

USER MANUAL

D3024 & D3024R

High Speed (Refrigerated) Micro-Centrifuge



Dragon Laboratory Instruments Limited

www.dragon-lab.com

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

VERSION201012



 **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 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 centrifuge 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.
- When there is fluid in the rotor chamber, please promptly 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 or bucket if such abnormality found.
 - 2) Do not set the centrifuge speed override the allowable minimum speed of the rotor kits (rotor, bucket, or the other adapter). 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 provided with a cap, ensure it is tightened before the operation.
- If any abnormal condition occurs during operation, please stop it immediately and contact our service center. Notice the service the alarm code if displayed.
- Earthquake damage is likely to the centrifuge, contact our service center if abnormality observed.

1. Specifications

Maximum speed	15000rpm(200-15000rpm), increment: 10rpm
Maximum RCF	21380×g, increment: 10×g
Maximum capacity	2ml×24, 0.5ml×36, 4-PCR8 serial tubes
Temperature range	-20℃ -40℃ (D3024R)
Timer	30seconds -99minutes-HOLD, continuous operation
Driving Motor	Brushless DC motor
Safety devices	Dual door interlock、 Over-speed detector、 Over-temperature detector、 Automatic internal diagnosis
Power requirements	D3024: Single-phase, 220V-240V, 50Hz/60Hz, 5A. 110V-120V, 50Hz/60Hz, 5A
	D3024R: Single-phase, 220V-240V, 50Hz/60Hz, 10A. 110V-120V, 50Hz/60Hz, 10A
Dimensions (mm)	D3024: (L) 280× (W) 364× (H) 266
	D3024R: (L) 338× (W) 580× (H) 324
Weight	D3024: 12kg
	D3024R: 30kg
Additional features	Speed/RCF switch、 Pulse operation、 Processing display、 Voice reminder

2. Declaration of Conformity

Construction in accordance with the following safety standards:
EN 61010-1
EN 61010-2-10
Construction in accordance with the following EMC standards:
EN 61326-1/ FCC Part 15 Subpart B/ IECS 001
Associated EU guidelines:
EMC-guidelines: 2004/108/EC
Instrument guidelines: 2006/95/EC
This ISM device complies with Canadian ICES-001.

3. Required Operational Conditions

3.1 Basic operational conditions

(1) Power:

D3024: Single-phase, 220V-240V, 50Hz/60Hz, 5A; 110V-120V, 50Hz/60Hz, 5A

D3024R: Single-phase, 220V-240V, 50Hz/60Hz, 10A; 110V-120V, 50Hz/60Hz, 10A

(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 conditions

(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:**

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

4.1 Location

(1) Locate this 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 table-board that conveys vibration.

(2) Ideal ambient temperature is 20°C±5°C, avoid placing the centrifuge in direct sunlight if temperature exceeds 30°C.

(3) Ensure the centrifuge has at least 10cm of free space on both sides and at least 30cm behind it to guarantee cooling efficiency.

(4) No heat or water resource nearby, otherwise easily cause sample temperature increase or centrifuge

failures.

4.2 Connection of the power cord and grounding

⚠ WARNING:

- Do not touch the power cord with wet hands to avoid electrical shocks.
- This centrifuge must be grounded properly.

(1) This centrifuge is equipped with a 3P flat plug, grounding can be done just by plugging the 3P plug into the outlet.

(2) An over 10A outlet which has a good ground is required, and meet with local safety requirements to ensure its earth terminal is properly.

5. Structure

D3024

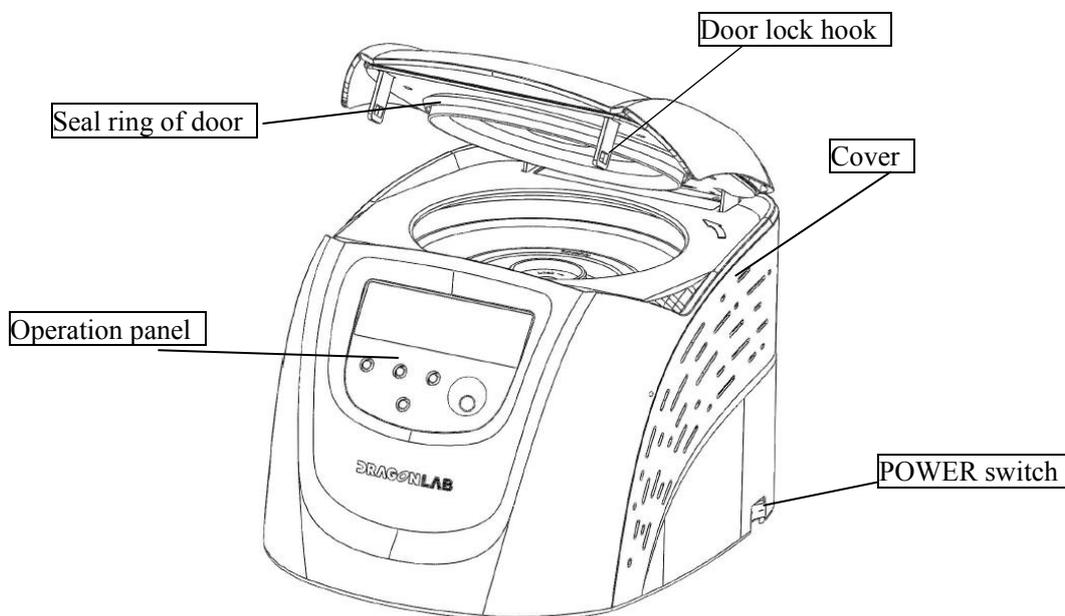


Figure 5.1 D3024 Front view of centrifuge

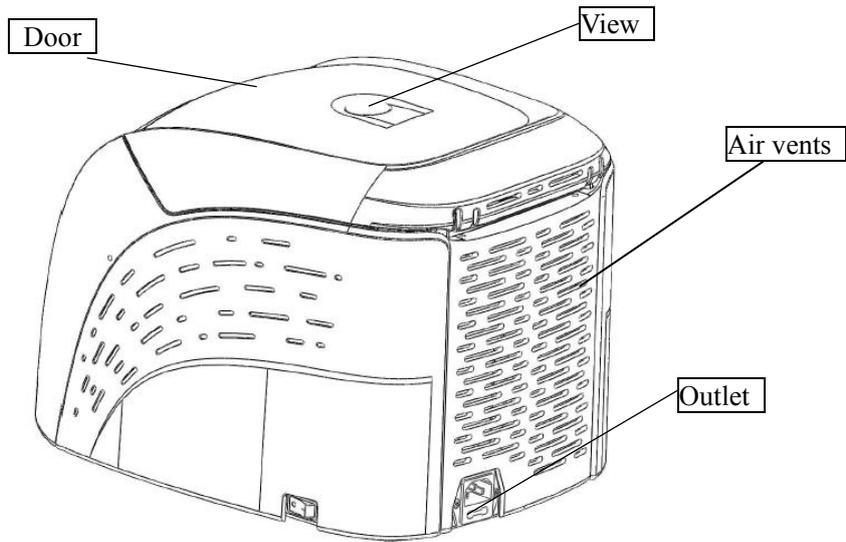


Figure 5.2 D3024 Rear view of centrifuge

D3024R

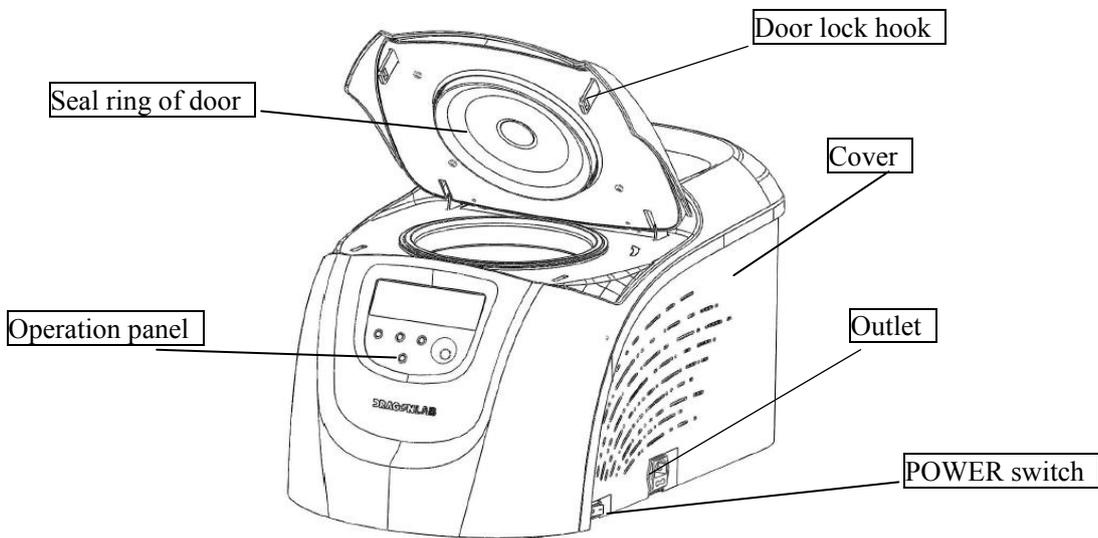


Figure 5.3 D3024R Front view of centrifuge

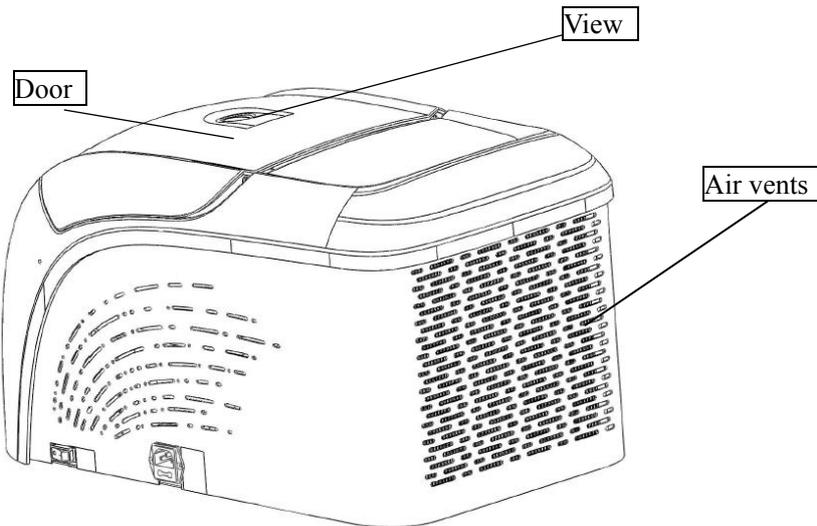


Figure 5.4 D3024R Rear view of centrifuge

6. Operation panel

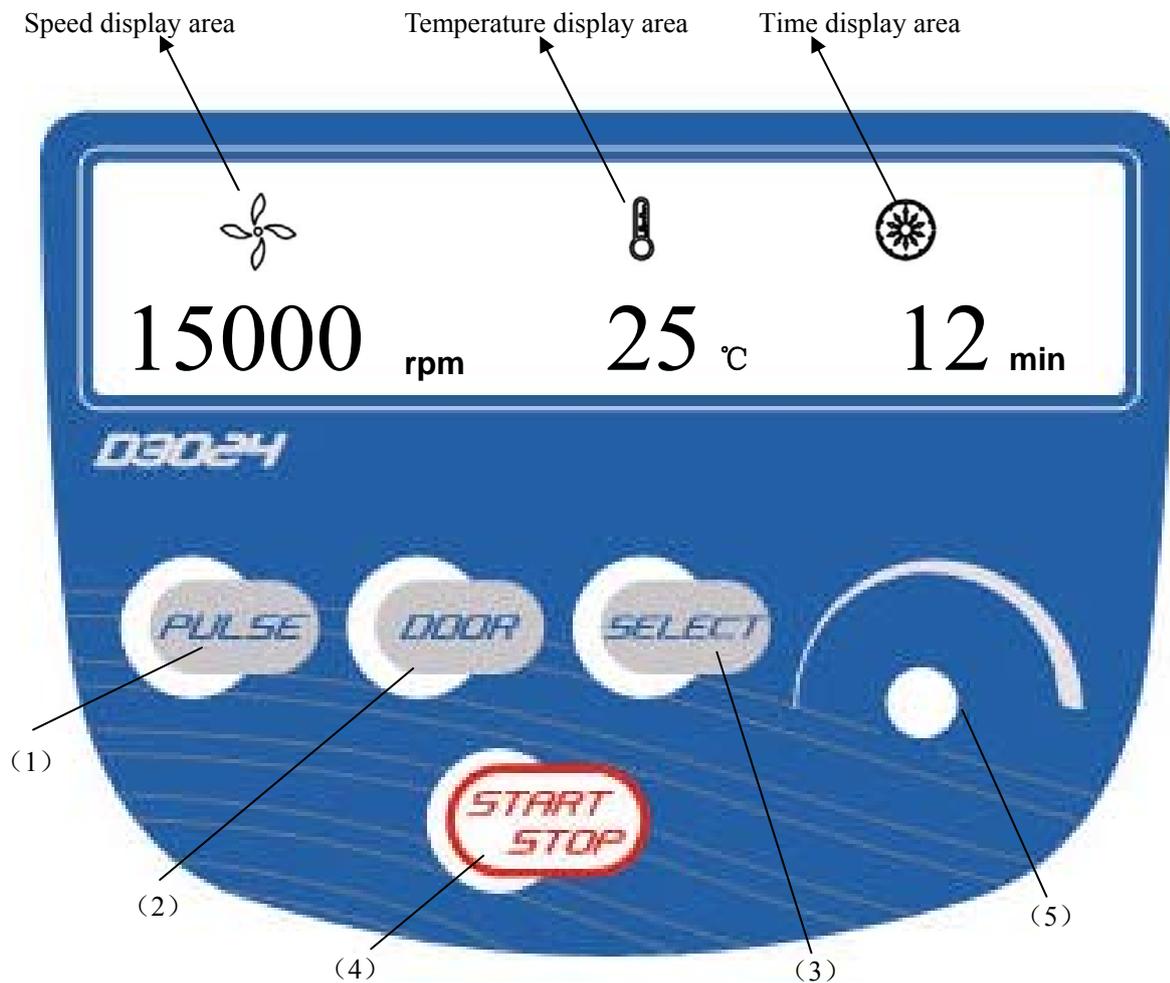


Figure 6-1 Operation Panel

Item	Symbol	Name	Function
1		Pulse button	When the door closed, press and hold the button to accelerate running, release the button to stop it.
2		Open/ lock button	Press the button to open the door The button is not available when the centrifuge is running.
3		Select button	Press the button to choose the parameter which you want to modify.
4		Start/ Stop button	Press down the button to start running. The centrifuge will brake to stop running if press the button during centrifugation.
5		Parameter button	Clockwise rotate to increase parameter values. counter-clockwise rotate to decrease parameter values. Press down the button, shift between speed and RCF display.

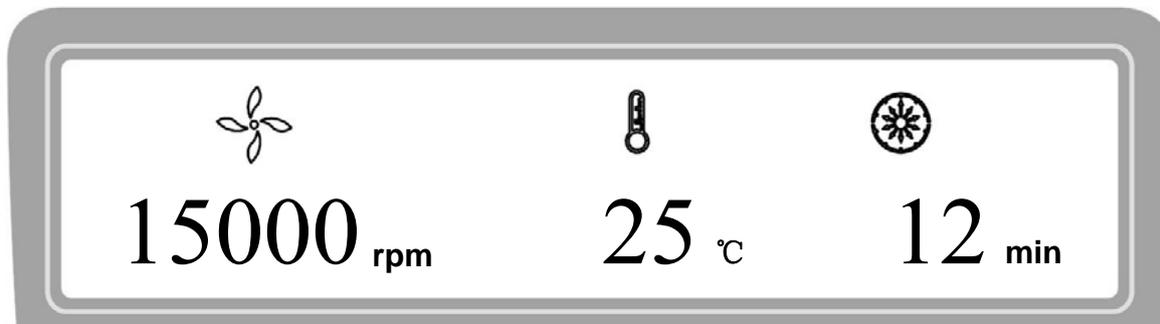


Figure 6-2 The main interface (D3024)

Main interface of D3024 model is as figure 6-2. The speed is set to be 15000rpm, temperature of centrifugal chamber is 25°C, and the running time is 12 minutes. 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.

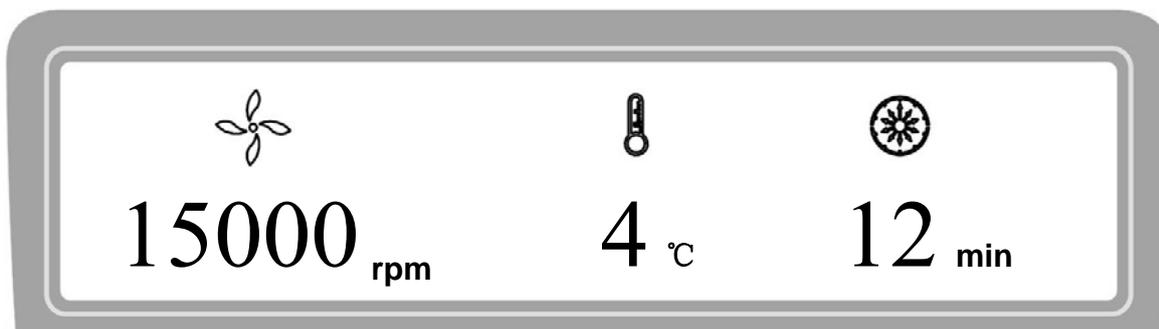


Figure 6-3 The main interface (D3024R)

Main interface of D3024R model is as figure 6-3. The speed is set to be 15000rpm, temperature of centrifugal chamber is 4°C, and the running time is 12 minutes. When speed symbol  is rotating, indicating the centrifuge is running, the rotation is faster, the speed is higher. When temperature symbol  is blinking, indicating refrigeration is running, no blinking means refrigeration stop working. 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 sample

7.2 Inject the sample into tubes.

 CAUTION: Do not inject overloading samples into the centrifuge which will be caused leaking.

- Do not exceed the actual capacity allowed in the user manual.

7.3 Keep the tubes balance

- Although the centrifuge can accept sample balancing by eye, we recommend that you use 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

 CAUTION:

- Any abnormality such as corrosion or scratches are found, stop using the rotor and contact our service center.
- Only manufacturer's rotors which claimed can be used with the unit.

- Check the rotor and bucket for corrosion or scratch before using.

7.5 Symmetrically load centrifuge tubes in rotor

 CAUTION:

- Make sure the rotor door is securely fixed on the rotor, rotor and shaft are tightened. Otherwise, the rotor may be moved off while rotating and cause damage of the centrifuge or 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 fragment or sample solution left in the centrifugal chamber. Always keep the centrifugal chamber clean.
- If this centrifuge makes strange noise during operation, stop it immediately and contact our service center. Notify the alarm code if displayed.

8.1 Normal operation

Turn on the POWER switch, centrifuge will start the self-checking process. (See figure 8-1)

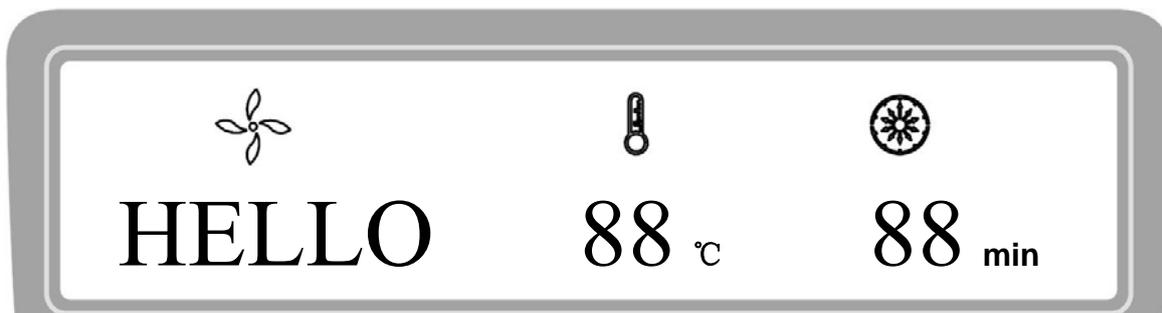


Figure 8-1 Self-checking interface

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

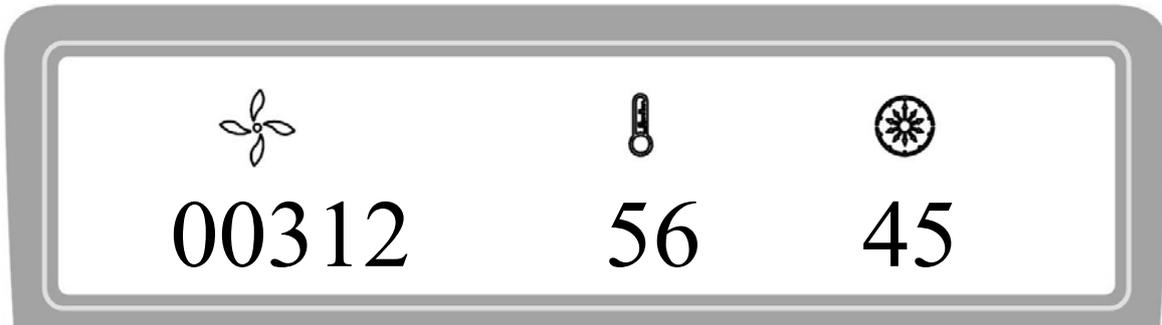


Figure 8-2 Accumulative running time interface

- The figure indicates the instrument has accumulated running time 312 hours 56 minutes and 45 seconds, and then the instrument displays the last running parameters.

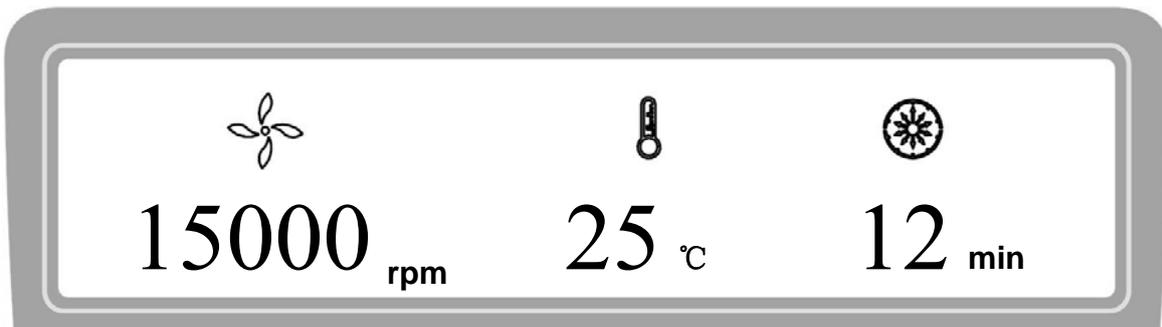


Figure 8-3 Last running interface

- Speed: 15000rpm; running time: 12minutes; centrifugal chamber temperature: 25 °C
- Release the door.

8.1.1 Load and replace the rotor

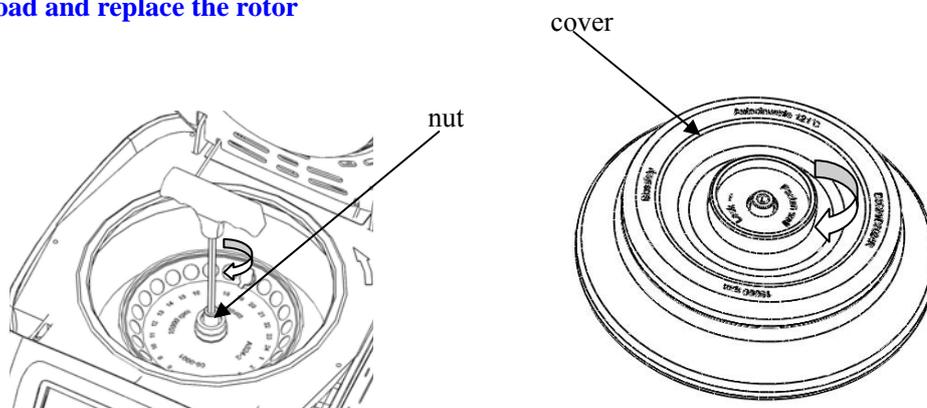


Figure 8-4 Load the rotor

 CAUTION:

- Load the rotor on the shaft to ensure rotor is in position until it contacts with the shaft, and tighten the screw to connect firmly the rotor with shaft, otherwise the rotor may be move off to damage the centrifuge.
- Should be confirmed the rotor lid is firmly tightened with rotor.

- Load the rotor to the shaft to ensure rotor is in position until it fit well with the shaft.
- You should feel a click when the rotor is properly loaded on the shaft. If not, may be something stuck between the rotor and the shaft. Double check and clean it if necessary.
- Rotate the rotor slightly by your fingers to double check, if the rotor vibrates obviously, load the rotor again.
- Clockwise rotate the nut using the wrench to tighten the rotor with shaft firmly.
- Close the rotor lid, clockwise rotate and firmly tighten the cover with rotor and ensure is in position. Close the door and then start running.
- The method of removing rotor is as same as the above mentioned by turning the screw counterclockwise.

8.1.2 Set the operation parameters

Press the  button to select required parameters. The parameter can be modified when the parameter is flashing. Clockwise rotate the parameter button  to increase parameter value. counter-clockwise rotate the parameter button  to decrease parameter value. Parameter button  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 select button , choose the speed unit rpm, showing the speed parameter.
- While select speed button, the speed symbol will flash into the speed parameter input status.
- The minimum speed value you can set 200rpm, the minimum increment is 10rpm.
- Clockwise rotate parameter button  to increase parameter value. counter-clockwise rotate parameter button  to decrease parameter value.
- You can quick set value by parameter button , quickly rotate parameter button  to

speed up parameter changing.

- There is a circulating function to increase/ decrease parameters. Clockwise rotate parameter button , values circulate from small → large → maximum → minimum. counter-clockwise rotate parameter button , values circulate from large → small → minimum → maximum.

(2) Set the time:

- Press select button , time value flash into time setting mode.
- Rotate parameter button  to set running time range from 30 seconds to 99 minutes.
- When time displays as HD, that showing long-running mode.

(3) Set the temperature (D3024R):

- Press select button , temperature value flash into temperature setting mode.
- Rotate parameter button , input temperature value range from -20°C-40°C.
- When temperature symbol  flash, indicating refrigeration system is running, otherwise refrigeration stops working.

8.1.3 Start the operation

(1) Press button  to start running

- The door should be locked before rotor starts rotating.
- It will start timing once the rotor starts running, the screen displays remaining run time.

(2) Inquiry and modify the operation parameters

- Operation parameters can be modified after the centrifuge reaches setting speed.
- Press select button , return to the preparation interface and displays setting parameters.

Press again the select button , once the parameter symbol is flashing, rotate parameter button  to modify parameters. Release button after 5 seconds, centrifuge will return to normal operation mode and run process according to the new parameters.

- After time parameter has been modified, the operation time is not cleared and will continue to be accumulated.

(3) Alarm display

- If anything wrong in processing, the centrifuge will brake to stop automatically, and display the error code on the time area. You can find out the malfunction causes by checking the table 10-1, and make correct actions accordingly.

8.1.4 End the operation

- (1) The centrifuge will brake when it reaches the setting time or  button is pressed.
 - When the rotor stops rotating, centrifuge will start beeping to alarm the operation was over.
- (2) Open the door
 - The door can be released automatically when the operation was over.
 - After door closed, you are able to press the  button 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 sample.

8.2 RCF (Relative Centrifugal Force) operation

- (1) Turn on the POWER switch
- (2) Set a RCF value

 CAUTION:

- Do not exceed the allowable maximum RCF value of the rotor and adapters.

- Press the select button , choose speed unit $\times g$, the speed symbol will flash into RCF parameter input status.
- If no button is pressed after the speed parameter has flashed after 5 seconds, the inputting mode will be shut down.
- Rotate parameter button  to input a RCF value, RCF increment is $10 \times g$.

- (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 button works only when the rotor stopped and the door locked.

- (1) Turn on the POWER switch and load the rotor on the shaft, tighten the rotor door and make sure it is in secured position, and then close the door.

(2) The centrifuge gets into preparation mode and displays last running parameters.

(3) Press  knob and hold, speed up to reach the maximum speed. While release  knob during acceleration, the centrifuge will start to decelerate and stop.

9. Maintenance

9.1 Cleaning

 CAUTION: Do not follow the recommended instructions for cleaning or disinfecting which 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.
- Once the centrifuge is heavily dirty, 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.

- Once the rotor chamber is dirty, 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

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

(4) Door

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

(5) Rotor

- To prevent corrosion, remove the rotor from rotor chamber. If do not use for a lone term, then

detach the rotor door and upside the rotor down to dry the tube holes.

- If a sample is leaked in the rotor, rinse the rotor with water. Apply a thin coat of silicon grease to the rotor when it is completely dried.
- 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 (D3024R)

- The centrifuge is equipped with [drainage](#), drain off water when more water is in drain pipe.

9.2 Consumables

The table list below is the centrifuge consumables. It is recommended to replace consumables according the table below.

No.	Consumables	Replacement conditions
1	Seal ring of door	Crack
2	Rubber block of temperature sensor	
3	Seal ring of centrifuge chamber (3024R)	

9.3 The replacement of 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.

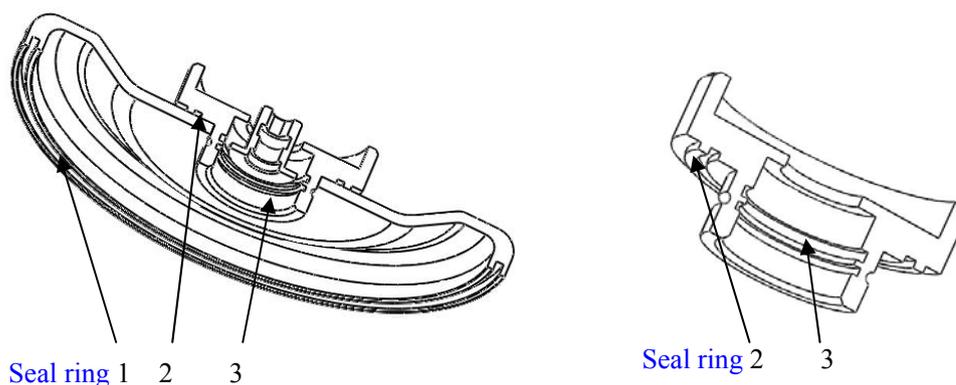


Figure 9-1 Seal rings of rotor

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 multimeter 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 Frequent problems list

This centrifuge has designed self-diagnosing function. When something wrong and it is not available to operate, the alarm code will be displayed on the time display screen, and the operator can know the malfunction caused by the alarm code.

 **WARNING:** Do not open the door when the rotor is rotating during maintenance.

Symptom	Causes	Solutions	
Nothing appears on the screen when the POWER is turned on.	<ul style="list-style-type: none"> ·Building power circuit breaker trips. ·the fuse was blown out. 	<ul style="list-style-type: none"> ·Remove the trouble and turn on the POWER. ·Replace the fuse. 	
Alarm code appeared on the time display screen	E-02 Door fault	<ul style="list-style-type: none"> ·The door opened in running. ·Press the button  while the door opening. 	<ul style="list-style-type: none"> ·Close the door immediately. ·Close the door, and then start to operate.
	E-04 Temperature fault	<ul style="list-style-type: none"> ·The air inlets are blocked. ·Radiator fan is damaged. 	<ul style="list-style-type: none"> ·Clean air inlets. ·Replace radiator fan.
	E-06 Set wrong parameter	<ul style="list-style-type: none"> ·The setting parameter exceed the allowable range. 	<ul style="list-style-type: none"> ·Modify the parameter value.
	E-10~86	<ul style="list-style-type: none"> ·Read the maintenance manual. 	<ul style="list-style-type: none"> ·Contact with service center.

Table 10-1 Frequent problems and solutions

- Alarm code E-1-9 are related to wrong operating. You can continue running the centrifuge after the cause removed.

10.2 How to open the door

<p> WARNING:</p> <ul style="list-style-type: none">● Never open the door while the centrifuge is running.● close the door immediately when the rotor is still rotating.

10.2.1 In the case of power on

<p> CAUTION: The door just can be opened while the power on and rotor stops rotating.</p>

- (1) Turn on the POWER switch, release the door automatically.
- (2) The door will be released automatically once the operation finished.
- (3) Press  button once the rotor stops, door can be released.

10.2.2 In the case of power outage

If the door cannot be opened due to the power outage, open the door as follows.

- (1) Ensure if the rotor is rotating.
 - Listen carefully to ensure no rotating sound can be heard.
- (2) Insert a screw driver into the hole to open door.
 - The hole is located on the left、right sides of the unit.
 - Insert a screw driver into the two holes and push forward to release the door.

10.3 Replace fuses

- (1) There are two fuses of D3024, 250V, 5A time-delay type, size: $\Phi 5 \times 20$. There are two fuses of D3024R, 250V, 10A 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.

11.1 The rotor instructions

11.1.1 Rotor structure

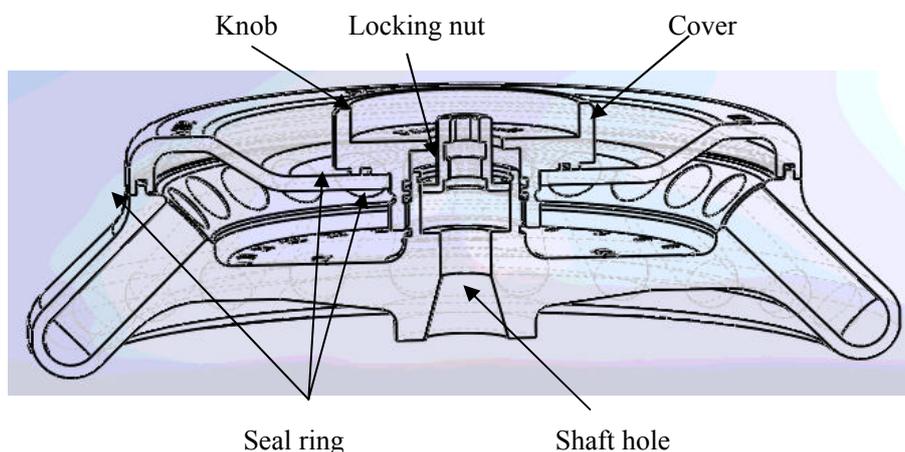


Figure 11-1 The rotor structure

11.1.2 Available rotors and adapters

All rotors 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:

Table 11.1 Rotors and adapters

Rotor type	ID code	Tube/bottle	Adapter	Maximum speed (rpm)	Maximum centrifugal radius r_{max} (cm)	Maximum RCF Rcf ($\times g$)
1	AS24-2	2/1.5ml tube		15000	8.5	21380

		0.2ml PCR tube	A02P2	15000	6.9	17350
		0.5ml micro tube	A05P2	15000	7.6	19100
2	AS36-05	0.5ml micro tube		15000	8.5	21380
		PCR8 serial tube	A02P05	15000	7.6	19100
3	AS4-PCR8	PCR8 serial tube			6.5/7.2	16350/18100

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 lone term, 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

121°C (1.0kg/cm²) 20 minutes. The rotor makes by high-strength aluminum alloy material, can be high-pressure sterilization: 121°C (1.0kg/cm²) 20 minutes.

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 Clean and sterilize tubes, please refer to the table below.

Table 11.2 Cleaning and sterilizing conditions for tubes

O: Applicable X: Inapplicable

Condition		Material	PA	PC	PP
			Clean	Acidic (pH5 or lower)	X
Acidic (higher than pH5)	O	O		O	

	Cleaning fluids	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 ²) 30minutes	O	O	O
		121°C (1.0kg/cm ²) 20 minutes	X	O	O
		126°C (1.4kg/cm ²) 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/cm²) for 30 minutes and PC and PP tubes at 121°C (0.1kg/cm²) for 20 minutes. If a certain temperature is exceeded, the tubes may be deformed.

When use 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 doors 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 5.0 and 9.0), 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 cracked tubes.

12. Calculate RCF

An RCF can be determined as the calculation formula 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
912015130000	D3024	High Speed Micro-Centrifuge, with AS24-2 rotor kits, US plug, 110V/50Hz/60Hz
912115120000	D3024	High Speed Micro-Centrifuge, with AS24-2 rotor kits, Cn plug, 220V/50Hz/60Hz
912215120000	D3024	High Speed Micro-Centrifuge, with AS24-2 rotor kits, Euro plug, 220V/50Hz/60Hz
912315120000	D3024	High Speed Micro-Centrifuge, with AS24-2 rotor kits, UK plug, 220V/50Hz/60Hz
922015130000	D3024R	High Speed Refrigerated Micro-Centrifuge, with AS24-2 rotor kits, US plug, 110V/50Hz/60Hz
922115120000	D3024R	High Speed Refrigerated Micro-Centrifuge, with AS24-2 rotor kits, Cn plug, 220V/50Hz/60Hz
922215120000	D3024R	High Speed Refrigerated Micro-Centrifuge, with AS24-2 rotor kits, Euro plug, 220V/50Hz/60Hz
922315120000	D3024R	High Speed Refrigerated Micro-Centrifuge, with AS24-2 rotor kits, UK plug, 220V/50Hz/60Hz
Accessories		
19400002	AS24-2	Rotor kits with cover, fixing clips and O'ring, 15000rpm, 2ml*24, used with D3024 & D3024R
19400003	AS36-05	Rotor kits with cover, fixing clips and O'ring, 15000rpm, 0.5ml*36, used with D3024 & D3024R
19400004	AS4-PCR8	Rotor kits with cover, fixing clips and O'ring, 15000rpm, 4-PCR8, used with D3024 & D3024R

19500001	A02P2	0.2ml rotor adapter, used with A12-2 & AS24-2 rotors, 24pcs/pk
19500002	A05P2	0.5ml rotor adapter, used with A12-2 & AS24-2 rotors, 24pcs/pk
19500003	A02P05	0.2ml rotor adapter, used with AS36-05 rotor, 36pcs/pk

14. Guarantee

14.1 Guarantee of centrifuge

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

14.2 Guarantee 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

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.

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