User Manual

RSLab microtubes centrifuge, model HiFuge-GJ6

Code: GJC006

Contents

1. Specifications

Maximum speed	15000rpm, increment: 100rpm
Maximum RCF	15100×g, increment: 100×g
Maximum capacity	2ml×12
Timer	30 seconds -99 minutes-HOLD, continuous operation
Driving Motor	Brushless DC motor
Safety devices	Door interlock、over-speed detector、over-temperature detector、automatic internal diagnosis
Power requirements	Single-phase, 110V-240V, 50Hz/60Hz, 3A
Dimensions（mm）	（L）255×（W）245×（H）140
Weight	6kgs
Additional features	Speed/RCF switch、Pulse operation、Processing display、Voice reminder

2. Required Operational Condition

3.1 Basic operational Conditions

（1）Power: 110V-240V, 50Hz/60Hz, 3A.

（2） Ambient temperature: 2℃-40℃.

（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℃-55℃.

（2） Relative humidity: ≤93%.

3. 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.

3.1 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℃±5℃, avoid placing the centrifuge in direct sunlight if temperature exceeds 30℃.

（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.

3.2 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.

4. Structure

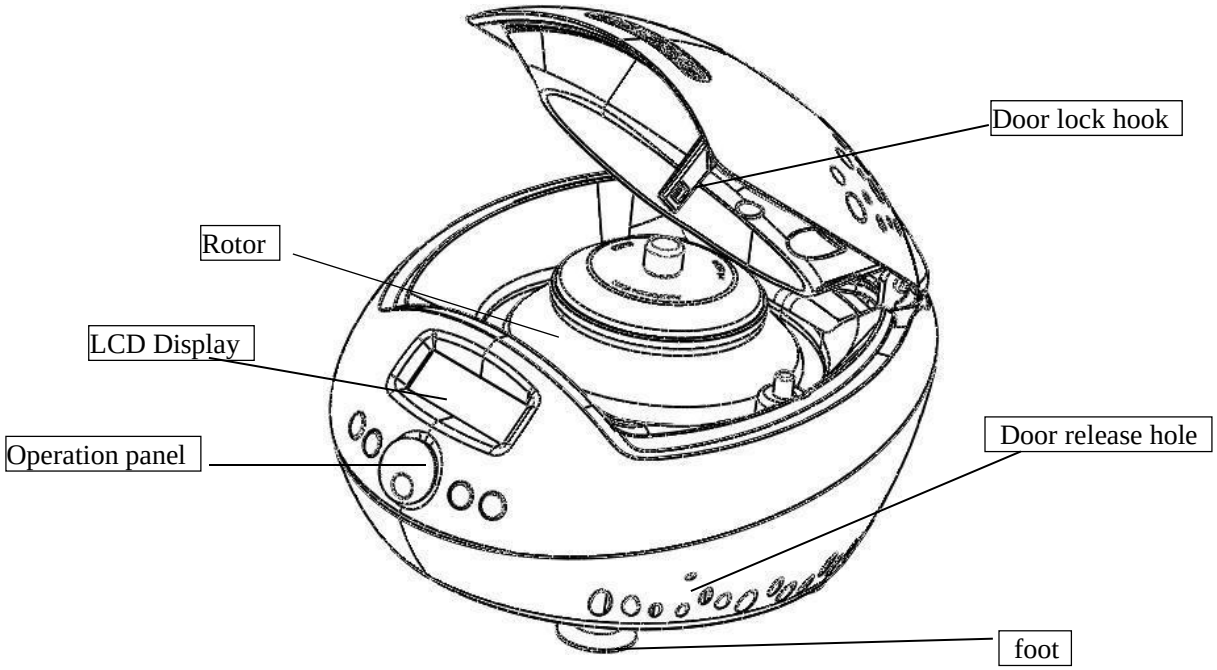

Figure 5.1 Front view of centrifuge

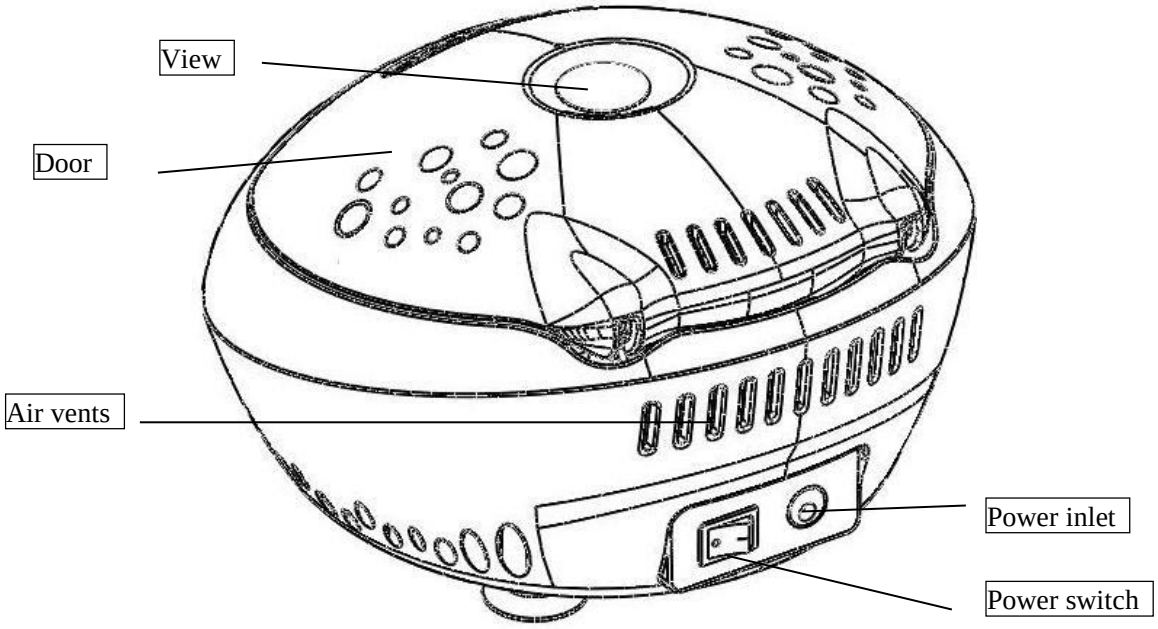

Figure 5.2 Rear view of centrifuge

5. Operation panel

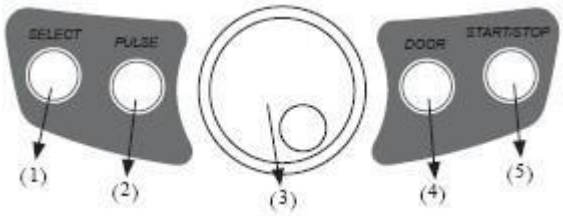

Figure 6-1 Operation Panel

Item	Symbol	Name	Function
1	Select	Select button	Press the button to choose the program which you want to modify.
2	Pulse	Pulse button	The speed can be accelerated and held at the speed when pressing Pulse on.
3		Parameter button	Clockwise rotate to increase program values. Rotate anti-clockwise to decrease parameter values. Press the button, shift between speed and RCF display.
4	Door	Open/ lock button	Press the button to open the door The button is not available when the centrifuge is running.
5	Run/stop	Start/ Stop button	Press the button to start running. The centrifuge will brake to stop running if pressed during centrifugation.

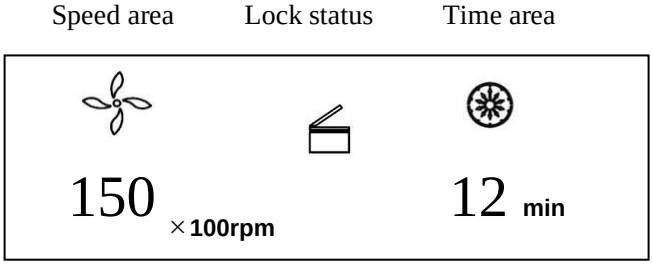

Figure 6-2 the main interface

Main interface is as figure 6-2. The speed is set to be 15000 rpm, running time is 12 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.

6. Rotor Preparation

6.1 Prepare the samples

6.2 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.

6.3 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.

6.4 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.

6.5 Symmetrically load centrifuge tubes in rotor

⚠ CAUTION：

- Make sure the rotor lid is securely fixed on the rotor, as well as the rotor and shaft are tightened. Otherwise, the rotor may be moved off while rotating and cause damage of the centrifuge and rotor.

7. 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.

7.1Normal 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:

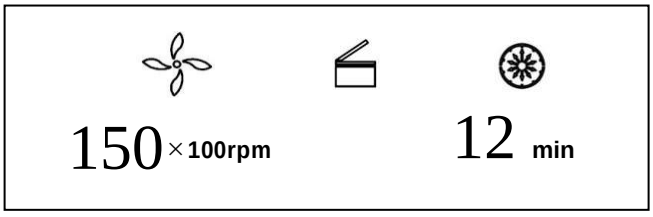

Figure 8-1 the last running interface

- Speed: 15000rpm. Running time: 12 minutes.
- The door lock is released.

7.1.1 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.

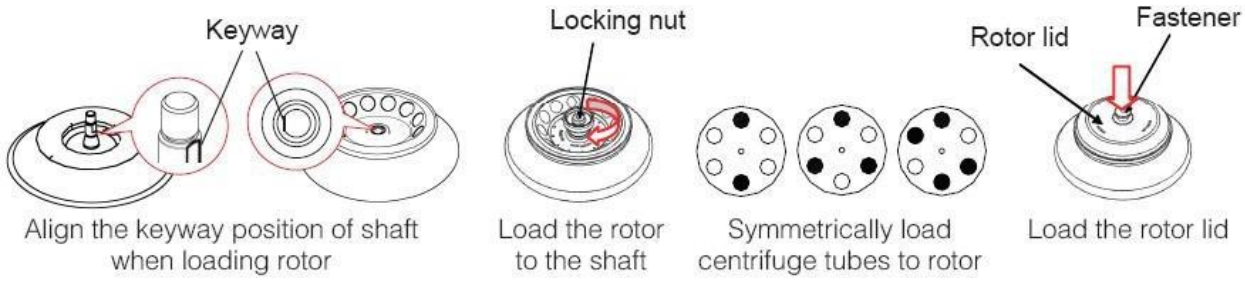

Figure 8-2 the rotor installation

7.1.1.1 Load the rotor to the shaft to ensure rotor is in position until it connected well with the shaft.

7.1.1.2 Rotate the rotor slightly by your fingers to check, if the rotor vibrates, if so attach the rotor again.

7.1.1.3 Hold on the rotor with one hand, tighten clockwise the nut with the other hand, and make sure tighten firmly.

7.1.1.4 Put the rotor lid to the rotor, press the fastener down and make the Fastener g nut fastener att tightly.

7.1.1.5 Close the door and start running.

7.1.1.6 To release the rotor, firstly pull the fastener up to remove the lid, and then turn the locking nut anti-clockwise.

CAUTION

- Check the rotor is firmly tightened before running.

7.1.2 Set the operation parameters

Press the Select button to select required parameters. The parameter can be modified when the parameter is flashing. Clockwise rotate the parameter button to increase parameter value; counter-clockwise rotate the parameter button to decrease parameter value. Parameter button rotate faster, parameter value increase faster. The minimum speed increment is 100 rpm, the minimum time increment is 1 second.

（1）Set the speed

- Press the select button Select 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 program button clockwise to increase speed value, rotate the program button anti-clockwise to decrease speed value.
- You can speed-up set the speed value by rotating program button quickly.
- There is a circulating function to increase/decrease the speed values. Rotate the program button

clockwise to change settings from small → large → maximum → minimum. Rotate the program button anti-clockwise to change settings from large → small → minimum → maximum.

（2）Set the time

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

7.1.3 Start the operation

（1） Press running button Run/stop 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 button Select, returns the display to the program interface and displays settings programs. Press the select button Select to the desired program. When flashing, rotate parameter button to modify values. Release the button after 5 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.

7.1.4 End the operation

（1） The centrifuge will brake when it reaches the setting time or Run/stop 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 Door 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.

7.2 RCF Operation

（1） Turn on the power switch.

（2） Set a RCF (Relative Centrifugal Force) value.

- Press the select button Select and choose speed unit ×g, the speed symbol will flash into RCF value input status.
- If no button is pressed after the speed value has flashed for 5 seconds, the input mode will be shut down.
- Rotate program button to input a RCF value, RCF increment is100×g.

（3） Set operating conditions

- The other operation, please refer to the section 8.1.

7.3 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 is locked.

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

（2） The centrifuge gets into preparation mode and displays last running values. The values can be reset.

（3） Press Pulse knob and hold, the centrifuge will speed up to the setting speed. While releasing Pulse knob during acceleration, the centrifuge will start to decelerate and stop.

8. 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.

9. Troubleshooting

9.1 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.	・Building power circuit breaker trips. ・the fuse was blown out.	・Remove the trouble and turn on the POWER. ・Replace the fuse.
Abnormal vibration	・ Rotor do not match with spindle ・Samples are imbalance	・Install again the rotor ・ Weighting scales, install symmetrically

		• Rotor lid loosed	• Tighten the rotor lid firmly
Alarm code appeared on the time display screen	E-02 Door fault	• The door opened in running. • The START STOP button is pressed while the door opening.	• Close the door immediately. • Close the door，and then start to operate.
	E-06 Set wrong speed	• The setting speed exceed the allowable range.	• Modify the speed value.
	E-10～86	• Read the service manual	• 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.

9.2 How to open the door

9.2.1 In the case of power on

⚠ CAUTION

- The door just can be opened while the power on and rotor stops rotating.

9.2.1.1 Turn on the POWER switch, the door lock will release automatically.

9.2.1.2 The door lock will release automatically once the operation finished.

9.2.1.3 It is available to release the door by pressing button Door once the rotor stops.

9.2.2 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. 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.

10.1 The rotor instructions

10.1.1 Rotor structure

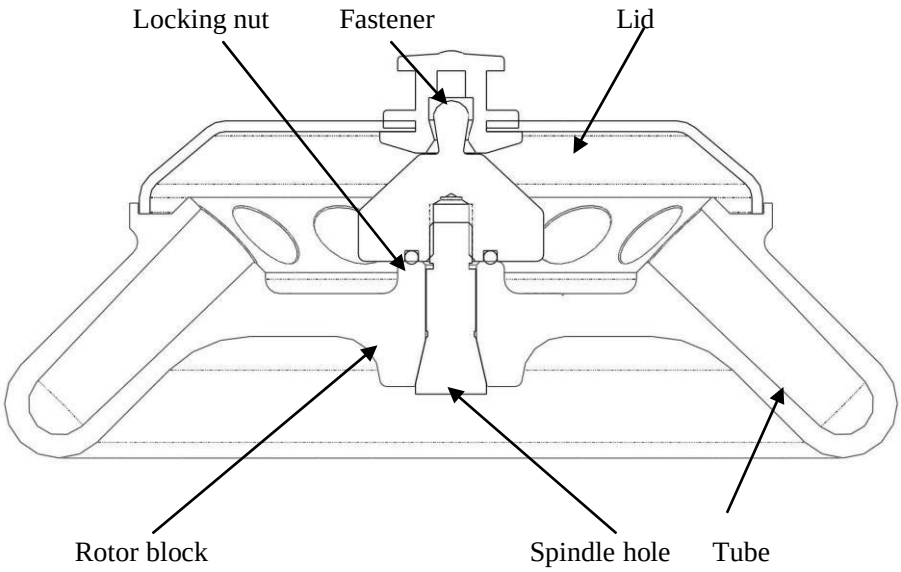

Figure11-1 the rotor profile

10.1.2 Available rotors and adapters

Table 11.1 Rotors and adapters

Model	Rotor type	ID code	Tubes	Adapters	Maximum speed（rpm）	Maximum RCF（×g）	Allowable imbalance（*）	
							imbalance	Volume imbalance（**）
D2012	A12-2	01	1.5/2.0ml tube		15000	15100	2.0g/tube	5mm/ tube
			0.2ml PCR tube	A02P2	15000	11700		

			0.5ml micro tube	A05P2	15000	12780		
D2012 plus	A12-2P	02	1.5/2.0ml tube		15000	15100	2.0g/ tube	5mm/ tube
			0.2ml PCR tube	A05P2	15000	11700		
			0.5ml micro tube	A02P2	15000	12780		

10.1.3 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.
  Allow Speed (rpm)= Maximum speed×(2.0(g/ml)/Sample density (g/ml)) $^{1/2}$

10.1.4 Autoclaving

A12-2 rotor is manufactured in high-strength aluminum alloy material and can be autoclaved: 121℃ (1.0kg/cm2), 20 minutes.

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.

10.2 Tubes

10.2.1 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℃)	O	O	O
	Ultrasonic cleaning	Neutral detergent（pH7）	O	O	O

Sterilization	Autoclaving	115℃（0.7kg/cm^2）30minutes	O	O	O
		121℃（1.0kg/cm^2）20 minutes	X	O	O
		126℃（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

10.2.2 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.

10.2.3 Autoclaving PA、PC and PP tubes

PA begins softening at about 120℃, PC and PP at about 130℃. Autoclave PA tubes at 115℃（0.7kg/cm^2）for 30 minutes and PC and PP tubes at 121℃（0.1kg/cm^2）for 20 minutes. If a certain temperature is exceeded, the tubes may be deformed.

When using a sterilizing chamber, please operate as follows:

10.2.3.1 Place tubes in vertical position, mouths upward. If tubes are placed sideways, they may deform into an oval shape due to gravity.

10.2.3.2 Remove screw nuts and inner covers to prevent from deformation or rupture.

10.2.3.3 Wait until the sterilizing chamber cools down to the room temperature before the tubes are removed.

10.2.4 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.

11. 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