USER MANUAL

High-speed ventilated microcentrifuge
D1524



Please read the user manual carefully before using the centrifuge.

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1 COPYRIGHT:

No part of this manual may be reproduced without the written permission of the manufacturer.

The manufacturer is not required to notify any changes in the technical specifications of the centrifuges.

2 SAFETY ADVICE

2.1 Safety precautions

Please read the following safety precautions carefully:

- Carefully read the safety instructions in this manual and on the centrifuge.
- Follow the instructions and procedures described in this manual to use the centrifuge safely.

Safety messages are represented as follows in combination with the words 'WARNING' and 'CAUTION' and with the hazard triangle symbol to draw attention to potentially hazardous elements or operations. The definitions of hazard are as follows:



CAUTION: Danger to persons

Warning notes indicating any conditions of use which, if not strictly observed, could result in personal injury or death.



CAUTION: Possible damage to the centrifuge

Cautionary notes indicating conditions of use which, if not strictly observed, may result in damage or destruction of the centrifuge.

- Do not use this centrifuge in any way other than that described in this user manual. In case of need or any problems, contact qualified technical personnel.
- The precautions described in this manual have been carefully developed to protect users from all possible risks.



WARNING

- This centrifuge is not explosion-proof. Never use explosive or flammable samples.
- Do not install the centrifuge in locations where flammable gases are generated or where hazardous chemicals are stored.
- Do not place hazardous materials within 30 centimetres of the centrifuge.
- Take all necessary safety precautions before using toxic, radioactive or microorganism-contaminated samples.
- If the centrifuge rotor and accessories become contaminated with toxic, radioactive or pathogenic materials, clean them according to the appropriate decontamination procedure.
- If you require technical assistance, please sterilise and decontaminate the centrifuge in advance, and then notify the technical staff of the details of the materials and procedures used.
- To avoid electric shock, ensure your hands are completely dry before touching the power cord or turning the power switch on/off.
- For safety reasons, do not stand within 30 centimetres of the centrifuge when it is in operation.
- While the rotor is spinning, never attempt to force the locking mechanism.

NOTE: Unauthorised repairs or modifications to the centrifuge by anyone other than specialised technicians from the service centre are strictly prohibited.



WARNINGS

- The centrifuge must be placed on a stable, horizontal surface.
- Ensure that the centrifuge is horizontal before use.
- Ensure that the angle between the lid and the machine body is greater than 70 degrees when opening the lid.
- Be careful not to put your fingers or hands between the opening and the lid.
- Do not move or shift the centrifuge while it is in operation.
- If liquid leaks into the rotor chamber, clean it immediately and dry it with a cloth to prevent sample contamination.
- Be sure to remove any objects and test tube fragments that have fallen into the rotor chamber before performing another centrifugation.
- Precautions for the rotor:
- Always check that there is no corrosion and/or damage on the surface of the rotor before use. Do not use the rotor if any abnormalities are found.
- Do not set the speed above the maximum value allowed for the rotor/adapter kit.
- Never exceed the permissible imbalance load.
- Use the rotor and tubes without exceeding their actual capacity.
- If the rotor is equipped with a lid, ensure that it is securely fastened.
- If any abnormalities occur during operation, it is recommended that you immediately stop the centrifugation cycle and contact the supplier's service centre.
- Inform the service centre if an alarm code is displayed.
- Excessive vibrations can damage the centrifuge. Contact the supplier's service centre if any anomalies are detected as a result of these phenomena.

3 TECHNICAL SPECIFICATIONS

Maximum speed	15,000 rpm (200-15,000 rpm), increment: 100 rpm
Maximum RCF	21,380 x g, increment: 10 x g
Maximum capacity	2 x 24 ml, 0.5 x 36 ml, 4-PCR8 for PCR
Timer	30 seconds - 99 minutes or continuous
Acceleration ramps	1-9
Deceleration ramps	1-9
RCF display	Yes
Spin function	Yes
Programmes	Yes
Motor	Induction motor
Safety devices	Double-locking lid; Maximum temperature sensor; Automatic diagnosis, imbalance sensor
Electrical characteristics	Single-phase, 220V-240V, 50Hz, 400 W
Dimensions (mm)	(L) 300 × (W) 440 × (H) 250
Weight	18 kg
Acceleration/deceleration time	25s↑25s↓
Noise	≤56dB

4 OPERATING CONDITIONS

4.1 Basic operating conditions

- Power supply: 220V-240V, 50Hz, 500W
- Ambient temperature: 5℃ ~ 40℃.
- Relative humidity: ≤ 80%.
- No vibration or airflow around the centrifuge.
- No explosive or corrosive gases present.

4.2 Transport and storage conditions

- Storage temperature: -40℃ ~ 55℃.
- Relative humidity: ≤ 93%.
- During transport, the centrifuge must remain in an upright position, suitably protected by a wooden Kart box. Lift the centrifuge only by the frame.
- Pay attention to the weight of the centrifuge during transport (see "performance indicators").
- Centrifuges with a cooling device must be left for approximately 1 hour after being moved to a new location in order to stabilise the refrigerant in the compressor.

5 INSTALLATION

This section describes the instructions to be followed when installing the centrifuge to ensure safety and optimal performance. Before moving the centrifuge, the rotor must be removed.



WARNING

- Incorrect power supply may damage the centrifuge.
- Ensure that the power source complies with the required specifications before connecting to the mains.

5.1 Position

- Place the centrifuge on a flat, solid surface and ensure that there is no unevenness, making sure that the four feet of the centrifuge are firmly on the counter.
- Avoid installing it on a slippery surface or a surface subject to vibrations.
- The ideal ambient temperature is 20°C ± 5°C. Avoid exposing the centrifuge to direct sunlight if the temperature exceeds 30°C.
- Maintain a clear area around the centrifuge of at least 10 cm on both sides and at least 30 cm behind to ensure efficient cooling.
- Keep it away from sources of heat or water to avoid sample heating problems or centrifuge malfunctions.

5.2 Connecting the power cable and grounding



WARNING

- To avoid electric shock, ensure your hands are dry when touching the power cord.
- The centrifuge must be properly earthed.

A socket with a minimum amperage of 10A provides sufficient protection and is necessary to meet local safety requirements.

6 STRUCTURE

Refrigerated Microcentrifuge:

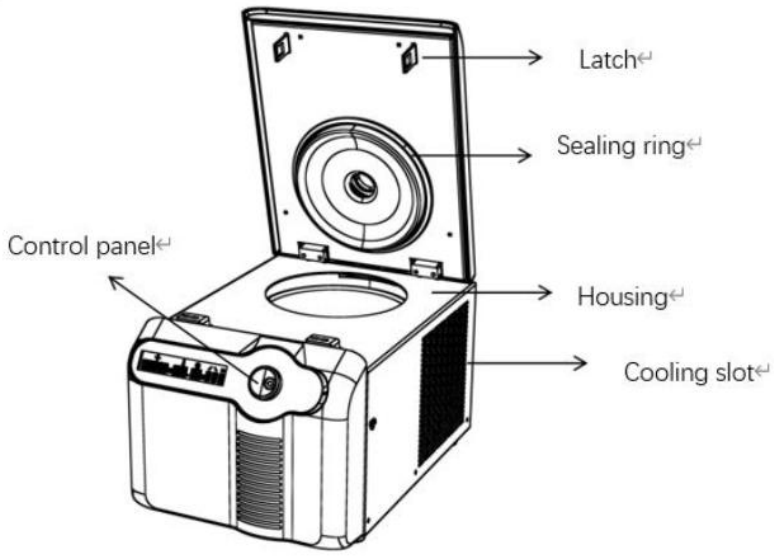


Fig. 5.3. Front view of centrifuge

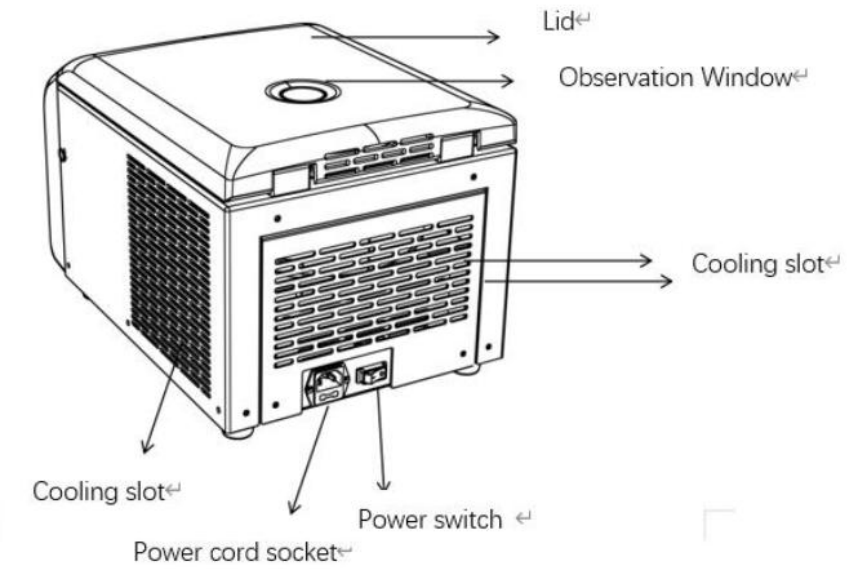
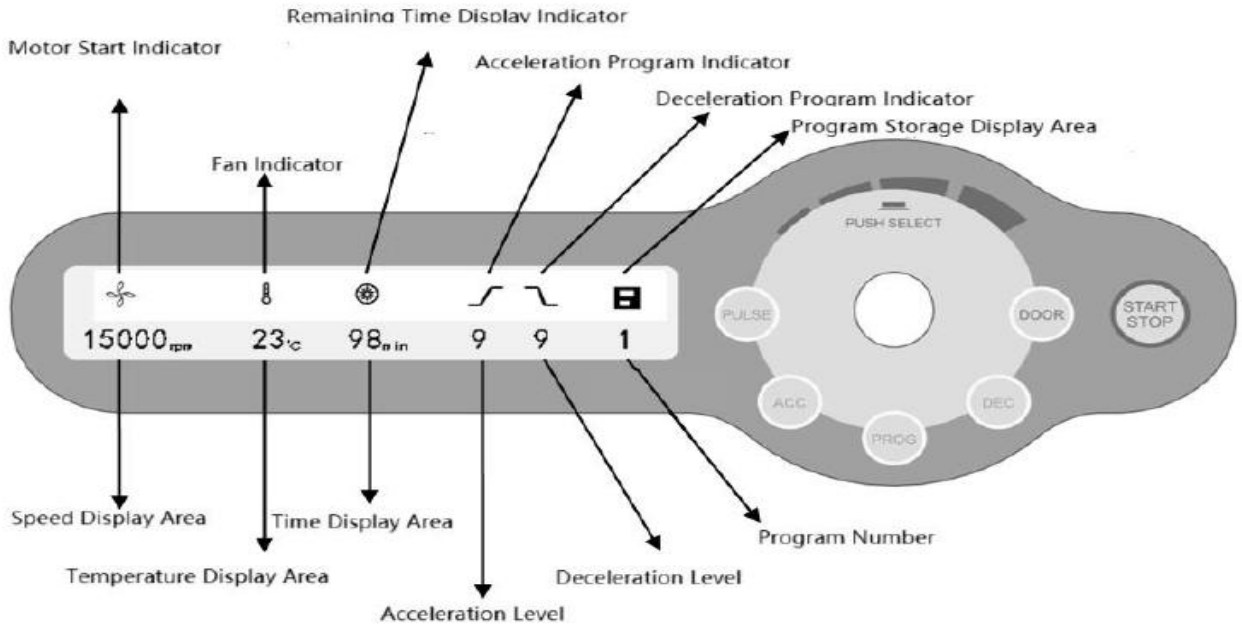


Fig. 5.4 Rear view of centrifuge

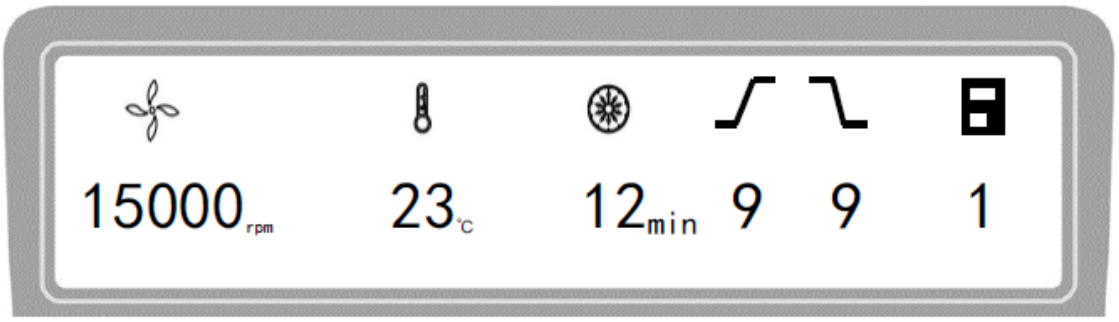
7 CONTROL PANEL



No.	Button	Description	Function
1	Acc	Acceleration	Press this button to set the acceleration level (1-9)
2	Dec	Deceleration	Press this button to set the deceleration level (1-9)
3	Prog	Programmes	Press this button to select the stored programme.
4	Door	Lid opening	Press this button to open the lid. The button is not available when the spin cycle is in progress.
5	Pluse	Pulse	When the lid is closed, pressing and holding this button causes the centrifuge to reach the set rotation speed.
6	START STOP	Start/Stop	Press this button to start the cycle. The centrifuge will stop if the button is pressed during the centrifugation.
7		Programming	Press the knob to enter the programme parameter setting mode. Press the knob to scroll through the parameters. Turn clockwise to increase and anticlockwise to decrease the values.

The following table provides a comparison of acceleration and deceleration times in 1-9 positions: (error ±10%)

Level	Acc (0—15,000rpm)	Dec (15,000-0rpm)
1	75s	73s
2	52s	44
3	44	42
4	35	38
5	30	36
6	28	34
7	26	31
8	24s	28s
9	23	26



Main screen

The main screen appears as shown in the figure. The speed is set to 15,000 rpm, the temperature inside the chamber is 23°C, and the centrifugation time is set to 12 minutes.

When the speed symbol rotates, it means that the centrifuge is in operation.

The time symbol indicates the ratio between elapsed time and set time. Elapsed time is divided into 10 sections.

8 ROTOR PREPARATION

8.1 Preparation of samples

8.1.1 Placing the samples in the test tubes

WARNING

- Do not overfill the test tubes containing the sample as this may cause leakage.
- Do not exceed the actual capacities indicated in this manual.

8.1.2 Load balancing

- Although the centrifuge can operate correctly with an approximate rotor balance, it is advisable to always perform a precise balancing using a precision balance, as this will extend the life of the machine.
- Never intentionally attempt to centrifuge under unbalanced conditions, even if the permissible imbalance is not exceeded.

8.1.3 Rotor inspection

Always check the rotor for signs of corrosion or scratches before use.



WARNING

- If signs of corrosion, scratches or other abnormalities are detected, stop using the rotor immediately
- using the rotor and contact the supplier's service centre.
- Only rotors manufactured by the manufacturer may be used with this centrifuge.
- Do not expose the rotor and its accessories to direct sunlight or ultraviolet rays.

8.1.4 Securing the rotor



WARNING

- Ensure that the rotor lid is securely fastened to the rotor and that the rotor and shaft are tightly secured. Otherwise, the rotor may oscillate during rotation and cause damage to the centrifuge and the rotor itself.

9 OPERATIONS



CAUTION

- Do not push or lean on the centrifuge while it is in operation.
- Do not run centrifugation cycles if there are fragments or liquids from the samples in the inner chamber. Always keep the centrifuge chamber clean.
- If the centrifuge makes strange noises during operation, stop it immediately and contact the service centre.
- Notify them of any alarm code, if displayed.

9.1 Routine operations

When you press the power button, the spin dryer turns on and the first screen, Hello page, appears on the display. See below:



Self-diagnostic test

The display will then show the last values set.

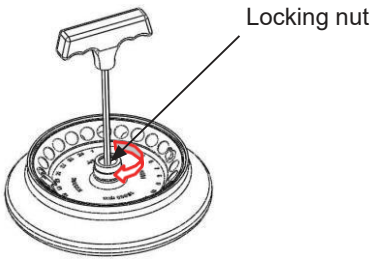


Last values set

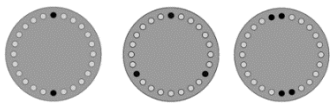
Set speed: 15,000 rpm; duration: 12 minutes; centrifuge chamber temperature: 25 °C.

The outer lid lock is released.

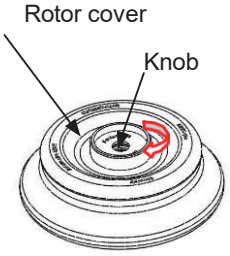
9.1.1 Loading and replacing the rotor



Inserting the rotor onto the shaft



Symmetrical loading of test tubes into the rotor



Securing the cover

CAUTION

- Secure the rotor to the motor shaft. Ensure that the rotor is in position and secure it to the shaft by tightening the Allen screw.
- Ensure that the rotor cover is securely anchored to the rotor.

- Place the rotor on the shaft and ensure that it is in the correct position.
- When the rotor is correctly loaded onto the shaft, you should hear a 'click'. If not, there may be

something stuck between the rotor and the shaft. Check and clean if necessary.

- Rotate the rotor slightly with your fingers to check for vibration. If so, secure the rotor again.
- Turn the Allen key clockwise using the tightening key provided.
- Close the rotor lid and tighten the ring nut clockwise. Close the lid and start centrifugation.
- The method for removing the rotor is the same procedure performed in reverse, i.e. by turning the locking Allen key anticlockwise.

9.1.2 Closing the lid

- Close the centrifuge lid by gently pushing it downwards.
- The lid locks automatically with an audible click.

NOTE: *Do not slam the centrifuge lid.*

The lid only closes when the centrifuge is switched on.

9.1.3 Setting the programmes

The '' knob is used to set the programme parameters.

- Press the knob to enter programme adjustment mode.
- Press and select the parameter to be adjusted. The value can be changed when the parameter flashes. The minimum rotation speed is 100 rpm, the minimum centrifugal force step is 10 g and the minimum step time is 1 second if within 1 minute and otherwise 1 minute.
- Turn the adjustment knob clockwise to increase the parameter value or anticlockwise to decrease the value.

1 - Set the speed

- Press the ' ' knob to select the rpm value for the speed and wait for the corresponding value on the display to start flashing. The parameter increases or decreases cyclically.
- Turn the knob clockwise/anti-clockwise to increase/decrease the speed value.

The minimum speed value that can be set is 200 rpm, the minimum increment is 100 rpm.

2 - Set the time

- Press the knob to select the time parameter and wait for the corresponding value on the display to start flashing.
- Turn the adjustment knob to set the duration from 10 seconds to 99 minutes.

When the display shows "HD", this indicates continuous operation mode.

9.1.4 Starting centrifugation

- Press the ' START STOP ' button to start centrifugation.
- The lid must be locked before the rotor starts spinning.

The timer will start counting down once the set speed value has been reached. The screen displays the remaining operating time.

2 Viewing and modifying programmes

- Programmes can be modified after the centrifuge reaches the set speed.
- Pressing the knob returns the display to the programme interface and shows the operating parameters.
- Press the knob to select the desired parameter. When it flashes, turn the knob to change the value.

After 7 seconds of inactivity, the display will return to normal mode and run the programme according to the new values.

If the set time value has not been changed, the operating time will not be affected and will continue its countdown.

3 - Display of a message

If an error occurs during centrifugation, the machine will stop automatically and display the error code on the display. The error code can be checked in Table 10-1, and appropriate corrective actions can be taken.

9.1.5 End of centrifugation

The centrifuge stops when the set time has elapsed or when the ' START STOP ' button is pressed. When the rotor stops spinning, the centrifuge will emit an acoustic signal to indicate that the operation is complete and the lid opens.

2 - Opening the lid

Press the '(Door)' button to open the lid and remove the tubes and, if necessary, the rotor.

After completing the operation, the microcentrifuge automatically stores the programme values set for this operation, and the display will show these values again when the machine is restarted.

10 RCF (RELATIVE CENTRIFUGAL FORCE)

Turn on the power switch.

Set an RCF (relative centrifugal force) value



CAUTION

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

The relative centrifugal acceleration is calculated based on the maximum radius and speed of the rotor. (See Table 14.2 for the maximum rotor radius).

- Press the knob and select the xg unit. The symbol will start flashing and you can then set the desired RCF value.
- Turn the adjustment knob to set an RCF value. The minimum RCF increment is 100 xg.

If no button is pressed after the speed value starts flashing, the setting mode will exit after 7 seconds.

3 - Set the operating conditions

For all other operations, refer to section 9.1 above, which contains all the necessary instructions.

10.1 Rapid centrifugation function (Spin)

This function is generally used to remove any residual samples that may have adhered to the inside of the tubes or to perform rapid centrifugation.

Note: The button only works when the rotor is stationary and the lid is closed.

- Switch on the power supply On/Off switch and load the rotor, tighten the rotor lid and ensure that it is in the closed position, then close the lid.

The centrifuge enters preparation mode and displays the values from the last cycle. The values can be reset to zero.

- By pressing and holding the '(Pluse)' button, the centrifuge accelerates to the set speed. If the button is released during acceleration, the centrifuge begins to slow down and stops.

11 MAINTENANCE

11.1 Cleaning



CAUTION

Disconnect the power cable before cleaning.
Failure to follow the cleaning and disinfection instructions may result in damage to the centrifuge.

1 - Centrifuge

If the centrifuge is exposed to ultraviolet rays for a long time, the colour of the lid may change and the labels may peel off. After use, cover the centrifuge with a cloth to protect it from direct exposure.

If the centrifuge needs cleaning, wipe it with a cloth or sponge moistened with a neutral detergent solution.

Sterilize the centrifuge by wiping it with a cloth moistened with a 70% ethanol solution.

2 - Centrifugation chamber



CAUTION

Do not pour water, a neutral detergent or a disinfectant solution directly into the chamber, as this may cause liquids to leak inside the unit and cause corrosion, damage the electrical/electronic compartment or deteriorate the motor bearings.

If the rotor needs to be cleaned, clean it with a cloth or sponge moistened with a neutral detergent solution. Sterilize the rotor by wiping it with a moistened cloth with a 70% ethanol solution.

3 - drive shaft

Regular maintenance of the drive shaft is recommended. It is advisable to clean the drive shaft with a soft cloth, then apply a thin layer of silicone grease.

4 - Cover

Clean and sterilize the cover using the same method as in section (1) above.

5 - Rotor

To prevent corrosion, remove the rotor from the centrifuge chamber if it is not going to be used for a long period of time, then remove the rotor cover and turn it upside down to dry the housings.

Clean the rotor using a mild detergent with a pH value of 6-8 and dry the aluminium part immediately after cleaning by placing it in a hot air dryer at a temperature not exceeding 50°C.

If there are any sample leaks in the rotor, rinse with water. Apply a thin layer of silicone grease to the shaft when it is completely dry.

12 STERILIZATION

If the centrifuge tubes contain leaks of infectious material, the rotor and/or centrifuge must be sterilized immediately.

Infectious substances could enter the centrifuge if the centrifuge tube breaks or is overfilled.

Contact may cause a risk of infection. Staff must be provided with adequate protective measures.

Pay attention to the permitted filling volume and load limit of the centrifuge tubes.

In the event of contamination, the operator must ensure that other operators are not at risk.

The contaminated part must be sterilized immediately.

Take additional protective measures if necessary.

12.1.1 Sterilize using common neutral disinfectants

The rotor and centrifuge chamber must be treated with common neutral disinfectants.

The most suitable method is to spray the disinfectant evenly onto the rotor and accessories. Sterilise the rotor and accessories as follows:

- Disconnect the power supply.
- Unscrew the rotor from the rotating shaft.
- Remove the rotor and lift it vertically off the rotating shaft.
- Remove the centrifuge tubes and adapters and sterilize or dispose of them as necessary.
- Treat the rotor and rotor lid (by immersing or spraying) according to the disinfectant instructions.
- Drain the disinfectant by turning the rotor upside down and then rinse it with water.
- Remove any residual disinfectant thoroughly.
- The aluminium rotor must then be treated with anti-corrosion oil.
- All seals must be re-lubricated.

12.1.2 Sterilize using alkaline bleaching liquid.



CAUTION

Alkaline bleach contains highly concentrated, corrosive hypochlorite and therefore cannot be used on the aluminium rotor.

The following are protective measures for plastic rotors:

- Avoid high temperatures and ensure that the temperature of the bleaching solution and rotor does not exceed 25℃.
- Do not sterilize more than necessary.
- After sterilization, wash the rotor thoroughly with distilled water and dry it.
- All sealing gaskets must be re-lubricated.

12.2 Consumables

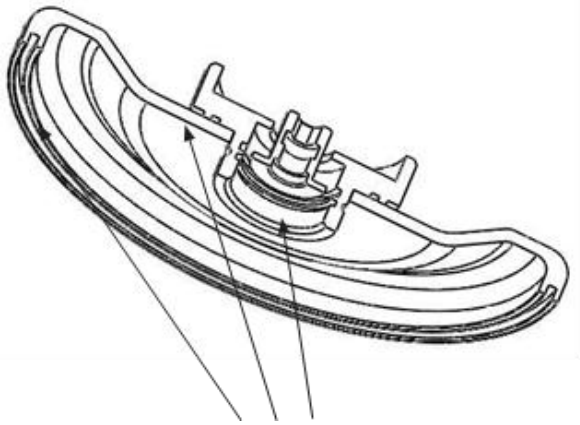
The table below lists the parts subject to wear. It is recommended that they be replaced according to the instructions in this table.

ITEM	SPARE PARTS	REPLACEMENT CONDITION
1	Cover gasket	When broken
2	Rubber capsule temperature sensor	
3	Centrifuge chamber seals	

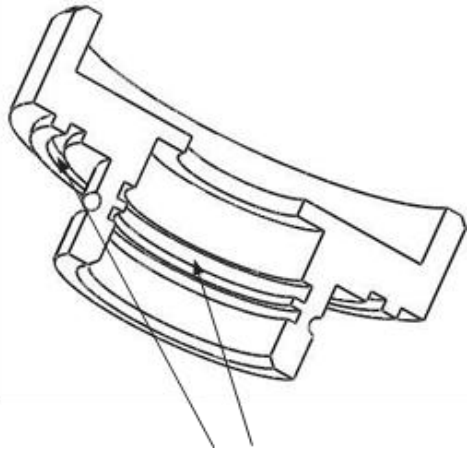
12.3 Replacing the seals

12.3.1 Instructions

There are three high-temperature rubber seals, which are mounted on the rotor to achieve a bio-safe condition. The seals may become loose due to age or after numerous autoclaving processes and must be replaced.



Seals 1 2 3



Seals 2 3

12.3.2 Replacement method

- Clean the seal groove with a neutral detergent solution and dry it.
- Spread an even layer of glue in the groove of the seal ring and insert the ring. Press to ensure even contact and a secure fit.
- Leave the glue to work for 20 minutes and allow it to solidify completely.

12.3.3 Routine checks

- Check that the centrifuge is on a flat, solid and level surface, ensuring that the feet are firmly fixed to the surface.
- Check that the centrifuge is properly earthed. Use a multimeter to check that there is equipotential contact (short circuit) between the power cable in the earth terminal and the motor shaft. If non-equipotentiality is detected, check for possible reasons and troubleshoot before use.

13 TROUBLESHOOTING

13.1 Problems and solutions

This centrifuge is equipped with a self-diagnostic function. If a problem occurs, an error/warning code is displayed on the screen, allowing the operator to determine the cause of the malfunction using the alarm code, see below.

SYMPTOM		CAUSE	SOLUTION
Nothing appears on the screen		The automatic switch has tripped The fuse has blown	Resolve the problem and restore power Replace the fuse
An error code appears on the screen	E-02 Door fault	• The lid opened during the cycle • START STOP was pressed while the lid was open	• Close the lid and restart the spin cycle
	E-04 Temperature fault	• The air vents are dirty • The fan of the radiator is blocked	• Clean the air intakes • Replace the radiator fan
	E-06 Set wrong speed value	• The speed values set exceed the permitted values	• Correct the set speed values
	E-10～86	• Read the service manual	• Contact technical support

CAUTION: All codes between E1～E6 are related to setting or operating errors, so they can be resolved after implementing corrective procedures.

13.2 Opening the cover when there is no power supply

ATTENTION

- Only open the lid when the centrifuge is switched on and the rotor is

When the centrifuge is switched on, the lid opens automatically. Once the centrifugation cycle is complete, the lid remains closed.

When the rotor is stationary, press Door to open the lid.

13.2.1 Opening in the event of a power failure

The lid cannot be opened automatically in the absence of electricity.

However, it is possible to open it manually if you cannot wait for the blackout to end: Check whether the rotor is rotating.

PLEASE NOTE: You can either "listen" to the machine to check that the rotor is stationary or look through the peephole on the machine cover to see that the rotor is indeed stationary.

WARNING

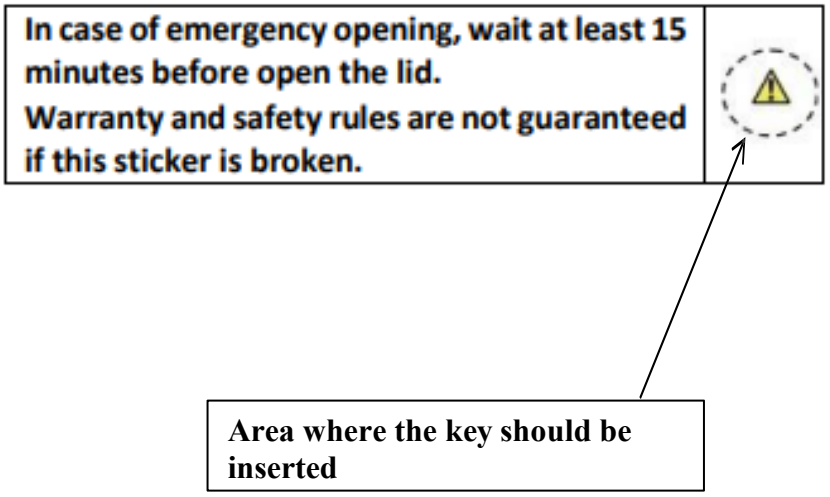
- **In any case, for safety reasons, it is advisable to wait AT LEAST 15 minutes after the start of the power failure to be sure that the rotor is actually stationary.**

At this point, once you are sure that the rotor is stationary:

Disconnect the power cable from the machine

Insert the key into the hole on the right, push forward and turn clockwise to open the cover lock.

NOTE: the above hole is protected against tampering by a specially designed anti-theft label, which cannot be removed without breaking it, see below.



WARNING

- **If this label is not perfectly intact, safety standards cannot be guaranteed.**

13.3 Replacing the fuses

There are two 250V - 5A fuses, dimensions: Φ5 × 20 mm.

The fuse holder is located in the power socket at the rear of the machine. If necessary, remove the fuse holder and replace the fuses.

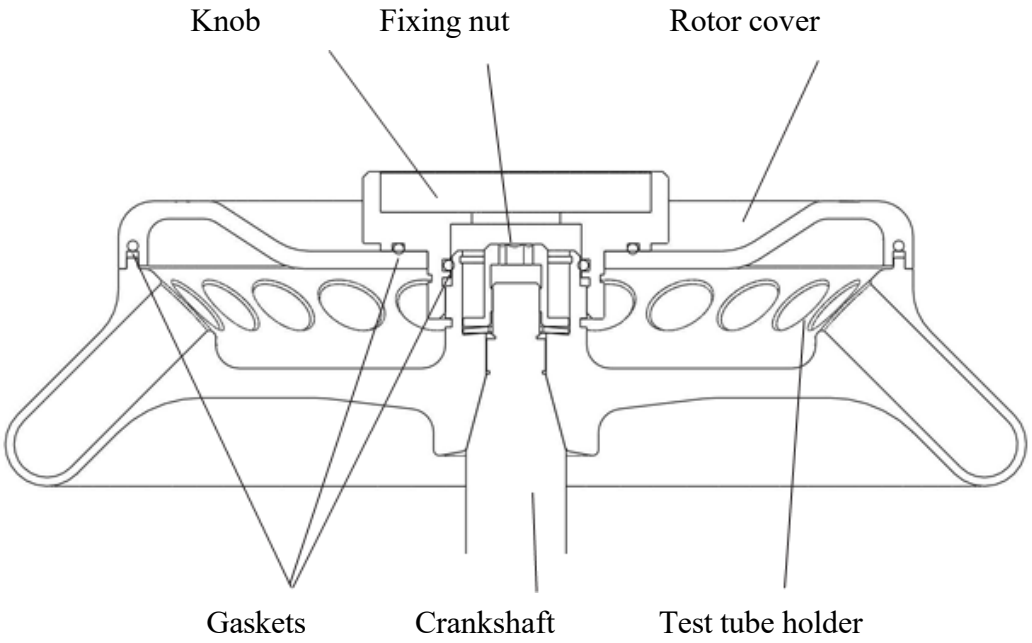
14 INSTRUCTIONS FOR ROTOR AND TEST TUBES

CAUTION

- Read the instructions carefully to load the rotor correctly.
- Do not exceed the maximum speed allowed for the rotor, tubes and adapters.

14.1 Instructions for use of the rotor

14.1.1 Rotor structure



14.2 Rotors and adapters available

All rotors guarantee biosafety when the rotor lid is closed correctly and the tubes are positioned so that there are no leaks during the centrifugation process. If the rotor lid is not used, biosafety cannot be guaranteed. The rotors can be used as follows:

No.	Name	Test tubes	Adapters	Max speed (rpm)	Max centrifugation radius (mm)	Max RCF (xg)
1	AS24-2	2 ml		1500	85	21380
		0.2 ml	RI 02-24	15,000	69	17350
		0.5 ml	RI 05-24	15000	76	19100
2	AS36-05	0.5 ml		15000	85	21380
		0.2 ml	RI02-36	15,000	76	19100
3	AS4-PCR8	PCR8		15000	65/72	16350/18100

14.2.1 Warning

The centrifuge rotor is capable of separating samples with a density lower than 1.2 g/ml. If the density of the samples is greater than 1.2 g/ml, the permitted speed must be calculated.

Permitted speed (rpm) = Maximum speed × (1.2 (g/ml) /sample density (g/ml)) $^{1/2}$

To prevent corrosion, remove the rotor from the chamber if it is not going to be used for a long period of time, then remove the rotor lid and place it upside down to dry the tube holes.

If there are any sample leaks in the rotor, rinse with water. Apply a thin layer of silicone grease to the shaft when it is completely dry.

Rotors should be cleaned and checked every 3 months to ensure that the tube holes and motor shaft hole are clean and in good condition.

14.2.2 Autoclaving

The rotor is made of high-strength aluminium alloy material and can be autoclaved: 121 ℃ (1.0 kg/cm²) for 20 minutes.

14.2.3 Bio-safety seal

There are three high-temperature rubber seals, which are mounted on the rotor to achieve a biosafety condition. The seals may become loose due to age or after numerous autoclaving processes and must be replaced.

15 CALCULATION OF RELATIVE CENTRIFUGAL FORCE (RCF)

Relative centrifugal force (RCF) can be determined using the following formula: RCF

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

Where:

R = Radius of rotation (cm); n

= Rotational speed (rpm)

16 WARRANTY

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

The warranty on the centrifuge is void if any of the following conditions occur, even if they occur within the warranty period:

- failures caused by incorrect installation.
- faults caused by improper or incorrect use.
- failures caused by transport or transfer after installation.
- faults caused by unauthorised dismantling or modifications.
- faults caused by the use of non-original spare parts or accessories and unauthorised modifications.
- Failures caused by natural disasters such as fires, earthquakes, etc.
- Consumables have a limited warranty period by their very nature.

17 AFTER-SALES SERVICE

Regular maintenance is necessary to ensure that the centrifuge operates safely and efficiently. If the centrifuge malfunctions, do not attempt to repair it yourself, but contact technical or after-sales support.

18 DISPOSAL OF ELECTRONIC EQUIPMENT



This equipment is subject to regulations for electronic devices. Dispose of in accordance with local regulations. The illegal disposal of electrical and electronic equipment is punished with an administrative fine.