



HIGH SPEED MICRO-CENTRIFUGE

USER MANUAL

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INTRODUCTION

Welcome to the High Speed Micro-Centrifuge User Manual. Users should read this manual carefully, follow the instructions and procedures, and beware of all the cautions when using this instrument.

| PRODUCT CODE | DESCRIPTION |
|--------------------|--|
| 400.003.205 | Centrifuge Supplied With Rotor 400.003.221 (24 x1.5ml/2ml) |
| 400.003.210 | Refrigerated with Rotor 400.003.221 24x1.5ml/2ml |
| 400.003.220 | Rotor 5ml x 18 |
| 400.003.221 | Rotor 1.5ml/2ml x 24 |
| 400.003.222 | Rotor 0.5ml x 36 |
| 400.003.223 | Rotor PCR Strip x 4 |
| 400.003.250 | Adapter 2ml to 0.2ml PK36 |
| 400.003.251 | Adapter 2ml to 0.5ml PK36 |

WARRANTY

Warranty of centrifuge

This centrifuge is guaranteed for 12 months from the date of delivery provided that it has been operated and maintained properly.

Warranty of the rotor

The rotor is guaranteed for 12 months from the date of delivery. 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 unauthorised 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

DELIVERY

This unit is supplied with one centrifuge unit, rotor and user manual.

Safety Instructions

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 the 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, emphasising 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.



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 sterilise and decontaminate centrifuge in advance, and then notice the service centre 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.
- Unauthorised repairs, disassembly, and other services to the centrifuge except by our service centre 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:

- Always check for corrosion and damages on the rotor surface before using it. Do not use the rotor or bucket if such abnormality found.
- 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.
- Do not exceed the allowable imbalance.
- Use the rotor and tubes within their actual capacities.
- 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 centre. Notice the service the alarm code if displayed.

1. SPECIFICATIONS

| SPECIFICATIONS | DESCRIPTION |
|---------------------|---|
| 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°C-40°C (Refrigerated only) |
| 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 | 400.003.205_Single-phase, 220V-240V, 50Hz/60Hz, 5A. |
| | 400.003.210 Single-phase, 220V-240V, 50Hz/60Hz, 10A. |
| DIMENSIONS (MM) | 400.003.205: (L) 280 × (W) 364 × (H) 266 |
| | 400.003.210: (L) 338 × (W) 580 × (H)324 |
| WEIGHT | 400.003.205: 12kg & 400.003.210: 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/ IEC 61010-1

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: 400.003.205: Single-phase, 220V-240V
400.003.210: Single-phase, 220V-240V
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 $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$; 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

400.003.205

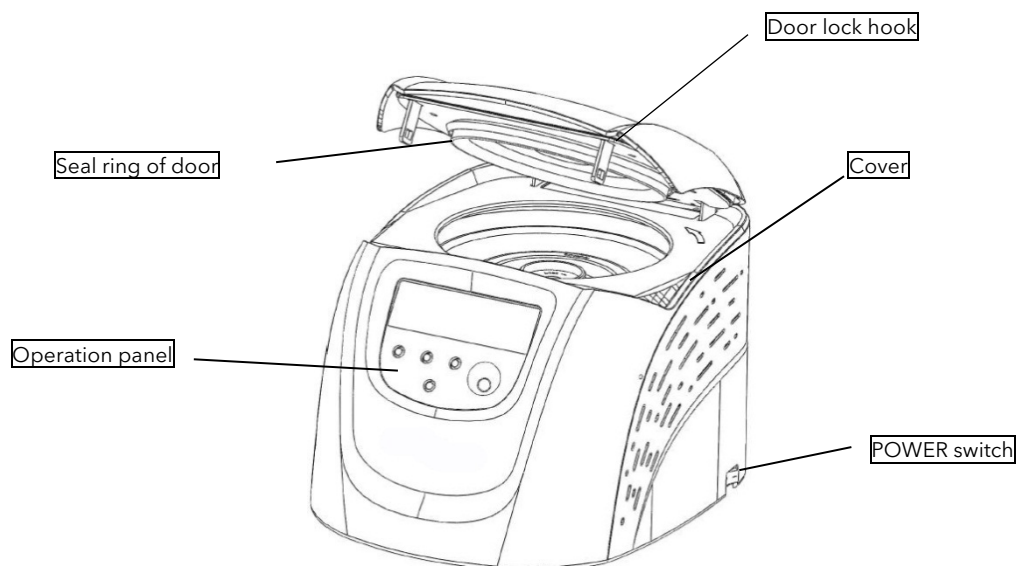


Figure 5.1: 400.003.205 Front view of centrifuge

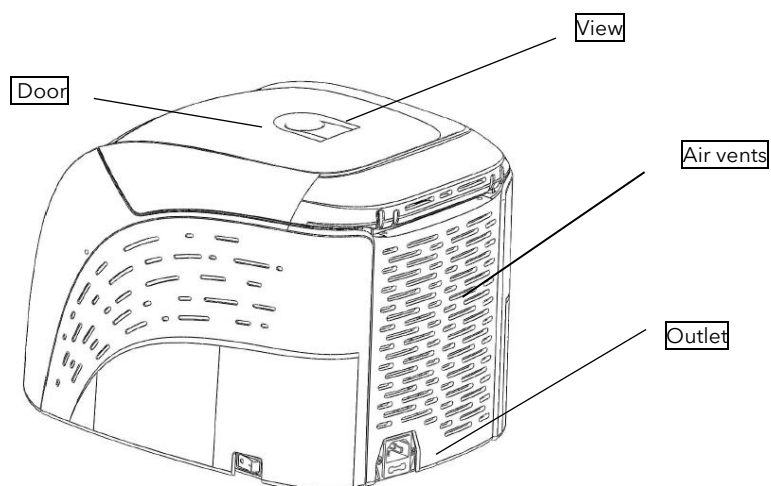


Figure 5.2: 400.003.205 Rear view of centrifuge

400.003.210

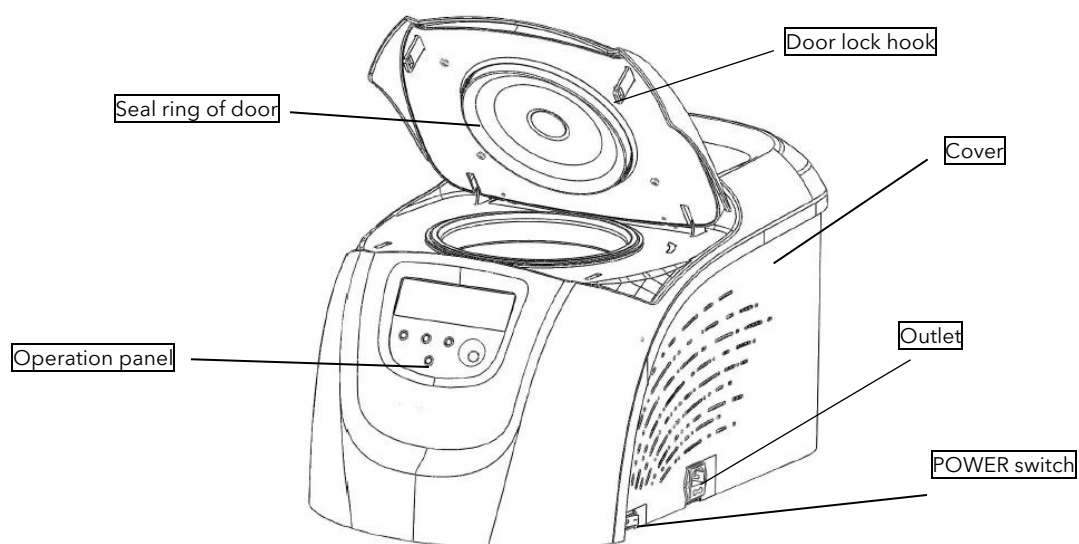


Figure 5.3 400.003.210 Front view of centrifuge

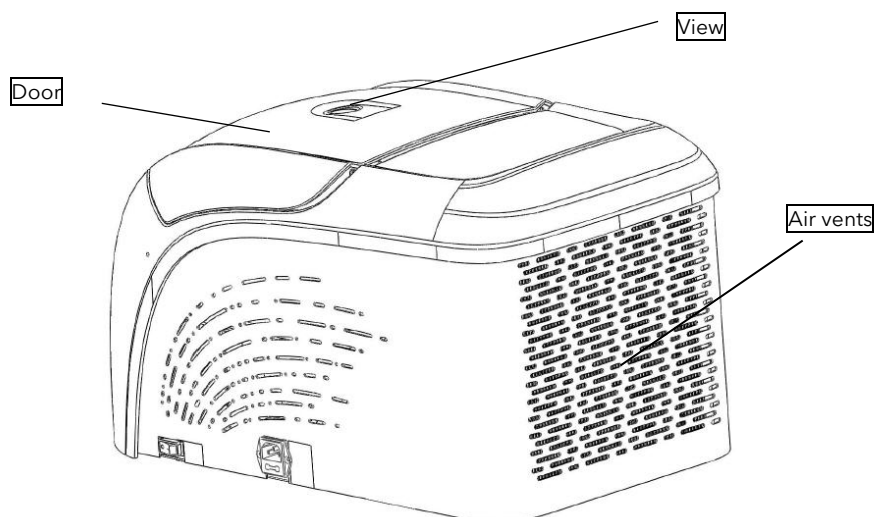


Figure 5.4 400.003.210 Rear view of centrifuge

6. OPERATION PANEL

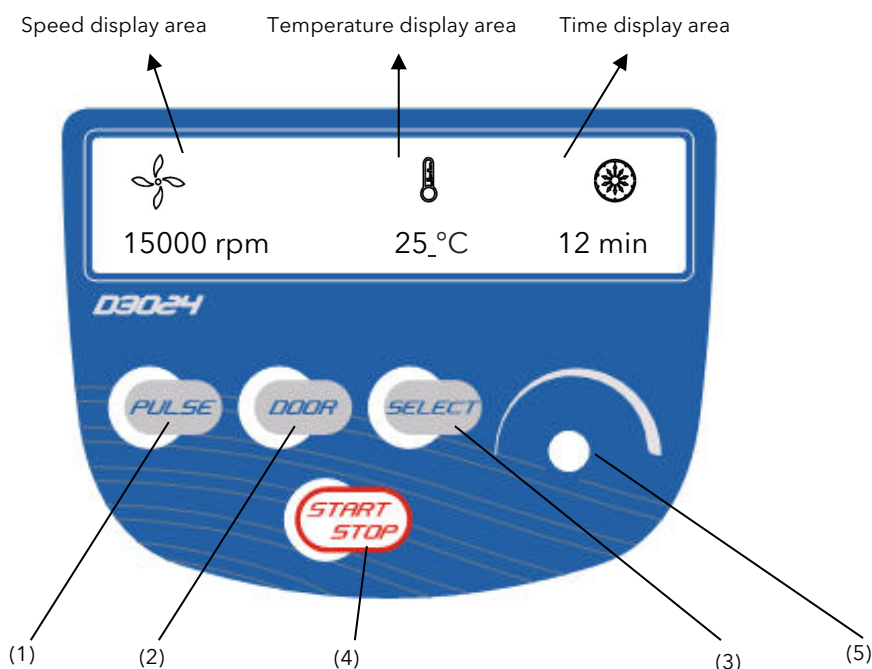


Figure 6-1 Operation Panel

| 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. (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 the button is pressed during centrifugation. |
| 5 | | Parameter Button | Clockwise rotate to increase parameter values. Counter-clockwise rotate to decrease parameter values. Press down the button to shift between speed and RCF display. |

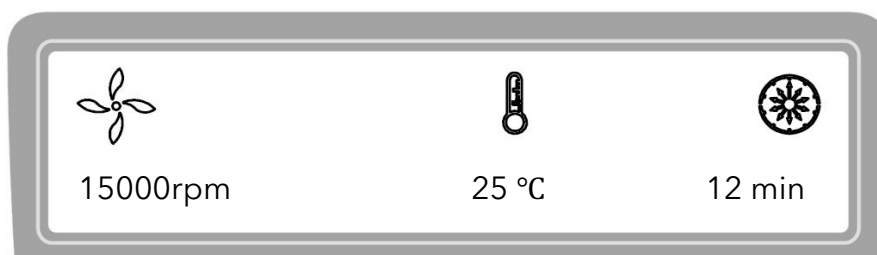




Figure 6-2 the main interface (non-refrigerated)

Main interface of 400.003.205 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 cannot be controlled. Time symbol  displays the ratio of working to time setting. The total time setting is divided into 10 scales.

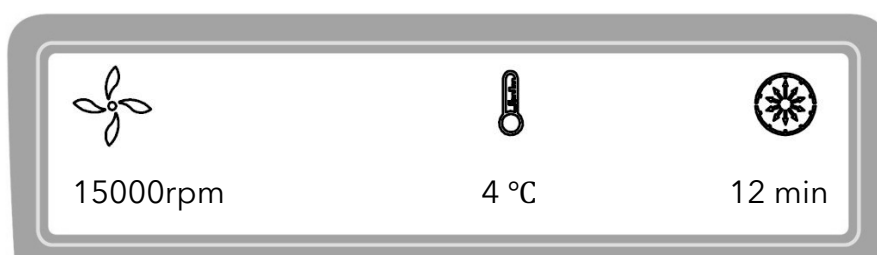





Figure 6-3 the main interface (Refrigerated)

Main interface of 400.003.210 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 BALANCED

- 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 abnormalities such as corrosion or scratches are found, stop using the rotor and contact our service centre.
- 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 noises during operation, stop it immediately and contact our service centre. 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)

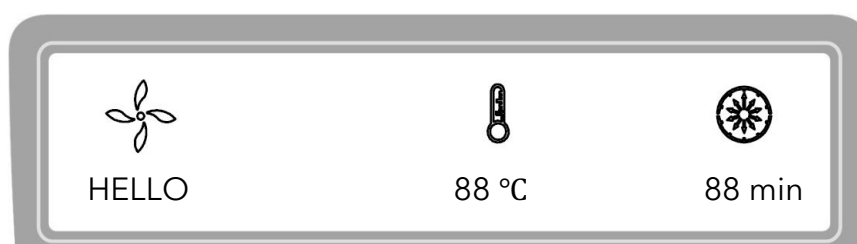


Figure 8-1 Self-checking interface

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.

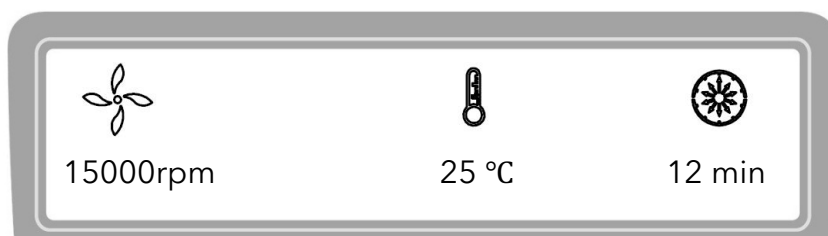


Figure 8-3 Last running interface

Speed: 15000rpm; running time: 12 minutes; centrifugal chamber temperature: 25 °C

Release the door.

8.1.1 LOAD AND REPLACE THE ROTOR

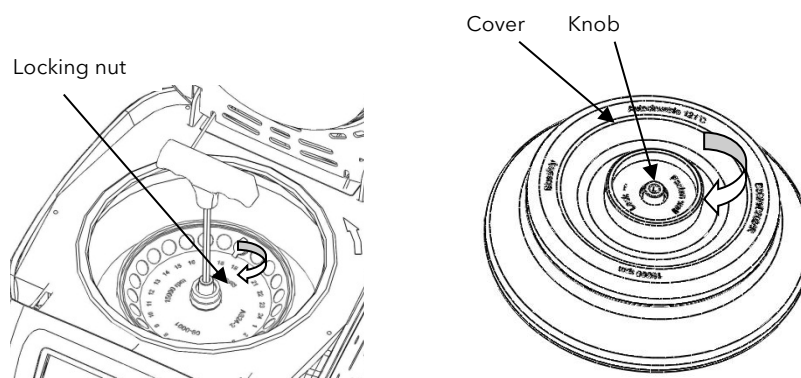


Figure 8-4 Load the rotor







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 move off and damage the centrifuge.
- Confirm the rotor lid is firmly tightened with rotor.

- Load the rotor to the shaft to ensure rotor is in position until it fits well with the shaft.
- You should feel a click when the rotor is properly loaded on the shaft. If not, there may be something stuck between the rotor and the shaft. Double check and clean if necessary.
- Rotate the rotor slightly by your fingers to double check, if the rotor vibrates obviously, load the rotor again.
- Rotate the nut clockwise using the wrench to tighten the rotor with shaft firmly.
- Close the rotor lids, rotate clockwise and firmly tighten the cover with rotor and ensure it 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 counter-clockwise.

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. Rotate the parameter button counter-clockwise  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 (Refrigerated model)

- 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.

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. Press release button and after 5 seconds, the 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 is 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 break 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: It is important to follow the recommended instructions for cleaning and disinfecting so not to cause damage to the centrifuge.

1. Centrifuge
 - If the centrifuge is exposed to ultraviolet rays for a long time, the colour 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.
 - Sterilise 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. Sterilise the centrifuge by wiping with a cloth moistened with 70% ethanol solution.

3. Drive shaft
 - We recommend having regular maintenance scheduled for the 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 sterilise the door using the same method as the step 1).
5. Rotor
 - To prevent corrosion, remove the rotor from rotor chamber. If not used for a long time, then detach the rotor door and flip the rotor 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 regularly maintained and it is recommend to cleaning it every 3 months to ensure tube and rotor holes keep clean, and then apply a thin coat of silicon grease.
6. Drain (Refrigerated)
 - 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 (Refrigerated) | |

9.3 THE REPLACEMENT OF SEAL RINGS

9.3.1 INSTRUCTIONS

There are three high-temperature rubber seal rings that are equipped into rotor the to achieve bio-safe. The seal rings may fall off or aging after several autoclaving and will need to be replaced or re-installed.

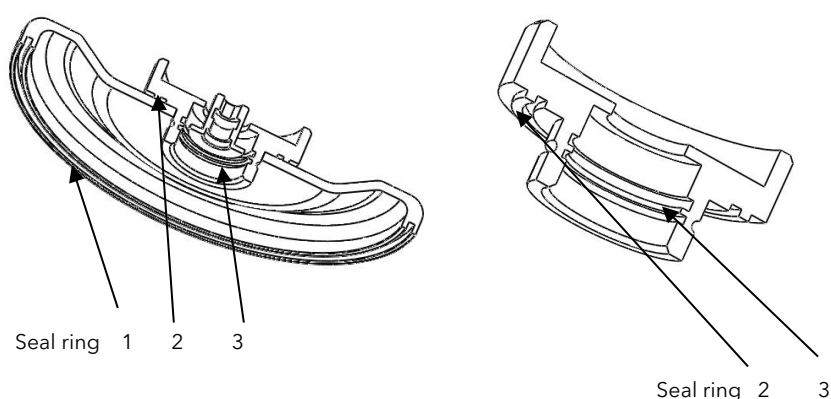


Figure 9-1 Seal rings of rotor

9.3.2 REPLACEMENT METHODS

1. Clean the seal ring slot with neutral detergent solution and make it dry.
2. Evenly coat with glue 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 the centrifuge is on a firm, flat and level table and ensure the four feet stand on the table firmly.
2. Check the centrifuge is grounded properly: Use multi-meter to check if short circuit between the power cord is 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. | | -Building power circuit breaker trips. -The fuse was blown out. | -Replace the fuse. |
| ALARM CODE APPEARED ON THE TIME DISPLAY SCREEN | E-02 Door fault | -The door opened in running. -Press the button  while the door opening. | -Close the door immediately. -Close the door, and then start to operate. |
| | E-04 Temperature fault | -The air inlets are blocked. -Radiator fan is damaged. | -Use the correct rotor. -Replace rotor identify connection. |
| | E-06 Set wrong parameter | - The setting parameter exceeds the allowable range. | -Clean air vents. -Replace radiator fan. |
| | E-10~86 | - Read the maintenance manual. | -Modify the set value. |
| | E-10~86 | -The door opened in running. -Press the button  while the door opening. | -Contact the service centre. |

Table 10-1 frequent problems and solutions

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

10.2 HOW TO OPEN THE DOOR



WARNING:


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



CAUTION: The door can be opened while the power on and rotor stops rotating.

1. Turn on the POWER switch, the door lock will release automatically.
2. The door lock will release automatically once the operation finishes.
3. It is available to release the door by pressing button  once the rotor stops.

10.2.2 IN THE CASE OF POWER OUTAGE

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

1. Ensure if the rotor has stopped rotating.
 - Listen carefully to ensure no rotating sound can be heard.
2. Insert a screw driver into the hole to open the door.
 - Hole is located on the top right side of the unit.
 - Insert a screw driver into the hole and push forward to release the door.

10.3 REPLACEMENT OF FUSES

1. There are two fuses of High Speed Micro Centrifuge, 250V, 5A 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

11.1.1 ROTOR STRUCTURE

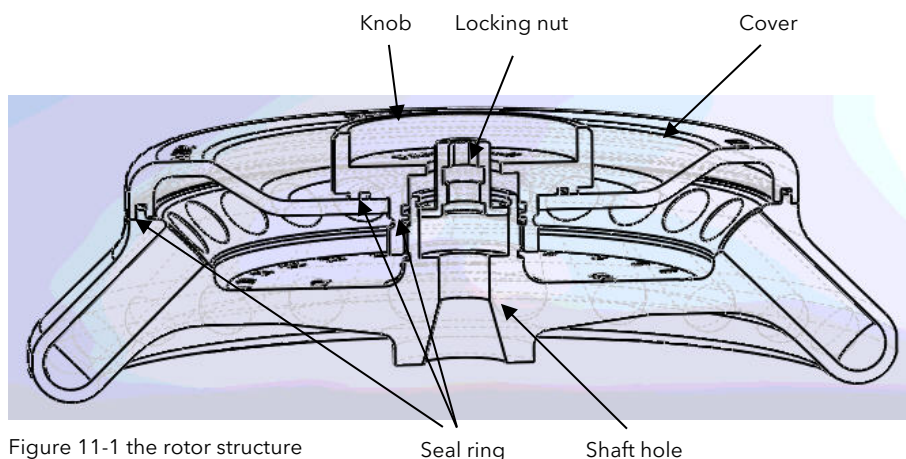


Figure 11-1 the rotor structure

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:

| ROTOR TYPE | ID CODE | TUBE/BOTTLE | ADAPTER | MAXIMUM SPEED (RPM) | MAXIMUM CENTRIFUGAL RADIUS $R_{MAX}(CM)$ | MAXIMUM RCF RCF (xG) |
|------------|-------------|-------------|-------------|---------------------|--|----------------------|
| 1 | 400.003.220 | 2/1.5ml | | 15000 | 8.5 | 21380 |
| | | 0.2ml PCR | 400.003.250 | 15000 | 6.9 | 17350 |
| | | 0.5ml micro | 400.003.251 | 15000 | 7.6 | 19100 |
| 2 | 400.003.222 | 0.5ml micro | | 15000 | 8.5 | 21380 |
| | | PCR8 serial | 400.003.252 | 15000 | 7.6 | 19100 |
| 3 | 400.003.223 | PCR8 serial | | 15000 | 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.
2. Allow Speed (rpm)= Maximum speed \times (2.0(g/ml)/Sample density (g/ml))^{1/2}
3. To prevent corrosion, remove the rotor from rotor chamber if do not use for a long time, then detach the rotor lid and flip the rotor to dry the tube holes.
4. 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.
5. It is necessary for regular maintenance on the rotor, we recommend cleaning it every 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 STERILISE TUBES

Please refer to the table below.

Table 11.2 Cleaning and sterilising conditions for tubes O : Applicable X : Inapplicable

| CONDITIONS | | MATERIALS | PA | PC | PP |
|---------------|---------------------------|---|----|----|----|
| CLEANING | Cleaning Fluids | Acidic (pH5 or lower) | X | X | X |
| | | Acidic (higher than pH5) | O | O | O |
| | | Alkaline (higher than pH9) | O | X | O |
| | | Alkaline (pH9 or lower) | O | O | O |
| | | Neutral (pH7) | O | O | O |
| | | Warm water (up to 70°C) | O | O | O |
| | Ultrasonic cleaning | Neutral detergent (pH7) | O | O | O |
| STERILISATION | 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 sterilisation | 200-300nm | X | X | X |
| | Gas sterilisation | 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 manufacturers catalogue. 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 sterilising chamber, please operate as follows:

1. Place tubes in vertical position. 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 sterilising 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 pre-treatment conditions such as cleaning and sterilisation, 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

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 your supplier.



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