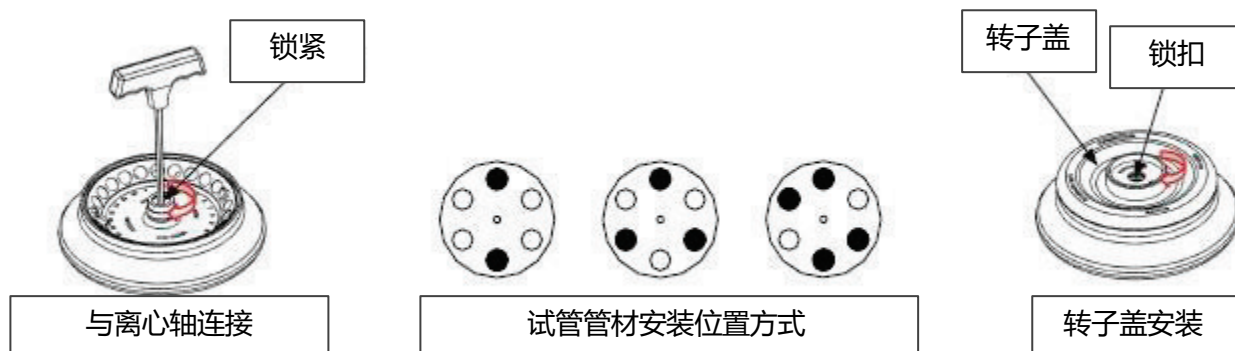



图 8-4 安装转子

#### ⚠ 告 诫

- 安装转子与转子轴前，确保转子和连接轴的位置，锁紧转子与轴锁紧螺母，防止转子损坏离心机。
- 确保转子盖子与转子锁紧

- 安装转子前确保转子与转子轴位置正确。
- 当转子与转子轴正确对接后，应该可以感觉到“咔哒”。如果没有，表示两者并没有正确对接。请仔细检查对接处是否有异物，清理后再次尝试对接。
- 用手指轻轻转动安装好的转子，感觉转子运转是否顺畅。如果感觉转子有跳动或不顺畅。请检查重新检查安装。
- 用扳手顺时针拧紧转子与转子轴。
- 将转子盖子与转子安装到位，并顺时针旋紧锁扣。关上舱门，开机运转。
- 逆向操作上述步骤即可移除转子。

### 8.1.2 设定操作参数

按压参数旋钮  选择相应的参数项。当相应的参数项标识开始闪烁时，顺时针旋转参数旋钮数值增加，逆时针旋转参数旋钮数值减少。参数旋钮旋转的速度越快，参数调整步进量越大，速度参数最小步进量为 100 转，时间参数的最小步进量为 1 秒。

#### (1) 速度设置



- 按压参数旋钮选择速度参数。
- 当速度参数被选中后，速度标识会闪烁。
- 速度调节最小值为 300 转，最小步进量为 100 转。
- 顺时针旋转参数旋钮增大数值，逆时针旋转减小数值。

- 快速旋转参数旋钮可以加大步进量
- 参数的调节是个循环进程。顺时针旋转参数旋钮的过程为：小-大-最大-最小。逆时针为：大-小-最小-最大

#### (2) 时间设置



- 按压参数旋钮直到时间标识开始闪烁。
- 旋转参数旋钮设置时间参数，范围：30 秒-99 分钟
- 当时间显示为 HD，代表连续运行。

#### (3) 加速和减速设置



- 按压  加速键,加速数值开始闪烁,再次按压加速键,数值增加,调节循环为 1-9-1。  
1 速: 最慢加速度; 9 速: 最大加速度
- 按压减速键 , 减速数值开始闪烁,再次按压减速键,数值增加,调节循环为 0-9-0。  
0 速: 惯性减速;  
1 速: 最小减速;9 速: 最大减速

#### (4) 程序设置

有 1 ~ 9 段程序可以创建和存储。



- 程序存储  
长按编程键  5 秒,当前参数将被保存到当前程序编号中。
- 加载程序 按压编程键 ,编程数值将增加,调节循环为 1-9-1。

#### 8.1.4 开始操作

- (1) 按压运行/停止键  开始运转
  - 确保舱门已经关闭在运行前。
  - 一旦开始运转,定时器将显示剩余运行时间。
- (2) 查看和修改操作程序
  - 按压参数调节旋钮 , 返回程序界面。按压参数调节旋选择相应参数项。旋转参数旋钮对相应的参数进行调节。调节完毕后,等待数值闪烁 5 秒钟后,数值被写入当前程序中。也可以按压参数调节旋钮选择其他参数项。
  - 如果之前设定的时间被修改,实际运行不会被影响将继续进行。
- (3) 警告显示
  - 如果在运行期间有错误提示出现,离心机会自动停止运转。显示屏会在显示时间的区域显示相应的错误代码。错误代码的意义可以在表格 10-1 中进行查询。

## 用户使用手册


### 8.1.5 操作结束

- (1) 离心机将会在定时到达后停止，或者按压运行/停止键 。
- 当转子停止转动后，离心机蜂鸣器会鸣响，显示屏开始闪烁。
- (2) 打开舱门
  - 操作结束后舱门会自动开启。
  - 按压舱门开启键 ，舱门会打开。
  - 操作结束后，在操作期间进行的程序更改数值会被存储入当前程序中，在下次开机时会载入最后一次运行的程序。
- (3) 打开舱门，拿出转子和样品。

### 8.2 离心力设定

- (1) 打开电源开关
- (2) 设置相对离心力数值


#### 告诫：

- 不要将相对离心力数值设定为超过转子规格要求。
- 按压参数旋钮  选择速度单位 X g 速度标识会闪烁
- 如果在随后的 5 秒钟内没有人后操作，输入状态将被取消。
- 旋转参数旋钮调节离心力数值，步进量为 100 x g。

- (3) 设置操作状态 Set operating conditions  
其他操作请参见章节 8.1。


### 8.3 点动操作

提示：该功能键只有在舱门关闭并且离心机没有运转时使用。

- (1) 安装转子并打开电源开关，关闭舱门。
- (2) 离心机进入准备工作状态。
- (3) 按住点动键 ，离心机将加速到设定速度，松开点动键，离心机将减速直到停止。

## 9. 维护

### 9.1 清洁


 告诫

- 如果不按照下述操作说明进行清洁工作，可能会对离心机产生部件损伤。

(1) 本体外壳

- 离心机在长时间暴露在紫外线的环境中，会造成外壳褪色，标签脱落等外观老化问题。所以，在使用后，请用离心机外罩将离心机遮盖，避免直接暴露。
- 使用抹布或海绵沾取适量的中性化学清洗剂进行清洗即可。
- 使用抹布或海绵沾取适量的 70%酒精即可进行消毒清洗。

(2) 离心舱

 告诫

- 不要将水，清洗剂或消毒剂等液体直接导入到离心舱内，这会导致驱动部件的损坏。

- 使用抹布或海绵沾取适量的 70%酒精即可对离心舱进行清洗。

(3) 转子轴

- 建议用户定期对转子轴进行擦拭，使用洁净干燥的抹布和海绵进行擦拭。

(4) 舱门

- 舱门的清洗参照本体外壳要求即可。

(5) 转子

- 为保证离心舱和转子的良好状态。如果在不使用的时候，请将转子从离心舱内取出。打开转子上盖，将转子与转子盖平放保管。
- 如果转子被样品污染，即刻用清水冲洗，擦拭干净。
- 转子应该定期（每 3 个月）做保养维护，确保转子和转子孔清洁。

### 9.2 耗材

请参照下表列出了可替换的耗材描述进行替换：

序号	替换部件	需要替换状态识别
1	温度传感器	橡胶外壳破裂



## 9.3 转子密封圈更换

### 9.3.1 结构

Bio-safe 款的转子配备的三个耐高温密封圈，在经过多次高温消毒后，该密封圈的性能会受到影响甚至脱落，需要进行更换。

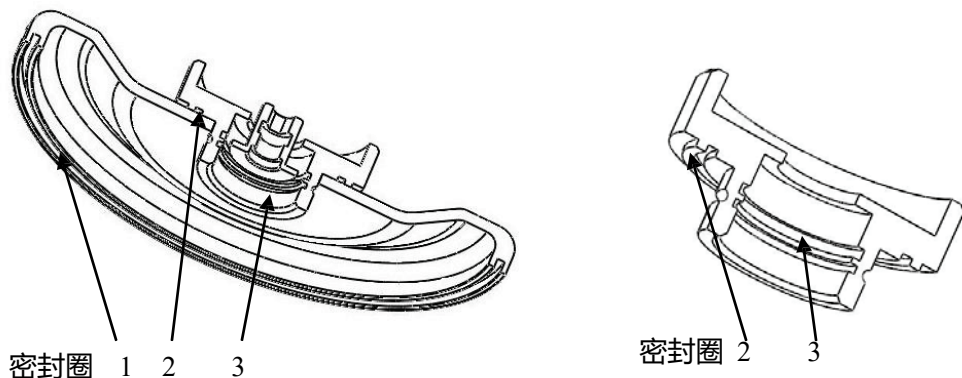


图 9-1

### 9.3.2 更换方法

- (1) 用中性清洗剂擦拭干净密封圈沟槽。
- (2) 在密封圈沟槽上均匀的涂抹上 501 胶水，然后将新的密封圈放入密封沟槽中，用手指压实，以使密封圈充分与沟槽压实。
- (3) 静置 20 分钟，以便让胶水充分干燥

## 9.4 日常检查

- (1) 检查前，将离心机放置在水平稳定平整的桌面上。
- (2) 检查离心机的接地线:用万用表检查电源线接地引脚和转子轴之间的状态。如果显示接通,说明正确接地;如果是开路,需要在使用前首先检查故障原因。

# 10. 故障检查

## 10.1 故障和解决方案

本离心机有自检功能，如果有错误发生，会显示错误代码，根据显示的错误代码和现象查询下表：


代码和现象	原因	解决方案
开机无显示	- 检查供电是否正常 - 保险熔断	- 确认供电正茌, 重新开机. - 更换保险

E-02 舱门错误	- 舱门没有闭合到位 - 按压运行/停止键  在舱门开启时	- 关好舱门 - 关好舱门再次开始运行
E-03 转子类型	- 离心机无法识别转子	- 确认转子型号
E-04 温度传感器	- 连接错误 - 传感器错误	- 重新安装传感器 - 更换传感器
E-06 参数错误	- 设置的参数数值超出范围	- 重新设置参数
E-08 离心舱温度	- 通风口受阻 - 冷却风扇损坏	- 清洁通风口 - 更换风扇
E-09 不平衡	- 不平衡保护启动 - 驱动系统故障	- 调节样品平衡状态 - 请专业人员检查
E-10 ~ 86	- 需要阅读维修服务手册	- 联系售后服务


表 10-1

## 10.2 如何打开舱门

### 10.2.1 通电状态

 告诫

- 务必确认离心机已经停机并且转子停转后再开启舱门

- (1) 通电后舱门锁将自动解锁。
- (2) 运转结束后，舱门锁将自动解锁。
- (3) 在舱门锁解锁状态下，按压舱门键  打开舱门。

### 10.2.2 断电状态 断电状态下，舱门无法通过按压舱门键开启。

- (1) 确认转子已经停转。
- (2) 用改锥插入离心机两侧开锁孔打开舱门。

用户使用手册  
10.3 更换保险丝

- 一共有两个保险丝, 250V, 6.3A 延时型, 尺寸:  $\Phi 5 \times 20$ .
- 保险丝在电源插口处。

## 11. 转子和试管介绍

⚠ 告诫:

- 仔细通读下文正确使用转子。
- 在使用转子时, 请严格遵照相应转子的技术规格要求使用。

### 11.1 转子结构

#### 11.1.1 转子结构介绍

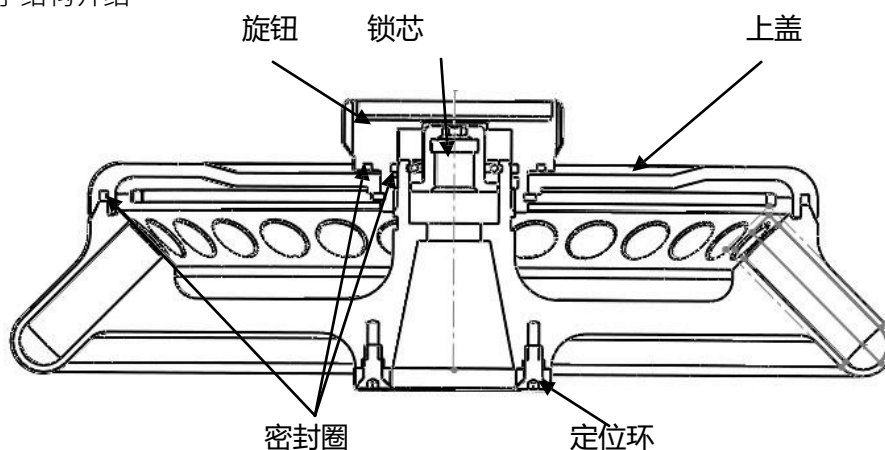


图 11-1

#### 11.1.2 转子和适配管

普通转子, 与离心机转子轴锁定即可。但是像 S30-2, AS18-5V, AS60-2, AS12-PCR8, AS6050V 转子是支持 bio-safe 功能的, 所以需要盖上上盖才能完全锁定。

个转子的规格详见下表:

序号	型号	适应管材	适配器	最大转速 (rpm)	最大离心半径(cm)	最大相对离心力 Rcf ( $\times g$ )
1	AS30-2	2/1.5ml $\times 30$		6000	10	4020
		0.2ml $\times 30$	A02P2	6000	8.5	3415
		0.5ml $\times 30$	A05P2	6000	9	3618

2	AS60-2	2/1.5ml ×60		6000	10	4020
		0.2ml×60	A02P2	6000	8.5	3415
		0.5ml×60	A05P2	6000	9	3618
3	AS18-5V	5mlV×18		6000	10	4020
4	AS12-PCR8	8-PCR ×12		6000	10	4020
		0.2ml×96		6000	10	4020
5	AS6-50V	50mlV×6		6000	10.7	4306
6	A30-15	15mlV×30		4500	R1=14.2 R2=12.2	3210 2760
7	A8-50	15mlV×16 50mlV×8		5000	12.4	3460
8	SE4-100A	100ml ×4		4000	15.9	2840
		85ml ×4	A85P100	4000	15.9	2840
		50mlV ×4	A50VP100	4000	15.9	2840
		15mlV ×8	A15VP100	4000	15.1	2700
		3~10ml ×8	A10P100	4000	14.7	2630
9	S2-MP (dimension) mm	MTP (128×85.6×15)		4000	12.1	2160
		Cell culture (128×85.6×21)		4000	12.1	2160
		DWP (128×85.6×45)		4000	12.1	2160
		Kits (128×85.6×60)		4000	12.1	2160

\* : 15mlV 意为 15ml 圆锥底管材, 同理为 5mlV and 50mlV.

表 11.1

### 11.1.3 注意

- (1) 离心机默认情况可以分离的样品密度不大于 2.0g/ml, 如果分离样品超过此数值, 请根据以下公式计算合理的速度:  
合理转速 (rpm)= 最大转速×(2.0(g/ml)/样品密度(g/ml))<sup>1/2</sup>
- (2) 为保证离心舱和转子的良好状态。如果在不使用的时候, 请将转子从离心舱内取出。打开转子上盖, 将转子与转子盖平放保管。
- (3) 如果转子被样品污染, 即刻用清水冲洗, 擦拭干净。
- (4) 转子应该定期 (每 3 个月) 做保养维护, 保转子和转子孔清洁。

### 11.1.4 高温消毒处理

- 所有的钻子都是由高强度铝合金或不锈钢制造, 可以经受 121°C (1.0kg/cm<sup>2</sup>), 持续 20 分钟的消

用户使用手册  
毒处理。

- 有部分适配管为塑胶制品，不能进行高温处理。可以使用普通的常温消毒方法。

### 11.1.5 Bio-safe 密封圈

Bio-safe 款的转子配备的三个耐高温密封圈，在经过多次高温消毒后，该密封圈的性能会收到影响甚至脱落，需要进行更换。详细介绍参考章节 9.3。

## 11.2 管材

### 11.2.1 清洗和消毒

状态	材质	PA	PC	PP	
清洗	清洁剂	酸性 (pH5 or lower)	X	X	X
		酸性 (higher than pH5 )	O	O	O
		碱性 (higher than pH9 )	O	X	O
		碱性 (pH9 or lower)	O	O	O
		中性 (pH7)	O	O	O
		温水(up to 70°C)	O	O	O
	超声波清洗	中性洗涤剂 (pH7)	O	O	O
消毒	高温灭菌	115°C (0.7kg/cm <sup>2</sup> ) 30 分钟	O	O	O
		121°C (1.0kg/cm <sup>2</sup> ) 20 分钟	X	O	O
		126°C (1.4kg/cm <sup>2</sup> ) 15 分钟	X	X	X
	蒸煮	15 to 30 分钟	O	O	O
	紫外线灭菌	200-300nm	X	X	X
	琪琪灭菌	环氧乙炔 (Ethylene oxide)	O	X	O
		甲醛 (Formaldehyde)	O	O	O

PA: 尼龙; PC: 聚碳酸酯; PP: 聚丙烯

11.2.2 管材使用寿命 不同材质的管材在不同的强度的长时间使用后,会出现机械性能衰减的现象,具体情况参照以下信息, 以下信结果是在标准应用 (管材内样品 PH5-9) 条件下得到的结果。在最大运行速度下: 高质量管材(PA、PC、

PP): 使用 30-50 次

普通(PA、PC、PP): 使用大概 10 次 (低速使用可适当延长使用寿命)。

清洗和消毒是否正确也会对管材的使用寿命造成影响。

提示:严禁使用已经有破损的管材进行分离操作

## 12. 相对离心力计算(RCF)

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

R—转子半径, 单位: cm; n—旋转速度, 单位: rpm

## 13. 订单信息

Cat. No.	Model	Descriptions
912015130000	THE	多功能离心机, SE4-100 转子, 美标插头, 110V/50Hz/60Hz
912115120000	THE	多功能离心机, SE4-100 转子, 中标插头, 220V/50Hz/60Hz
912215120000	THE CENTRIFU GE	多功能离心机, SE4-100 转子, 欧标插头, 220V/50Hz/60Hz
912315120000	THE CENTRIFU GE	多功能离心机, SE4-100 转子, 英标插头, 220V/50Hz/60Hz
<b>Accessories</b>		
19400002	AS30-2	转子盖, 紧固锁, 密封圈,, 15000rpm, 2ml*30, 应用于 D1536 & D1536R
19400002	AS18-5V	转子盖, 紧固锁, 密封圈, 15000rpm, 5mlV*18, 应用于 D1536 & D1536R
19400003	AS60-2	转子盖, 紧固锁, 密封圈, 14000rpm, 2ml*60, 应用于 D1536 & D1536R
19400002	AS12-PCR8	转子盖, 紧固锁, 密封圈, 14000rpm, PCR8*12, 应用于 D1536 & D1536R
19400002	AS6—50V	转子盖, 紧固锁, 密封圈, 12500rpm, 50mlV*6,应用于 D1536 & D1536R
19400002	A30-15	30-Φ 17 不锈钢适配管, 4500rpm, 30-15mlV tubes, 应用于 D1536 & D1536R
19400004	A8-50	16-Φ 17 不锈钢适配管 ; 8-Φ 31 不锈钢适配管, 5000rpm, 16x15mlV ; 8x50mlV , 应用于 D1536 & D1536R
19400004	SE4-100A	4-Φ 45 不锈钢适配管, 4-45 不锈钢圈, 4000rpm, 4-100ml 适配管, 应用于 D1536 & D1536R
19400004	S2-MP	2-吊篮 与 2-不锈钢负载, 4000rpm, 应用于 D1536 & D1536R
	A85P100	85ml 转子适配器, 应用于 SE4-100A 转子, 4 个/包
	A50VP100	50mlV 转子适配器, 应用于 SE4-100A 转子, 4 个/包

用户使用手册	A15VP100	15mlV 转子适配器, 应用于 SE4-100A 转子, 4 个/包
	A10P100	3 ~ 10ml 转子适配器, 应用于 SE4-100A 转子, 4 个/包

19500001	A02P2	0.2ml 转子适配器, 应用于 AS30-2 & AS60-2 转子, 30 个/包
	A05P2	0.5ml 转子适配器, 应用于 AS30-2 & AS60-2 转子, 30 个/包
		9 孔吊篮
		4 孔吊篮
		2 孔吊篮
		1 孔吊篮

## 14. 质保

### 14.1 离心机质保

离心机提供 2 年的质保，自生产商交付日期起算。

### 14.2 转子质保

转子提供 5 年的质保，自生产商交付日期起算。

**请注意，以下事项不在质保范围内：**

- (1) 不正确的安装损坏
- (2) 不正确的操作损坏
- (3) 搬运或运输造成的损坏
- (4) 擅自拆卸造成的损坏
- (5) 使用非原厂配件造成的损坏
- (6) 地震，火灾等不可抗拒的自然原因造成损坏
- (7) 配件和耗材超出质保周期

## 15. 售后服务

为了确保安全高效的使用离心机，需要对离心机进行定期的维护保养。如果离心机出现问题，请不要擅自进行维修，联系与您最近的经销商或厂商售后服务中心。