

13. Warranty

14.1 Warranty of the centrifuge

This centrifuge is guaranteed for one years from the date of delivery provided that it has been operated and maintained properly. The life of the centrifuge under normal conditions is not less than 5 years.

14.2 Warranty of the rotor

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

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

14. After-sales Service

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

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Instruction Manual

CD0506 - Low Speed Centrifuge



Thank you very much for purchasing the centrifuge from Phoenix Instrument. Before using centrifuge, please carefully read this user manual for its efficient operation and safety.


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Safety Reminder


Common safety precautions

Carefully read the following safety precautions for a thorough understanding.

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

 **WARNING:** Personal Danger

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

 **CAUTION:** Possible damage to instrument

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

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

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

 **WARNING:**

- This centrifuge is not explosion-proof. Never use explosive or flammable samples.

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

 CAUTION

- This centrifuge must be located on one firm and level table.
 - Make sure the centrifuge is horizontal before running.
 - Make sure the angle between the door and cover is greater than 70 degrees when open the door.
 - Be careful not put your fingers or hands between the door and cover when the door off.
 - Do not move or relocate this centrifuge while it is running.
 - If fluid spills in the rotor chamber, please promptly clean and dry with a dry cloth to avoid sample contamination.
 - Ensure to remove any objects and fragments of the tubes dropped inside the rotor chamber before running this centrifuge.
 - Cautions on rotors
- (1) Always check for corrosion and damages on the rotor surface before using it. Do not use the rotor if an abnormality is found.
- (2) Do not set the centrifuge speed beyond the allowable minimum speed of the rotor kits (rotor

- or adapters). Make sure to run it below the allowable minimum speed.
- (3) Do not exceed the allowable imbalance.
- (4) Use the rotor and tubes within their actual capacities.
- (5) If the rotor is attached with a lid, ensure it is tightened before operation.
- If any abnormal condition occurs during operation, please stop it immediately and contact our service center. Notify the service center is a warning code if displayed.
 - Vibrations are likely to damage the centrifuge, contact our service center if abnormality observed.

1. Specifications

Maximum speed	5000rpm (300-5000rpm) , increment: 10rpm
Maximum RCF	2600×g, increment: 10×g
Maximum capacity	15ml×6
Timer	30 seconds -99 minutes-HOLD, continuous operation
Driving Motor	Brushless DC motor
Safety devices	Door interlock、 over-speed detector、 Condition diagnosis system
Power requirements	Single-phase, 110V-240V, 50Hz/60Hz, 2A
Dimensions (mm)	(L) 300× (W) 240× (H) 180
Weight	5.2 kg
Additional features	Speed/RCF switch、 Display of runtime status, buzzer notification & alert

2. Declaration of Conformity

Construction in accordance with the following safety standards:

EN 61010-1
 EN 61010-2-10
 UL 3101-1
 CAN/CSA C22.2 (1010-1)

Construction in accordance with the following EMC standards:

EN 61326-1

Associated EU guidelines:

EMC: 89/336/EWG-73/023/EWG

3. Required Operational Condition

3.1 Basic operational Conditions

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

3.2 Transport and storage condition

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

4. Installation

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

⚠ WARNING:

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

4.1 Location

- (1) Place the centrifuge on a firm, flat and level table, ensure the four feet of this centrifuge stand on the table firmly. Avoid installing on the slippery surface or surface prone to vibration.
- (2) Ideal ambient temperature is 20°C±5°C, avoid placing the centrifuge in direct sunlight if temperature exceeds 30°C.
- (3) Keep clear of the centrifuge at least 10cm on both sides and at least 30cm behind it to guarantee the cooling efficiency.
- (4) Keep away from heat or water to avoid sample temperature issues or centrifuge failures.

4.2 Connection of the power cord and grounding

⚠ WARNING:

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

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

5. Structure

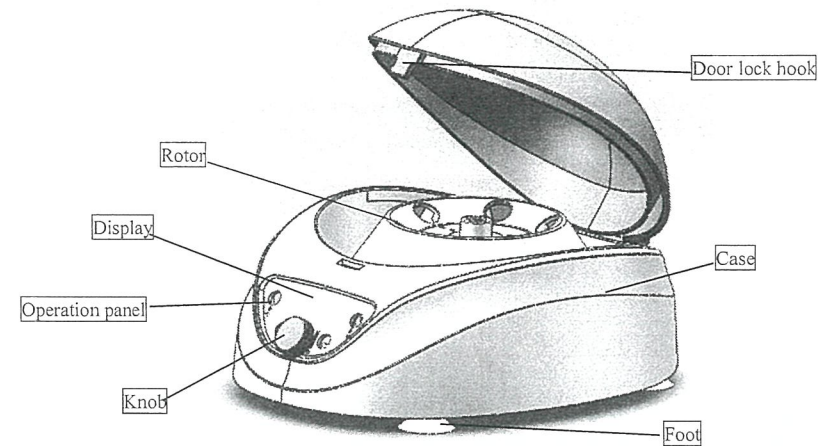


Figure 5.1 Front view of centrifuge

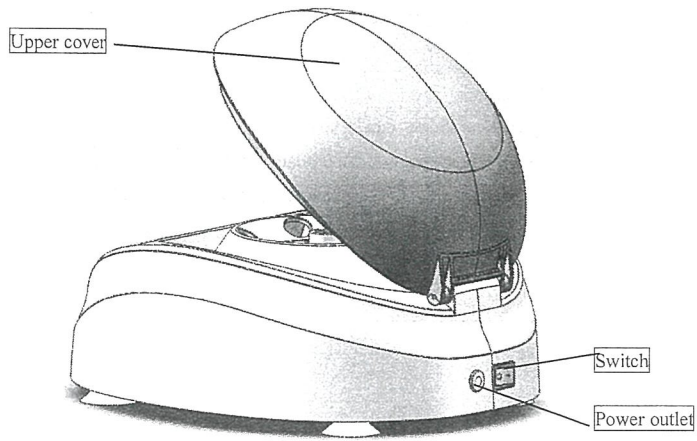


Figure 5.2 Rear view of centrifuge

6. Operation panel

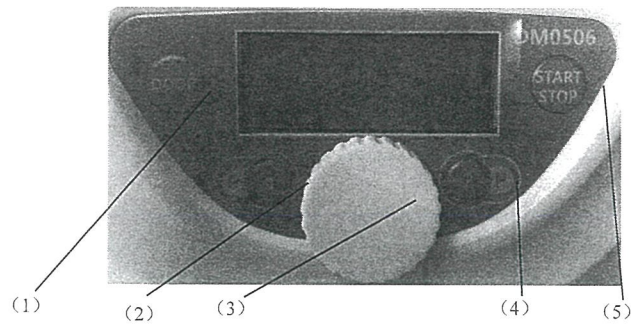


Figure 6-1 Operation Panel

Item	Symbol	Name	Function
1		Open/ lock button	Press the button to open the door The button is not available when the centrifuge is running.
2		Fixed gear key	Program can be selected and stored by this button

3		Knob	Adjust the speed, g value, time and speed reduction gear, etc
4		Fixed gear key	Program can be selected and stored by this button
5		Start/ Stop button	Press the button to start running. The centrifuge will brake to stop running if pressed during centrifugation.

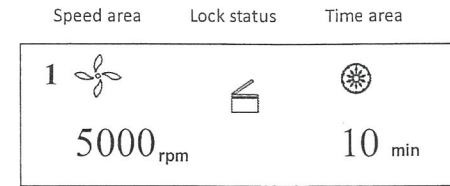


Figure 6-2 the main interface

Main interface is as figure 6-2. The speed is set to be 5000 rpm, running time is 10 minutes. When speed symbol is rotating, indicating the centrifuge is running. Time display symbol display the ratio of working to time setting. The total time setting is divided into 10 sections.

7. Rotor Preparation

7.1 Prepare the samples

7.2 Inject the samples into tubes.

CAUTION:

- Do not overload samples into the centrifuge which will cause leaking.

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

7.3 Keep the tubes balance

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

imbalance is not exceeded.

● 7.4 Inspect the rotor

Check the rotor for corrosion or scratches before using.

⚠ CAUTION:

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

7.5 Symmetrically load centrifuge tubes in rotor

⚠ CAUTION:

- Make sure the rotor and shaft are tightened. Otherwise, the rotor may be moved off while rotating and cause damage of the centrifuge and rotor.

8. Operation

⚠ CAUTION:

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

8.1 Normal Operation

Turn on the power switch, centrifuge will display the running interface last time after passing the self-diagnostic checks, see figure 8-1 below:

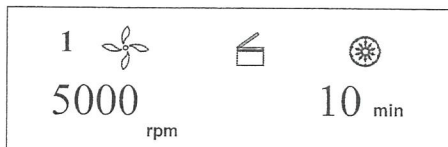


Figure 8-1 the last running interface

- Speed: 5000rpm. Running time: 10 minutes.
- The door lock is released.

8.1.1 Rotor loading and removal

⚠ CAUTION

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

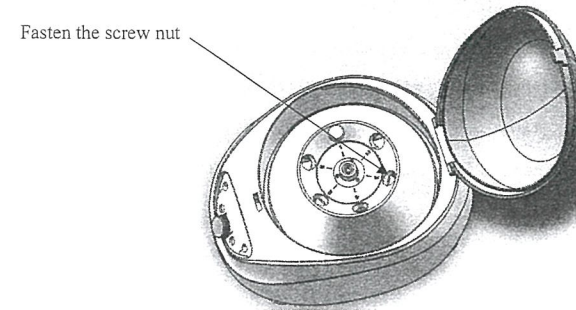






Figure 8-2 the rotor installation

- Load the rotor to the shaft to ensure rotor is in position until it connected well with the shaft.
- Rotate the rotor slightly by your fingers to check, if the rotor vibrates, if so attach the rotor again.
- Hold on the rotor with one hand, tighten clockwise the nut with the other hand, and make sure tighten firmly.
- Close the door and start running.
- To release the rotor, turn the locking nut anti-clockwise.







⚠ CAUTION

- Check the rotor is firmly tightened before running.



8.1.2 Set the operation parameters

Press the knob  to select required parameters. The parameter can be modified when the parameter is flashing. Clockwise rotate knob  to increase parameter value; counter-clockwise rotate the knob  to decrease parameter value. Rotate the knob  faster, parameter value increase faster. The minimum speed increment is 10 rpm, the minimum time increment is 1 second.

(1) Set the speed




- Press the knob  until the speed rpm is displayed.
- When the speed button is selected, the speed symbol will flash the speed value.
- The minimum speed value you can set 500rpm, the minimum increment is 100rpm.
- Rotate knob  clockwise to increase speed value, rotate knob  anti-clockwise to decrease speed value.
- You can speed-up set the speed value by rotating knob  quickly.
- There is a circulating function to increase/decrease the speed values. Rotate knob  clockwise to change settings from small → large → maximum → minimum. Rotate knob  anti-clockwise to change settings from large → small → minimum → maximum.

(2) Set the time

- Press knob , time value flashes in the time setting mode.
- Rotate knob  to set running time from 30 seconds to 99 minutes.
- When time displays HD, this is a continuous running mode.

8.1.3 Start the operation



(1) Press running button  to start running

- Timer will operate once the speed setting value is reached, the screen displays the remaining run time.
- (2) View and modify the operation programs
 - Pressing knob , returns the display to the program interface and displays settings programs. Press the knob  to the desired program. When flashing, rotate knob  to modify values. Release the button after 7 seconds, and the centrifuge will return to normal operation mode and run according to the new value.
 - If the set time value has been modified, the operation time is not affected and will continue.



(3) Warning display

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

8.1.4 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 alert the operation has finished.
- (2) Open the door
 - The door can be released automatically when the operation has stopped.
 - With the door closed, you are able to press the  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 samples.

8.2 RCF Operation

- (1) Turn on the power switch.
- (2) Set a RCF (Relative Centrifugal Force) value.
 - Press the knob  and choose speed unit $\times g$, the speed symbol will flash into RCF value input status.
 - If no button is pressed after the speed value has flashed for 7 seconds, the input mode will be shut down.
 - Rotate knob  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.

9. Maintenance

⚠ CAUTION

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

(1) Centrifuge

- If the centrifuge is exposed to ultraviolet rays for a long time, the color of the doors may be changed, or the label may be came off. After using, cover the centrifuge with a piece of cloth to protect it from direct exposure.
- If the centrifuge needs cleaning, clean it with a cloth or sponge moistened with a neutral detergent solution.
- Sterilize the centrifuge by wiping with a cloth moistened with 70% ethanol solution.

(2) Rotor chamber

⚠ CAUTION

- Do not directly pour water, neutral detergent or disinfectant solution into the rotor chamber. Otherwise fluids may leak into the drive units and cause corrosion or deterioration to the bearings.
- If the rotor chamber needs cleaning, clean with cloth or sponge moistened with a neutral detergent solution. Sterilize the centrifuge by wiping with a cloth moistened with 70% ethanol solution.

(3) Drive shaft

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

(4) Door

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

(5) Rotor

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

10. Troubleshooting

10.1 Frequent problems list

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


Symptom	Causes	Solutions	
Nothing appears on the screen when the POWER is turned on.	<ul style="list-style-type: none"> ·Building power circuit breaker trips. ·the fuse was blown out. 	<ul style="list-style-type: none"> ·Remove the trouble and turn on the POWER. ·Replace the fuse. 	
Abnormal vibration	<ul style="list-style-type: none"> ·Rotor do not match with spindle ·Samples are imbalance ·Rotor lid loosed 	<ul style="list-style-type: none"> ·Install again the rotor ·Weighting scales, install symmetrically ·Tighten the rotor lid firmly 	
Alarm code appeared on the time display screen	E-02 Door fault	<ul style="list-style-type: none"> ·The door opened in running. ·The  button is pressed while the door opening. 	<ul style="list-style-type: none"> ·Close the door immediately. ·Close the door, and then start to operate.
	E-09 Trigger unbalance detection	<ul style="list-style-type: none"> ·The test tube in the rotor is unbalanced 	<ul style="list-style-type: none"> ·Ensure the test tube is balanced
	Other fault	<ul style="list-style-type: none"> ·Read the service manual 	<ul style="list-style-type: none"> ·Contact with service center

Table 10-1 Frequent problems and solutions

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

10.2 How to open the door

10.2.1 In the case of power on

CAUTION

- The door just can be opened while the power on and rotor stops rotating.
 - (1) Turn on the POWER switch, the door lock will release automatically.
 - (2) The door lock will release automatically once the operation finished.
 - (3) It is available to release the door by pressing button ^{Door} 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.
- Observe through the transparent upper cover to ensure that the rotor is not rotating.
 - (2) Use the manual unlocker to open the upper door lock
 - The manual unlocker is at the bottom of the centrifuge.
 - Toggle the unlocker to the right to open the upper door lock, then you can open the upper door

11. Instructions of rotor and tube

CAUTION:

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

11.1 The rotor instructions

11.1.1 Rotor structure

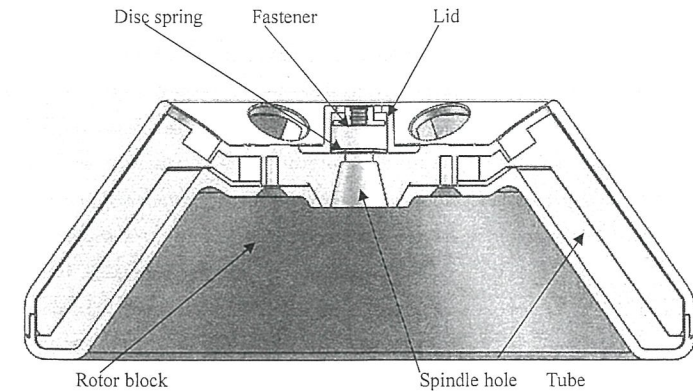


Figure 11-1 the rotor profile

11.1.2 Available rotors and adapters

Table 11.1 Rotors and adapters

Rotor type	ID code	Tubes	Adapters	Maximum speed (rpm)	Maximum RCF (×g)	Allowable imbalance (*)
						imbalance
A6-15P	01	1.5/2.0ml tube	A2P17	5000	1817	2.0g/ tube
		13×75 Blood collection tube	A5P17	5000	2236	2.0g/ tube
		15ml tube		5000	2600	2.0g/ tube
		13×100 tube		5000	2600	2.0g/ tube
		16×100 tube		5000	2600	2.0g/ tube

11.1.3 Notice

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

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

11.1.4 Autoclaving

A12-2P rotor is made of plastic, cannot be high-pressure sterilization and UV irradiation, only ordinary sterilization can be used.

CAUTION:

- The lid of the rotor is made of plastics, can not be high-pressure sterilization, only ordinary sterilization can be used.

11.2 Tubes

11.2.1 Cleaning and sterilizing tubes

Table 11.2 Cleaning and sterilizing conditions for tubes

O: Applicable X: Inapplicable

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

PA: Polyallomer; PC: Polycarbonate; PP: Polypropylene

11.2.2 Cleaning PC tubes

PC materials are low in chemical resistance against alkaline solutions. Avoid using neutral detergents with pH higher than 9. Note that pH of some neutral detergents are still higher than 9

even if diluted according to the instruction in the maker's catalog. Use detergent with its pH between 7 and 9.

11.2.3 Autoclaving PA、PC and PP tubes

PA begins softening at about 120°C, PC and PP at about 130°C. Autoclave PA tubes at 115°C (0.7kg/cm²) for 30 minutes and PC and PP tubes at 121°C (0.1kg/cm²) for 20 minutes. If a certain temperature is exceeded, the tubes may be deformed.

When using a sterilizing chamber, please operate as follows:

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

11.2.4 Condition and life expectancy of tubes

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

Be operated at the maximum speed:

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

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

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

Notice: Do not use damaged or cracked tubes.

12. Calculation Relative Centrifuge Force (RCF)

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

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

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