

# Manual de Instrucciones

**Centrífuga para microtubos RSLab, modelo HiFuge-GJ6**

**Referencia: GJC006**



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## 1. Especificaciones

Velocidad máxima	15000 rpm, incremento: 100 rpm
FCR máxima	15100×g, incremento: 100×g
Capacidad máxima	2 ml×12
Temporizador	30 segundos - 99 minutos - HOLD, operación continua
Motor	Motor DC sin escobillas
Dispositivos de seguridad	Bloqueo de la tapa, detector de exceso de velocidad, detector de exceso de temperatura, diagnóstico interno automático
Alimentación eléctrica	Monofásica, 110V-240V, 50Hz/60Hz, 3A
Dimensiones (mm)	(L) 255× (A) 245× (H) 140
Peso	6 kg
Características adicionales	Interruptor Velocidad/FCR, operación con pulsos cortos, pantalla de proceso, indicación por voz

## 2. Condiciones requeridas para la operación

### 2.1 Condiciones de operación básicas

- (1) Alimentación: 110V-240V, 50Hz/60Hz, 3A.
- (2) Temperatura ambiente: 2°C-40°C.
- (3) Humedad relativa: ≤80%.
- (4) Sin vibraciones y flujo de aire en el entorno.
- (5) Sin polvo ni gases explosivos o corrosivos en el entorno.

### 2.2 Transporte y almacenamiento

- (1) Temperatura: -40°C-55°C.
- (2) Humedad relativa: ≤93%.

## 3. Instalación

Esta sección describe las instrucciones de instalación de la centrífuga que garantizan su seguridad y el desempeño óptimo de la misma. Antes de mover el equipo, el rotor debe ser retirado.



**ADVERTENCIA:**

- Una alimentación eléctrica inadecuada puede dañar la centrífuga.
- Antes de conectarla asegúrese que la fuente es la adecuada.

### 3.1 Ubicación

(1) Coloque la centrífuga sobre una mesa firme, plana y nivelada. Las 4 patas del equipo posicionadas firmemente sobre la mesa. Evite las superficie resbaladizas o propensas a vibración.

(2) La temperatura ambiente ideal es  $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , evite exponer la centrífuga a la luz solar directa si la temperatura excede los  $30^{\circ}\text{C}$ .

(3) Deje al menos 10 cm a ambos lados de la centrífuga y al menos 30 cm detrás de la misma para garantizar su enfriamiento.

(4) Mantenga el equipo lejos del calor y el agua para evitar el aumento de la temperatura de la muestra y fallos en el funcionamiento.

### 3.2 Conexión del cable de alimentación y aterramiento



**ADVERTENCIA:**

- Para evitar descargas eléctricas sus manos deben estar secas cuando toque el cable de alimentación.
- Esta centrífuga debe tener un aterramiento adecuado.

La salida de corriente debe proporcionar como mínimo 10A, el aterramiento suficiente y cumplir con los requerimientos de seguridad locales.

## 4. Estructura

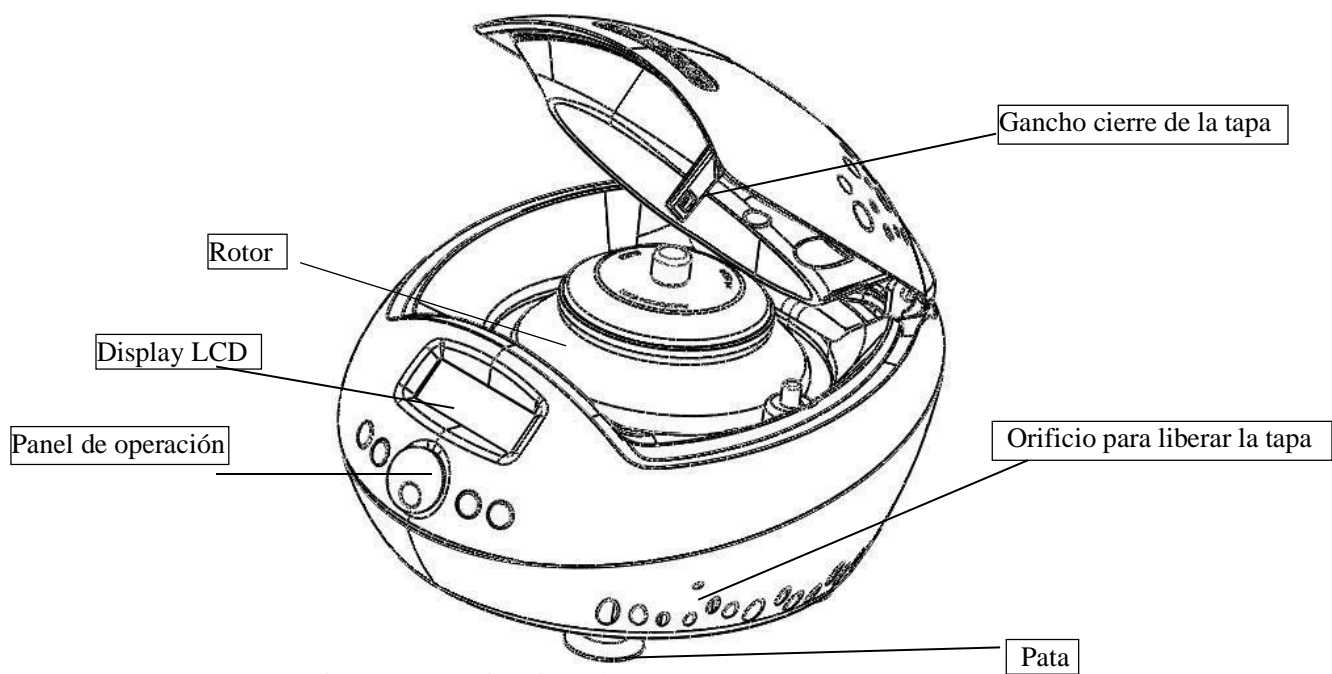


Figura 4.1 Vista frontal

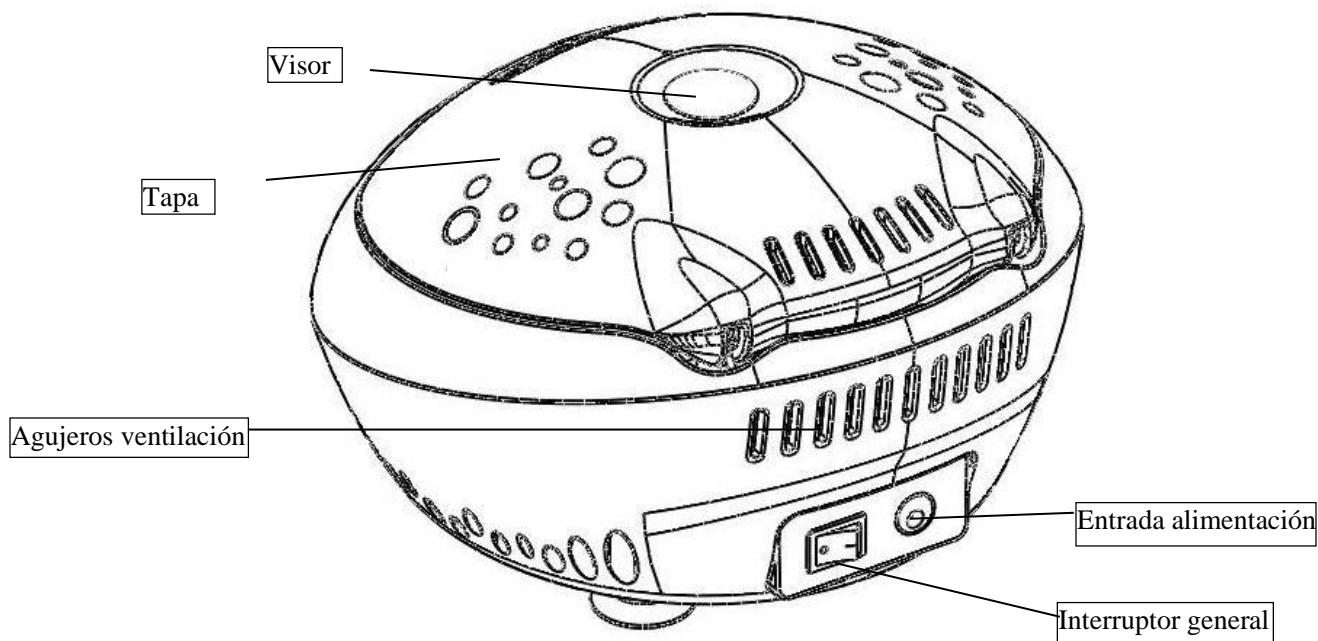


Figura 4.2 Vista trasera

## 5. Panel de operación

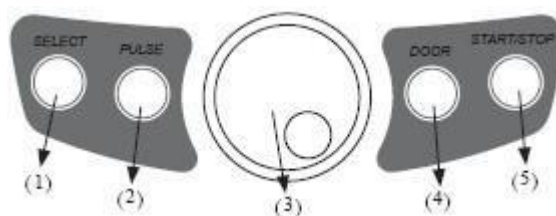


Figura 5.1 Panel de operación

No.	Símbolo	Nombre	Función
1		Botón “Seleccionar”	Pulse este botón para seleccionar el programa que desee modificar.
2		Botón “Pulso”	Si mantiene presionado este botón la centrífuga gradualmente aumentará su velocidad hasta alcanzar la velocidad fijada.
3		Botón “Parámetro”	Si se gira en el sentido de las agujas del reloj se incrementan los valores del programa; en sentido contrario disminuyen. Si lo pulsa, cambiará entre velocidad y FCR.
4		Botón “Apertura”	Pulse este botón para abrir la tapa de la centrífuga. Cuando el equipo esté en funcionamiento este botón no estará disponible.
5		Botón “Inicio/Parada”	Pulse este botón para iniciar la centrifugación. Si lo pulsa durante la corrida se producirá una desaceleración y posterior parada.

Velocidad      Estado del cierre      Tiempo

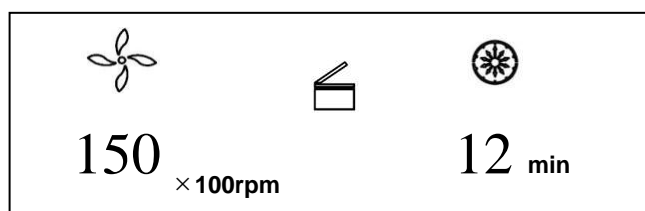


Figura 5.2 Interfaz principal

La interfaz principal es como se muestra en la figura 5.2. La velocidad se ha fijado en 15000 rpm, el tiempo de centrifugación en 12 minutos. Cuando el símbolo de velocidad rota esto significa que la centrífuga está en funcionamiento. El símbolo de tiempo muestra la relación entre el tiempo transcurrido y el tiempo fijado. El tiempo total se divide en 10 secciones.

## 6. Preparación del rotor

### 6.1 Preparar las muestras

### 6.2 Colocar las muestras en los tubos

 PRECAUCIÓN:

- No sobrecargue los tubos porque podrían producirse fugas.

- No exceda la capacidad máxima indicada en este manual.

### 6.3 Equilibrar los tubos

- Coloque la misma cantidad de muestra en los tubos. Esto contribuirá a alargar el tiempo de vida útil de la centrífuga.
- Nunca haga funcionar intencionalmente el equipo con tubos que no estén equilibrados.

### 6.4 Inspeccionar el rotor

Antes del uso compruebe que el rotor no tiene rayaduras ni daños por corrosión.

 PRECAUCIÓN:

- 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 Cargar los tubos en el rotor simétricamente

 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.

### 7.1 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:

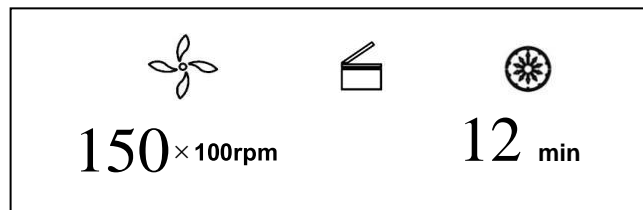


Figure 8-1 the last running interface

- Speed: 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.

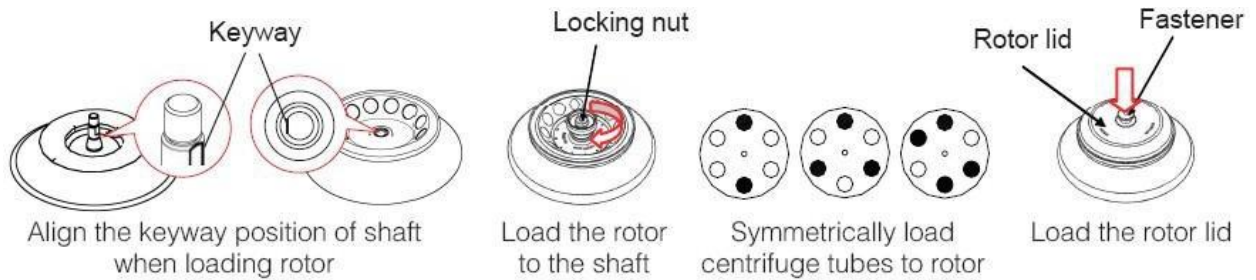


Figure 8-2 the rotor installation





- 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 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  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  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 , 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  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 , returns the display to the program interface and displays settings programs. Press the select button  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  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.



## 7.2 RCF Operation

- (1) Turn on the power switch.
- (2) Set a RCF (Relative Centrifugal Force) value.
  - Press the select button  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 5 seconds, the input mode will be shut down.
  - Rotate program button  to input a RCF value, RCF increment is  $100\times g$ .
- (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  knob and hold, the centrifuge will speed up to the setting speed. While releasing  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 long 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.	<ul style="list-style-type: none"><li>• Building power circuit breaker trips.</li><li>• the fuse was blown out.</li></ul>	<ul style="list-style-type: none"><li>• Remove the trouble and turn on the POWER.</li><li>• Replace the fuse.</li></ul>
Abnormal vibration	<ul style="list-style-type: none"><li>• Rotor do not match with spindle</li><li>• Samples are imbalance</li></ul>	<ul style="list-style-type: none"><li>• Install again the rotor</li><li>• Weighting scales, install symmetrically</li></ul>


		• Rotor lid loosed	• Tighten the rotor lid firmly
Alarm code appeared on the time display screen	E-02 Door fault	<ul style="list-style-type: none"> <li>• The door opened in running.</li> <li>• The  button is pressed while the door opening.</li> </ul>	<ul style="list-style-type: none"> <li>• Close the door immediately.</li> <li>• Close the door, and then start to operate.</li> </ul>
	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  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

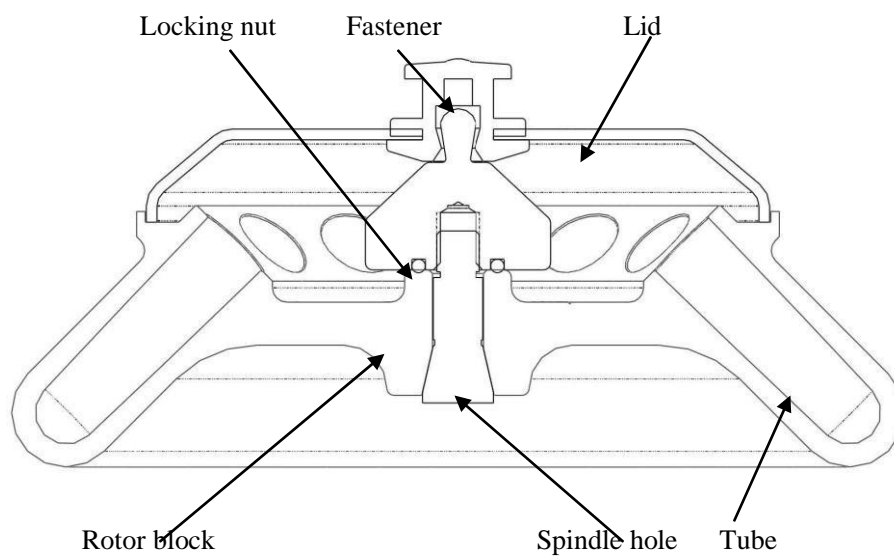


Figure11-1 the rotor profile

#### 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 ( $\times g$ )	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))<sup>1/2</sup>

### 10.1.4 Autoclaving

A12-2 rotor is manufactured in high-strength aluminum alloy material and can be autoclaved: 121 °C (1.0kg/cm<sup>2</sup>), 20 minutes.

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

<p> CAUTION:</p> <ul style="list-style-type: none"> <li>● The lid of the rotor is made of plastics, can not be high-pressure sterilization, only ordinary sterilization can be used.</li> </ul>
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## 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 °C)	O	O	O
	Ultrasonic cleaning	Neutral detergent (pH7)	O	O	O

Sterilization	Autoclaving	115°C (0.7kg/cm <sup>2</sup> ) 30minutes	O	O	O
		121°C (1.0kg/cm <sup>2</sup> ) 20 minutes	X	O	O
		126°C (1.4kg/cm <sup>2</sup> ) 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°C, PC and PP at about 130°C. Autoclave PA tubes at 115°C (0.7kg/cm<sup>2</sup>) for 30 minutes and PC and PP tubes at 121°C (0.1kg/cm<sup>2</sup>) 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.

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

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