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Гематокритная центрифуга DM1224

руководство по эксплуатации

CE FC

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Contents

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 rotation speed	12,000rpm (500-12,000rpm) step: 100rpm
Maximum RCF	13680×g, step: 100×g
Capacity	AC24 (capillary×24)
Timing	10 s-99m-HOLD（continuous operation）
Drive motor	DC brushless motor
Safety performance	Dual door locks, over speed, over temperature and status diagnosis system.
Power	Single phase，220-240V, 50Hz/60Hz，380W
Dimensions(mm)	280(L) × 364(D) × 213(H)
Weight	8.5kg
Acceleration / deceleration time	40s↑40s↓
Noise	＜65dB
Other functions	Rotation speed/acceleration switchover, transient operating performance, Current run time parameter display and sound reminder

2. Scope of application

Scope of application: suitable for separation of mixed solutions at medical institutions.

3. Environmental conditions

3.1 Basic operating conditions

(1) Power supply: 220-240V, 50Hz

(2) Ambient temperature: 2℃~40℃

(3) Relative humidity: ≤80%RH

(4) No vibration or air flow present nearby that might affect performance

(5) No conductive dust, explosive gas or corrosive gas exists in ambient air.

3.2 Transport and storage conditions

(1) Range of ambient temperature: -40℃~55℃.

(2) Range of relative humidity: ≤93%RH

4. Installation and testing

Users must strictly comply with the installation instructions contained in this chapter.

Be advised!

⚠ Warning

- Improper power connection might damage the centrifuge.
- Ensure to check the power supply before connection for compliance with the requirements.

4.1 Mounting position

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

(2) Ideal ambient temperature is 20℃± 5℃, avoid placing the centrifuge in direct sunlight if temperature

(3) exceeds 30℃.

(4) Ensure to clear 10cm from the centrifuge on both sides and behind the centrifuge in order to ensure air cooling efficiency.

(5) Prevent heat/water leakage near centrifuge, otherwise the rise in sample temperature or centrifuge failure might occur easily.

4.2 Connection between power cable and ground wire

⚠ Warning

- Don’t touch the power cable or power switch with wet hands to avoid electric shock.
- This centrifuge must be properly grounded.

A minimum of 10A outlet providing a good grounding terminal is required and needs to meet the local safety requirements.

5. Structure

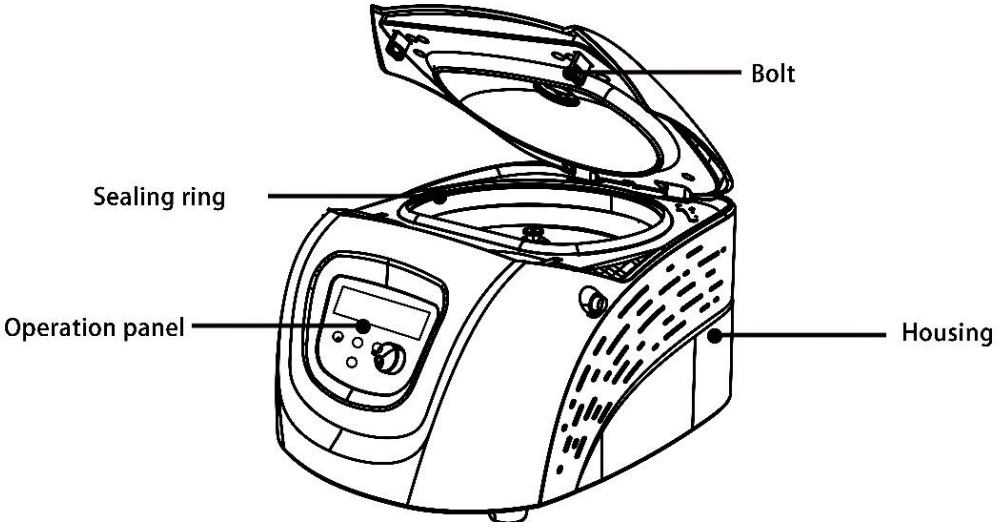


Fig. 5.1 Front view of centrifuge

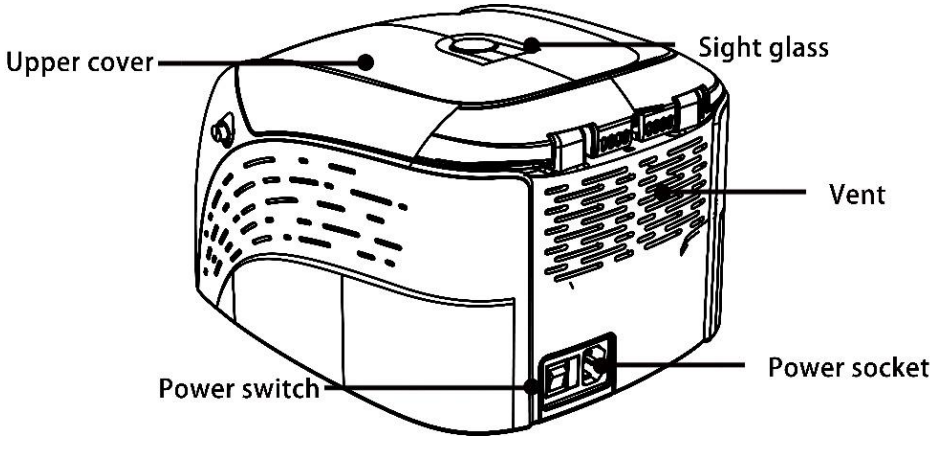


Fig. 5.2 Rear view of centrifuge

6. Operating panel

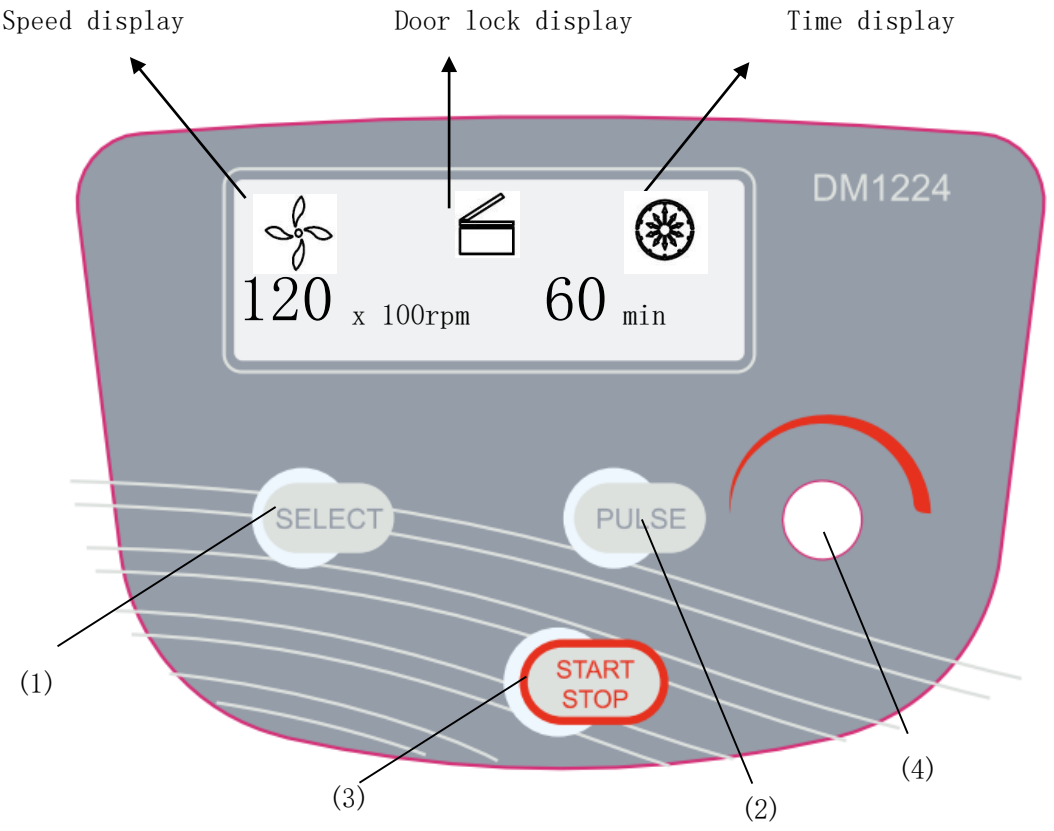


Fig. 6.1 Schematics of operating panel

No.	Legend	Name	Function
1	SELEC	Select Button	Press this button to choose the parameters setting.

2		Pulse Button	When the centrifuge lid is locked tightly, Press and hold this button and the centrifuge run to the set rotation speed
3		Run start / stop key	Set the parameters to desired setting and press this button to start run and operate the centrifuge. Press this button during operation to stop the operation.
4		Parameter adjustment knob	Rotate this knob clockwise/ anti clockwise to increase/ decrease the parameter setting value. Press this knob to choose the desired speed or acceleration.

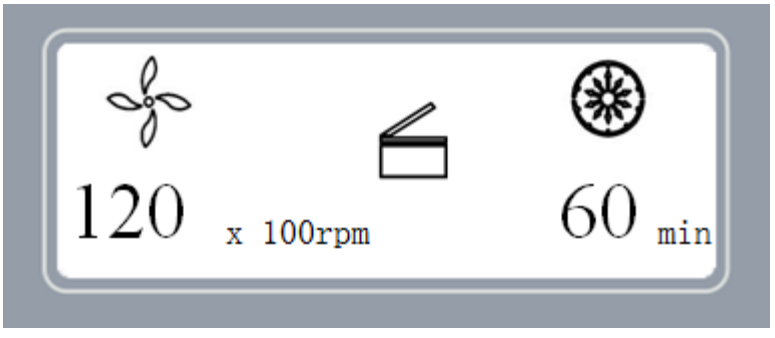


Fig. 6.2 Schematics of main display

- The main display is shown in Fig. 6.2, in which the speed is set at 12,000rpm and time is set to 60 minutes.
- The dock lock switch indicator shows whether it is open/close.
- When the speed icon rotates, it indicates the machine is running and its faster rotation indicates higher rotation speed.
- The time display icon divides the entire set run time into 10 equal parts, displaying the ratio of elapsed time to the total time.

7. Rotor preparation

7.1 Prepare the samples to be separated

7.2 Transfer the samples into the centrifuge tube

⚠ Caution

- Ensure that the centrifuge tubes are not overloaded with the samples which will result in leakage.

- Do not exceed the actual tube capacity as mentioned in this user manual.

7.3 Ensure the balanced centrifuge tube

- Although the centrifuge may be used with visually confirmed balance, it is

recommended that the samples are weighed using a balance to keep this centrifuge in a well-balanced condition to extend its life expectancy.

- Never intentionally run the centrifuge under an imbalance condition even though the allowable imbalance is not exceeded.

7.4 Check rotor

Ensure to check the rotor for any corrosion or scratch before every operation.

> ⚠ Caution
>
> - If any corrosion or scratch is found on the rotor, please cease to use the rotor.
> - Avoid the use of other manufacturer's rotor on this centrifuge.

7.5 Symmetrically load centrifuge tubes into rotor

> ⚠ Caution
>
> - Ensure to secure the rotor on the main shaft firmly. Otherwise, the rotor might fall off while the centrifuge is in operation, resulting in damage to the centrifuge or rotor.
> - Tighten the rotor lid to the rotor firmly.

8. Operation

⚠ Caution

- Avoid moving the centrifuge when it is in operation mode.
- Keep the centrifugal chamber clean and ensure to remove foreign particles from the centrifugal chamber, such as fragments of broken centrifuge tubes if any.
- If any abnormal/ strange noise is noticed from the operating centrifuge, stop the operation immediately and contact your service provider/ local supplier and also intimate the failure code indicated if any.

8.1 Normal operation

The display screen is lit when the power switch is turned ON, and the centrifuge shows HELLO page, as shown in Fig. 8.1.

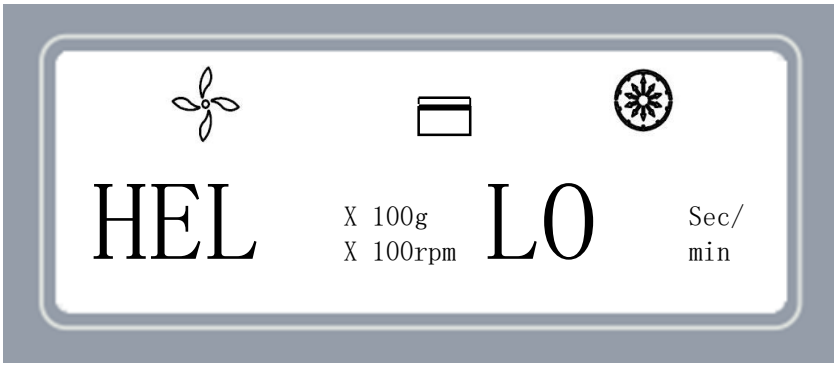


Fig. 8-1 Startup interface of centrifuge.

The centrifuge shows the centrifuge model 1224, as shown in Fig. 8-2.

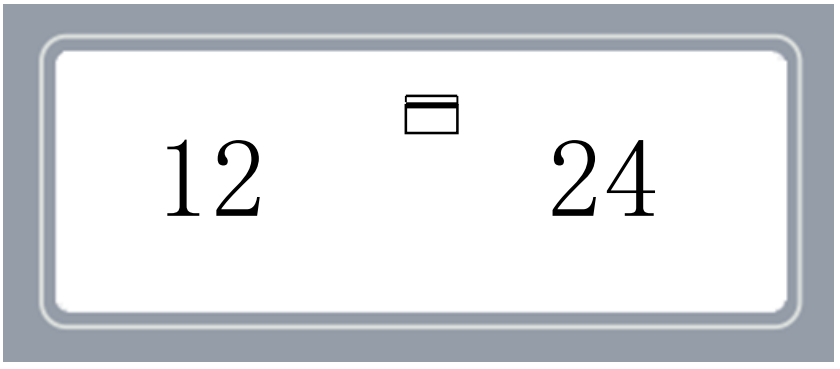


Fig. 8-2 Model 1224 interface

The centrifuge displays the last operating parameters, as shown in Fig. 8-3.

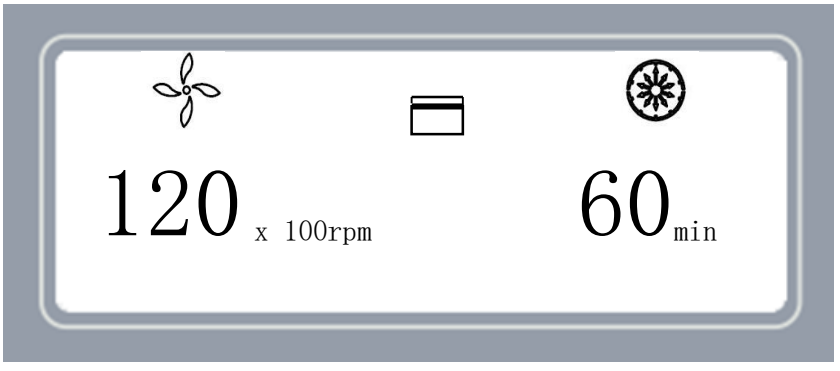
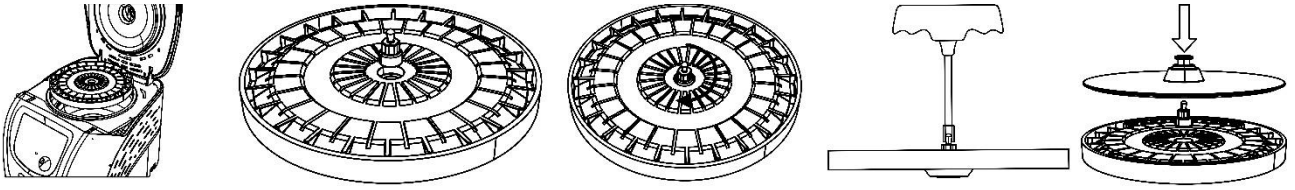


Fig. 8-3 Last operation interface

- Speed setting: 12000 rpm. Time setting 60minutes
- The upper lid is closed.

8.1.1 Rotor installation and replacement



cover. Fig. 8-4 Rotor Installation

⚠Caution

- Place the rotor on the main shaft and ensure full contact between the rotor and the main shaft. Screw up the nut on the rotor tightly using a wrench to connect the rotor with the main shaft firmly, otherwise the rotor might fall off, causing damage to the centrifuge.
- Tighten the lid and rotor firmly.

- When placing the rotor, ensure the full contact between the rotor and the main shaft.
- Load the rotor on to the shaft to ensure rotor is in position until it is well connected to the main shaft.
- If the rotor is loaded properly on the shaft, you will feel a “click” sound otherwise

it is understood that the rotor is not secured properly on the main shaft. Check once again and if necessary clean it again.

- Rotate the rotor slightly with your fingers to check if the rotor vibrates, if so attach the rotor again.
- Rotate the nut clockwise using the wrench to tighten the rotor to the shaft firmly.
- Rotate the rotor lid in clockwise to the rotor and close the rotor lid and ensure that it is in position. Close the centrifuge lid and start operation.
- Remove the rotor after operation same as above by turning the locking nut counterclockwise.

8.1.2 Set operating parameters

Press the select button SELEC gently to select the parameters and set the parameter values to desired setting. Use the parameter adjustment knob to set the selected parameters (whichever parameter icon flashes). Rotate the parameter adjustment knob in clockwise/anticlockwise direction to increase or decrease the parameter values to achieve the desired setting. The minimum speed increment is 10rpm, the minimum time increment is 1 second.

(1) Set the rotation speed

- Press the select button SELEC to select the rotation speed in rpm.

- The speed value flashes indicating that the speed is in adjustment mode
- The minimum set speed is 500rpm, and the minimum step is 100rpm.
- Turn the parameter adjustment knob clockwise/anti-clockwise to increase/decrease the parameter value.

(2) Set the running time

- Press the select button SELEC to make the time value flash and enter into the time setting mode.
- Turn the parameter adjustment knob to input the set time within a range of 10sec-99min.
- The centrifuge enters into continuous run mode if the time indicates HD.

8.1.3 Start operation

(1) Press the run start/stop button START STOP to start operation.

- The upper lid is locked and the rotor starts rotating.
- The timer starts only after the rotation speed reaches the set value, with the remaining run time display.

(2) View and modify the operation programs

The operating parameters can be modified if the centrifuge operates at a steady speed.

Press the select button SELEC when the screen displays the set operating parameters. Press the select button SELEC gently again to make the parameter icon flashes and turn the parameter adjustment knob to change the parameter values. The centrifuge automatically returns to the normal operation mode and continue to run according to the last set parameters after 7seconds of inactivity.

After change to the time setting parameter, the elapsed time will not be zeroed but will continue to accumulate.

(3) Error message

- The centrifuge will automatically stop if any failure occurs in the running process, with the failure code indicated on the time display window. By looking up table 10-1, the cause of failure can be found and appropriate action may be taken.

8.1.4 Stop running

（1）The centrifuge will brake when it reaches the set time or START STOP button is pressed.

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

（2）Open the door

- The door can be released automatically when the operation has stopped.

- Press the DOOR button to open the lid.
- After ending the operation, the program will store the set parameters of this operation, and will recall these parameters when restarting the program.

Open the upper cover lid and take out the rotor lid, rotor and the samples.

8.2 RCF operation

(1) Turn power switch ON

(2) Set the RCF (Relative Centrifugal Force)

> ⚠ Caution
>
> - The relative centrifugal force may not exceed the maximum relative centrifugal force allowed by the centrifuge tube and its adapter.

- Press the select button SELEC to choose the rotation speed unit as xg. Relative centrifugal force enters into the adjustment mode if the centrifugal acceleration value flashes.
- The centrifuge enters into operation mode if there is no activity for about 7Seconds
- Turn the parameter adjustment knob to adjust the relative centrifugal force in the increments of 100xg.

(3) Set the operating conditions

See Section 8.1 for operation of other parts.

8.3 Transient operation

This function is generally used to remove the samples attached to the inner wall of the centrifuge tube and can also meet the application requirements for transient centrifugation.

Reminder: this key works only when the rotor is inactive and the outer lid is locked firmly.

(1) Switch power On, fix the rotor on the main shaft, tighten the rotor cover firmly and close the upper cover.

(2) The centrifuge enters into the operation mode and displays the last set parameter values, and allows to reset the target rotation speed.

(3) Press and hold the pulse key PULSE to increase the rotation speed until the set rotation speed is achieved. Release the PULSE key to start decelerating and shutdown.

9. Cleaning & Maintenance

9.1 Cleaning

⚠ Caution

- Cleaning or sterilizing the centrifuge without complying the instructions contained herein might cause damage to the centrifuge.

(1) Centrifuge

- The color of housing might change and the label thereon might fall off if the centrifuge is exposed to ultraviolet for a prolonged period of time. Please cover the centrifuge with a cloth to avoid the exposure to light after use.
- If the centrifuge becomes dirty, please clean it using a cloth/ sponge soaked with neutral cleaning agent.
- The centrifuge can be sterilized using a cloth soaked in 70% alcohol solvent.

(2) Centrifugal chamber

⚠ Caution

- Never directly pour water or other solvents into the centrifugal chamber as these solvents might enter into the drive unit and cause corrosion or damage to the bearings.

- If the centrifuge chamber becomes dirty, clean it using a cloth/ sponge soaked with neutral cleaning agent.
- The centrifuge chamber can be sterilized using a cloth soaked in 70% alcohol solvent.

(3) Drive shaft

- It is suggested that the drive shaft should be subjected to periodical maintenance by wiping it using a piece of soft cloth and applying a thin layer of silicone grease on it.

(4) Upper cover

- Clean or sterilize the upper cover in the same manner as that of centrifuge(1).

(5) Rotor

- If the rotor is put out of service for a prolonged period of time, please remove the rotor from the centrifugal chamber, remove the rotor's lid and place the rotor upside down to dry the rotor hole and prevent corrosion.
- If any sample leaks into the rotor hole, flush the rotor hole with clean water and apply a thin layer of silicone grease on the rotor surface after it is dried.
- The rotor needs periodical maintenance. It is suggested that the rotor should be cleaned once every three months to ensure cleanliness of the tube hole and

main shaft hole before applying a thin layer of silicone grease.

9.2 Wearing parts

The following lists the wearing parts of this centrifuge. Please replace the wearing parts in time according to the suggestions in the following table.

No.	Wearing part	Replacement conditions
1	Sealing ring of the outer lid	Crack
2	Rubber seat of temperature sensor	

9.3 Routine check

(1) Check whether the tabletop on which the centrifuge is placed is solid, level and flat and ensure the four feet of the centrifuge remain in contact with the tabletop.

(2) Check whether the machine is reliably grounded, using a multi-meter. Check whether the grounding pin in the power cable, centrifugal chamber and motor shaft are short-circuited. A short-circuit indicates a reliable grounding. In case of disconnection, identify the cause and eliminate the failure before the centrifuge operation.

10. Common failures and solutions

10.1 List of common failures

This centrifuge is capable of self diagnosis. When the centrifuge fails, the time display window will indicate the failure code, leading to the immediate identification of the cause of failure.

Phenomenon		Possible cause	Solution
No display found after power ON		No power supply to the power socket. Fuse burned out.	Check and reconnect the power supply. Replace the fuse.
Alarm code indicated on the time display window	E-02 Upper cover fails	The door opens during operation. Press the START STOP key if the door is opened.	Immediately close the outer lid. Close the lid before operation.
	E-03 Wrong rotor identification	Rotor can not be identified.	Use the correct rotor. Confirm if the rotor identification line is reliably connected and remount the rotor.

	E-04 Abnormal temperature	Temperature sensor got damaged. Temperature sensor not connected.	Contact your service representative.
	E-06 Abnormal rotation speed setting	The set rotation speed exceeds the maximum allowed speed by the rotor.	Change the set rotation speed value.
	E-10～86	See the service manual.	Contact the service representative.

Table 10-1 Common failures and solutions

Failure code E-1-E-9 is related to erroneous operation. The centrifuge may continue in operation after error correction.

10.2 How to open the upper cover lid

⚠ Reminder:

- Open the upper cover only when the rotor is not running, if the centrifuge is powered ON,

(1) When the centrifuge is turned ON, the rotor stops running and the upper cover lock may be opened by pressing the door lock button on the right side of the machine. At this time, the upper cover may be turned open.

(2) When the centrifuge is turned OFF, press the door lock button on the right side of the machine to open the upper cover lock. At this time, the upper cover may be turned open.

10.3 Replace the fuse

(1) The centrifuge's fuse is 250V, 5A time delay, size: Φ5×20.

(2) The centrifuge's fuse is on the power socket. The fuse may be replaced by taking the fuse box out of the power socket.

11. Introduction to rotor and centrifuge tube

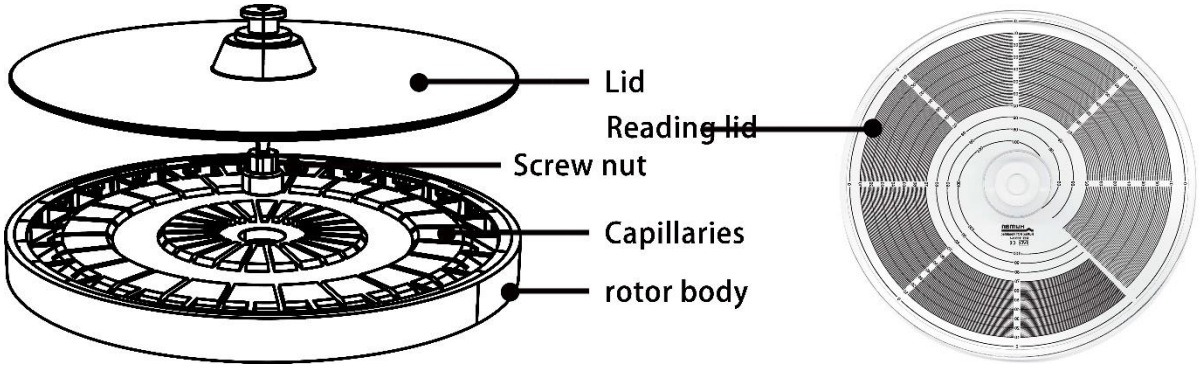
⚠ Caution

- Carefully read the user manual and correctly install and use the rotor.
- Don’t exceed the maximum speed allowed by the rotor, test tube and adaptor. The maximum speed allowed by certain adaptors is lower than the maximum speed of the rotor.

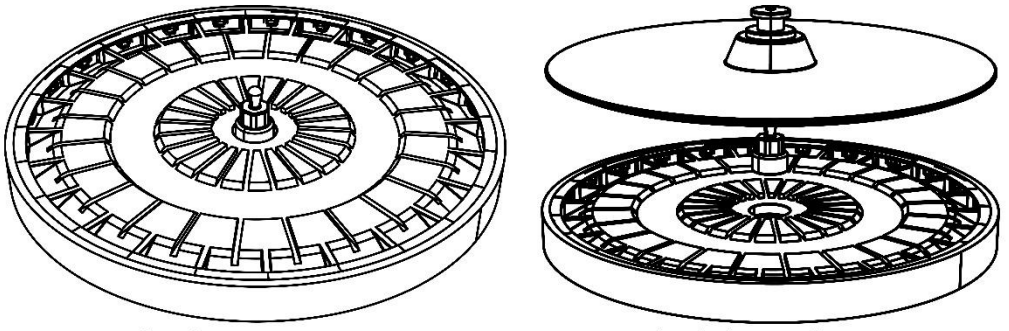
11.1 Introduction to rotor

11.1.1 Capillary rotor

(1) Introduction



(2) Mounting



11.1.2 Rotor

Rotor number	Rotor name	Centrifuge tube	Maximum speed (rpm)	Maximum centrifugal radius r_{max} (cm)	Maximum relative centrifugal force Rcf (×g)
1	AC24	24-ø1.75×75 capillary	12000	8.5	13680

Table 11.1 Rotor

11.1.3 Precautions

(1) The centrifuge rotor can separate samples with a density lower than 2.0g/ml. If the samples density is over 2.0g/ml, please calculate allowable speed depending

on the following formula.

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

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

(3) If samples have leaked in the rotor holes, wash the hole with water, apply a thin coat of silicon grease on the rotor surface after drying.

(4) It is recommended for regular rotor maintenance and should be cleaned every 3 months to keep the tube

holes and shaft clean.

(5) Apply a thin coat of silicon grease.

11.2 Centrifuge tube

11.2.1 Cleaning and sterilization

Conditions / Material			PA	PC	PP
Cleaning	Fluid cleaning	Acidic cleaning agent (pH5 or lower)	X	X	X
		Acidic cleaning agent (higher than pH5)	O	O	O

		Alkali cleaning agent (higher than pH9)	O	X	O
		Alkali cleaning agent (pH9 or lower)	O	O	O
		Neutral cleaning agent (pH7)	O	O	O
		70℃ hot water	O	O	O
	Ultrasonic cleaning	Neutral cleaning agent (pH7)	O	O	O
Sterilization	Autoclaving	115℃ (0.7kg/cm^2) 30 minutes	O	O	O
		121℃ (1.0kg/cm^2) 20 minutes	X	O	O
		126℃ (1.4kg/cm^2) 15 minutes	X	X	X
	Boiling sterilization	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 O : Yes X : No

Table 11.2 cleaning and sterilization conditions for centrifuge tube

11.2.2 PC centrifuge tube cleaning

PC material has relatively low chemical stability to alkaline solvent, therefore use

of cleaning agent with pH value of over 9 should be avoided. Some neutral cleaning agents still have pH value of over 9 after being diluted as recommended by the vendor, therefore use of cleaning agent with pH value of 7-9 is recommended.

11.2.3 Autoclaving of PA, PC and PP centrifuge tube

PA begins softening at the temperature of 120℃, while PC and PP begin softening at 130℃. Generally, PA may be sterilized for 30 minutes at 115℃ (0.7 kg/cm2), while PC and PP may be sterilized for 20 minutes at 121℃ (1.0 kg/cm2). Too high temperature would result in deformation of centrifuge tube.

Take the following steps, if using an autoclave:

(1) Place the centrifuge tube upright with opening facing upward. If the centrifuge tube is placed in an inclined or horizontal manner, it will deform due to the effect of gravity.

(2) Remove the threaded cover and inner cover to prevent deformation or crack of the centrifuge tube.

(3) Take the centrifuge tube only when the autoclave cools down to room temperature.

11.2.4 Service life of centrifuge tube

The service life of plastic centrifuge tube depends upon the nature of sample, rotor

speed and centrifugation temperature. When the plastic centrifuge tube is used for centrifugation of conventional neutral samples (pH5-pH9), its estimated service life at the maximum rotation speed is as follows:

High-quality centrifuge tube (PA, PC, PP): 30-50 times.

Conventional centrifuge tube: about 10 times (number of uses may be increased in case of low-speed use)

Notes: (1) The service life of centrifuge tube is also related to the cleaning and sterilization conditions;

(2) Never use any centrifuge tube with cracks on it.

12. RCF calculation

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

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

r-rotation radius, unit: cm; n-rotation speed, unit: rpm

13. Ordering information

Order code	Model	Description
9063001126	DM1224	Economical capillary centrifuge (including AC24 capillary rotor package), national standard-compliant plug, 220V, 50Hz
Accessories		
19400047	AC24	Capillary rotor package, including rotor, rotor cover and reading dial, with maximum rotation speed of 12,000 rpm, maximum capacity of 24 capillaries, suitable for DM1224.

14. Warranty

14.1 Unit warranty

The entire use will have two-year warranty period commencing from delivery date under the conditions of normal maintenance.

14.2 Rotor warranty

The rotor will have 5-year warranty period from the date of delivery. Don’t use any

rotor damaged due to corrosion or fatigue. The damage to the entire unit or rotor due to any of the following reasons is outside the scope of warranty.

(1) Damage due to improper installation.

(2) Damage due to brutal or improper operation.

(3) Damage to relocation or transport after completion of installation.

(4) Damage due to dismantling or modification by any unauthorized entity or individual.

(5) Damage due to use any parts not supplied by our company, such as rotor and adaptor.

(6) Damage due to natural disasters, including fire and earthquake.

(7) Wearing parts and parts with warranty period.

After-sales services

To ensure safe and efficient operation of a centrifuge, periodical maintenance is required. If the centrifuge fails, don’t attempt to repair it. Please contact the service center.

Контактная информация сервисных центров

Сервисный центр Диаэм в Москве:
Адрес: 129345, г. Москва, ул. Магаданская, д.7, стр.3
Тел.: +7 (495) 745-05-08 (многоканальный)
E-mail: service@dia-m.ru
www.dia-m.ru

Сервисный центр Диаэм в Новосибирске:
Адрес: 630090, Новосибирск, Академгородок, пр. Ак. Лаврентьева, 6/1, офис 100А
Тел.: +7 (495) 745-05-08 (многоканальный)
E-mail: service@dia-m.ru
www.dia-m.ru

Сервисный центр Диаэм в Казани:
Адрес: 420111, Казань, ул. Профсоюзная, д.40-42, пом. № 8
Тел.: +7 (495) 745-05-08 (многоканальный)
E-mail: service@dia-m.ru
www.dia-m.ru

Сервисный центр Диаэм в Санкт-Петербурге:
Адрес: 197022, Санкт-Петербург, ул. Профессора Попова, д. 23, лит. Д, офис 614 (БЦ «Гайот»)
Тел.: +7 (495) 745-05-08 (многоканальный)
E-mail: service@dia-m.ru
www.dia-m.ru