LABSTAC

OPERATION MANUAL
Tabletop Refrigerated Centrifuge
CEN1A-500R

www.labstac.com

Index

01. Preface

In order to ensure safe operation of this centrifuge, please read through this instruction manual carefully and follow the instructions before use or maintain this centrifuge. Please paste the Operational Program (attached separately) at the working area.

The centrifuge should be operated by trained specialists only.

⚠ **Failure to follow this instruction and safety information in this instruction manual will result in the expiration of the seller's warranty.**

02. Safety cautions

Safety cautions: safety cautions aim at the safety operation of the centrifuge which was described in this instruction manual. In the interest of your own personal safety, please read it carefully before you install, operate, maintain and repair this centrifuge. Knowing this safety caution and proper operating skills, the operator can avoid the hurting as well as avoid the damage to the centrifuge.

2.1 Installation and maintenance cautions

.The centrifugal chamber may contain rotors and other accessories in it, please open the lid to check and get out of it (if any) before installing.
·When maintaining this centrifuge, all the parts which needed to remove the cover may cause electric injury. Make sure you already cut off the electricity and pulled the plug from the socket before maintaining this instrument. The maintaining work should be done by professional staffs.
·Please use only rotors, accessories, replacement parts for this centrifuge which has been approved by us.
·A safety zone of at least 30 cm must be maintained around the centrifuge. People, dangerous substances or objects must be kept out of the safety zone during the centrifugation run.

2.2 Electric cautions

·To reduce the danger risk of the electric shocks, this centrifuge adopts three core plug which must be connected with three core socket which connects with earth wire.
·Make sure the socket on the wall connects well with the earth wire. Make sure the power voltage must conform to the voltage this centrifuge required.
·Do not use two wire expansion socket or multi-use power adapter which is not connect with the earth wire.
· Do not put the container which is full of liquid on or near the centrifuge, because if the container is knocked over, the liquid may penetrate into the centrifuge, which would damage

the components.
·The main plug must be freely accessible at all times. Pull out the power supply plug or disconnect the power supply in an emergency.

To avoid can't disconnect the mains from the centrifuge in the event of errors occurring in time, an emergency switch which is separate from the centrifuge must be available, this switch should be outside the room in which the centrifuge is operated or next to the exit of the room.

2.3 Fire prevention cautions

· Please use the same type specification overload insurance fuse. This machine use
the type specification for the fuse is BGXP ¢5×20 250V 15A.
·This centrifuge is not designed to separate flammable and explosive materials. Do not use this centrifuge to centrifuge these materials, do not put these kinds of materials in the centrifuge, or put such material in the safety zone.

2.4 Operation cautions

⚠Do not start the centrifugation run before you cleaning the centrifuge chamber, otherwise damages might occur!

⚠Please always set the rotor no. to the actual rotor no. you are going to run before set other parameters to prevent the overspeed accident might occur during the parameters setting process. (please refer to the rotor parameters in page 28-32 for the rotor no.)

- Do not start the centrifugation run when the lid is open.
- Always ensure the rotor has been securely fastened on the spindle and the samples have been balanced before each run.
- Never open the lid until the rotor has completely stop and this has been confirmed in the display.
- In case of fault or emergency release, disconnect the centrifuge from the mains first,
- open the lid only during rotor standstill.
- Please do not lean on, lift up, or move the centrifuge before the rotor stop running.
- Do not stretch anything into the centrifuge when the rotor is running.
- When the centrifuge is running, according to EN / IEC 61010-2-020, no persons, dangerous substances or objects may be within the safety margin of 30 cm around the centrifuge. Please don't work in that range unless you need to debug the machine.

⚠**To avoid damage to the compressor, wait for at least 5 minutes after power off the machine before switching on the machine again.**

2.5 Chemistry & Biology cautions

- Routine operation may include all kinds of solution and test samples which may be pathogenic, toxic or radioactive material, all the materials should not be centrifuged
- by this centrifuge unless protective measures have been adopted.
- Please pay attention to the description of the solution on the original solution container before you are going to centrifuge it.
- Be careful when you holding the liquid because they are contagious.
- The operator should obey this instruction manual and method of the laboratory strictly when they operating this centrifuge.
- All the waste solution must be destroyed according to the safety and protection demand of the environment.

When you ask for after-sale service, please make sure you had cleaned up the centrifuge, thanks in advance for your support.

03. Symbols & its meanings

No.	CODE	GB No.	MEANING
1	~	4706.1	AC POWER
2	|	5465.2	CONNECTED (MAIN POWER)
3	○	5465.2	DISCONNECTED (MAIN POWER)
4	⏚	4728.2	PROTECTIVE GROUNDING
5	⚠	4793	CAUTION !

04. Product introduction

4.1. Working principle

The centrifuge is a instrument which use the powerful centrifugal force which was generated by the high speed running of the rotor to accelerate the settlement of particles in solution, to make the samples of different subsidence coefficient and different density of the substance to be separated, concrete and pure.

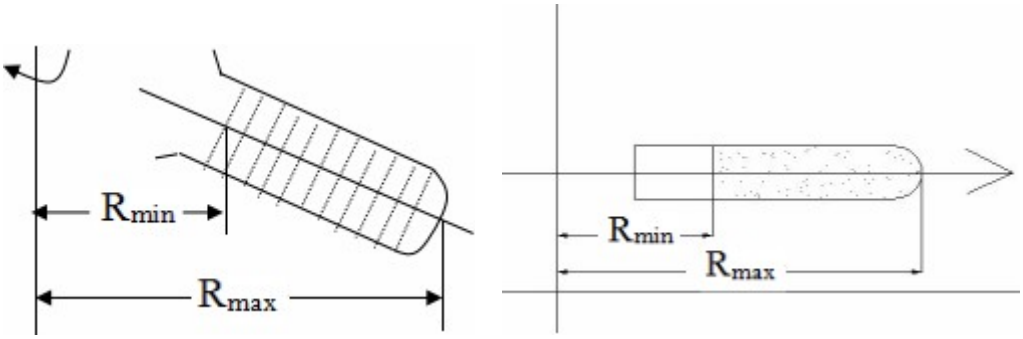
When operate a centrifuge, loading equivalent volume solutions into each centri-
fuge tubes / bottles which you are going to centrifuge and load these centrifuge tubes / bottles into the positions of the rotor symmetrically (the centrifuge tube / bottle must be opposite each other to make sure the rotor can run at a balance state).
The relative centrifugal force (RCF) depends on rotational radius “ r ” and rotational speed

(revolutions per minute) “ n ”, its computational formula as following:
RCF=1.118×10-5×n2×r（×g）
Among the formula:
n —— rotational speed (r/min)
r —— rotational radius (cm)
G —— gravitational acceleration (9.8 newton/kg)

The required centrifugal time T for particle separation sediment in the mixture solution was counted as the following computational formula:

$$T = \frac{27.4\times(1nR_{max}-1nR_{min})\mu}{n^2 r^2(\sigma-\rho)} \quad (min)$$

Among the formula:
ρ —— mixed solution density (g/cm³)
μ —— mixed solution viscosity (P)
n —— rotational speed (r/min)
r —— rotor rotational radius (cm)
σ —— particle density (g/cm³)
Rmax —— the horizontal distance from bottom surface of centrifuge solution to axis (cm)
Rmin —— the horizontal distance from solution surface to axis (cm)



fixed-angle rotor swing-out rotor

Fig.1

Our centrifuge is with automatic rpm / rcf conversion function, do not need to manual calculation.

4.2 Product features

This centrifuge adopts induction motor driving, user-intuitive touch screen, corrosion-resistant stainless steel centrifuge chamber, additional inner steel armored guard ring, steel housing, steel lid, electronic lid interlock, imbalance protection and other safety technologies for safe operation. It can store 1 000 programs and there are 40 acceleration rates and 40 deceleration rates available for daily use. TECUMSEH compressor and CFC-free refrigerant are adopted for the refrigerating system. The refrigerating/ heating double loops design makes the centrifuge cooling/heating fast as well as high precision. The operation parameters such as running speed/centrifugal force, running time can be modified during operation. The

self trouble diagnosis system can detect speed, lid lock, motor failure and many other kinds of fault automatically and show the fault code. Safety, performance and operation simplified at every run.

The features are as below:
(1) Due to the unique of shock absorber and the special design, the anti-vibration effect is good.
(2) The speed control system adopts PID control method, it's with a high precision, 40 acceleration rates and 40 deceleration rates selectable.
(3) Automatic calculation RCF value technical adopted.
(4) Electronic lock system security the centrifuge work safely. The centrifuge can't start when the lid not lock.
(5) All the rotors listed can **reach below 4 ℃ at full speed and -20 ℃ at low speed.**

4.3 Product use and application scope

This centrifuge is widely used in the field of biochemistry, agricultural science, environmental protection, clinical medicine, pharmacy, inspection and quarantine, radio-immunity and other research & manufacturing fields. It is a ideal separation equipment for colleges/universities, research institutes, and enterprises.

05. Install & Debug

5.1 Installation requirements

(1) Environment requirements
This centrifuge should be installed in the indoors, on a good, stable base, such as installed on a horizontal rigid solid laboratory worktable, no corrosive, conductive dust or damaging insulating air, and no powerful vibration source nearby, avoid direct sunlight.
To make sure the centrifuge can work properly, the install environment should fulfill the following conditions:
Environment temperature： 5℃ ~ 40℃
Relative humidity： ≤80%
Atmospheric pressure: 860hPa ~ 1060hPa
Supply voltage： AC 200 - 240V, 50/60Hz

(2) Space requirements
In order to ensure the in-out vent of cooling air the centrifuge demand, the set-up location must be well-ventilated at all times.
A safety zone of at least 30 cm must be maintained around the centrifuge. When the centrifuge is running, according to EN / IEC 61010-2-020, no persons, dangerous substances or objects may be within the safety margin of 30 cm around the centrifuge.
(3) Power supply requirements
The power for this centrifuge is single-phase 200-240V, 50/60Hz, 15A. The power should has protective earth wire. Do not use null line to instead of protective earth wire. If you are not sure about the power you are using, please contact your distributor or local electricity board.

⚠ **For ensure the good grounding of the centrifuge, this centrifuge connects with a single-phase three core plug. If the plug can not put into your socket, please contact electrician to change your original socket to ensure the safe action of the single-phase three core plug.**

To avoid can't disconnect the main from the centrifuge in the event of errors occurring in time, an emergency switch which is separate from the centrifuge must be available, this switch should be outside the room in which the centrifuge is operated or next to the exit of the room.

5.2 Machine installation

Remove the package (by the user)
Users should check the package appearance when receiving the product. Severe impact, recumbency and upend etc. should not happen during transportation. The package appearance should be well. Please contact with the cargo agent and inform our company in time if any damage is discovered.
First, remove the top cover of the package, get out of the rotor and accessories; Second, get out of the centrifuge from the package and place the centrifuge in a stable and level manner in a suitable place, such as place in the reserved horizontal rigid solid laboratory worktable (you can disassemble the plywood case by disassemble the four wood planks around the centrifuge, then you can get out the centrifuge easily). During set-up, the required safety margin of 30 cm around the centrifuge is to be kept according to EN / IEC 61010-2-020. Last, properly deal with the package and packing, not to pollute the environment, or save these for possible future transport of the centrifuge.

WARNING:

⚠ Never lift the centrifuge by the lid.

⚠ Always lift the centrifuge at the both sides on the bottom plate. Due to its weight (see "technical specifications" in page 28), the centrifuge may need to be carried by several people. Avoid impact during the carry process, the centrifuge will be damaged by impacts.

⚠ After installation, the four rubber feet on the bottom of the centrifuge should afford uniform stress, otherwise the user should increase block and readjust to meet the demand.

⚠ The horizontal leveling of the centrifuge must be checked every time after moving it to a different location.

5.3 Open the lid.

⚠ The lid can only be opened when the rotor is standstill.

There are two ways to open the lid.
1). Connect the centrifuge's plug to the power supply, switch on the main power switch on the right side of the machine, then tap the icon "Door", after you hear a sound of unlock, lift up the lid.
2). Open the lid by using the emergency release switch.
Emergency release switch, there is a line below the front of the machine (on the left side), which is used when power failure or something is wrong with the lock. Pull this line, after heard a sound of unlock, you can lift the lid.

⚠ The emergency release switch should not be used at ordinary time, it can only be used when power failure or something is wrong with the lid lock.
Take out the rotor and accessaries from the centrifuge chamber (if any) after opened the lid.

5.4 Rotor installation

Examine the rotor before every use.
Make sure there is no any crack or corrosion spot on the rotor / rotor cross or on the buckets / tube rack / steel sleeves / PP sleeves. **Strictly prohibit** to use the rotor which has any crack or corrosion spot on the rotor / rotor cross or on the buckets / tube rack / steel sleeves / PP sleeves.
The install proceed as follows:
First, place the rotor / rotor cross vertically onto the motor spindle (put the orifice cone of the rotor / rotor cross downward, the screw rod should come out after the installation.). Second, fit on the gasket and nut, then screw the nut tightly by use the spanner equipped in the clockwise direction (hold the rotor / rotor cross with one hand and secure the rotor / rotor cross to the spindle by turning the fixing nut clockwise). Third, **install all the steel sleeve / PP sleeve** (for fixed-angle rotor) **into the rotor or install all the buckets / tube rack** (for swing-out rotor) inside the rotor cross. (see Fig.2 and Fig.3).

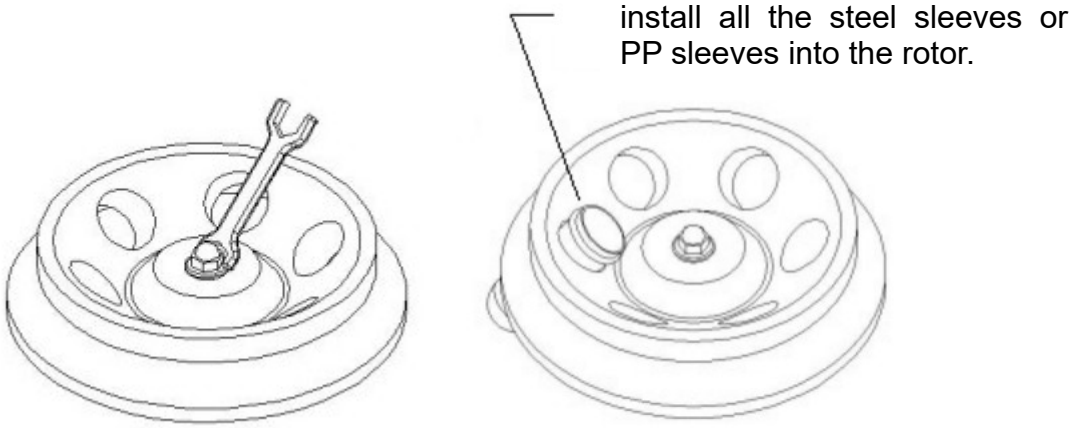


Fig. 2 Fixed-angle rotor installation

install all the buckets or tube racks inside the rotor cross.
(if the swing-out rotor comes with tube racks, make sure
all the steel sleeves were installed inside the tube rack before load the test tube into it.)

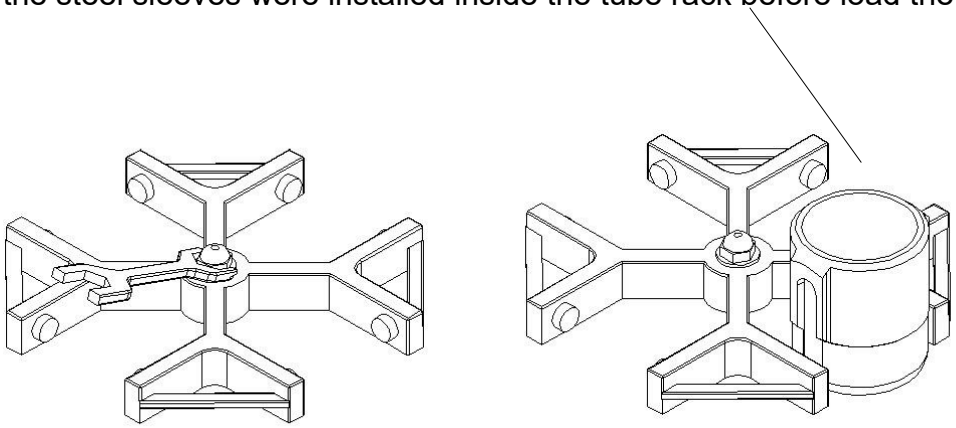


Fig. 3 Swing-out rotor installation

⚠**For safety, always ensure the rotor has been securely fastened on the spindle before each run.**

When need to change rotor, take down the buckets / tube racks, discharge the rotor / rotor cross with the spanner equipped (keep the rotor / rotor cross standstill with one hand, unscrew the nut with the spanner), then get out of the rotor / rotor cross and install the new desired rotor the experiment required.

5.5 Loading Rotors

Always balance the samples.
To ensure safe operation of the centrifuge, the rotor must be evenly loaded at all times. The centrifuge tubes / bottles must be filled with same volume solutions, the loaded centrifuge tubes / bottles must be opposite each other, the **weight difference of the loaded tube racks / buckets should not exceed 1 g. Imbalanced running is strictly prohibited.** There is serious accident will occur due to the imbalanced running.

⚠**Please check the maximum permissible revolutions of the test tubes / bottles (producer indication).**

(1) Loading fixed-angle angle rotors

For the fixed-angle rotor (if the fixed-angle rotor equipped with steel sleeves or PP sleeves, all the steel sleeves or PP sleeves must be installed into the rotor before load the tubes into the sleeves), the loaded test solution for each tube / bottle should not exceed 75% of its nominal capacity as usual unless you can make sure the test tube / bottle can be 100% sealed. The test tubes / bottles must be loaded with equal weight and must be loaded into the rotor symmetrically to make sure the rotor can run at a balance state.

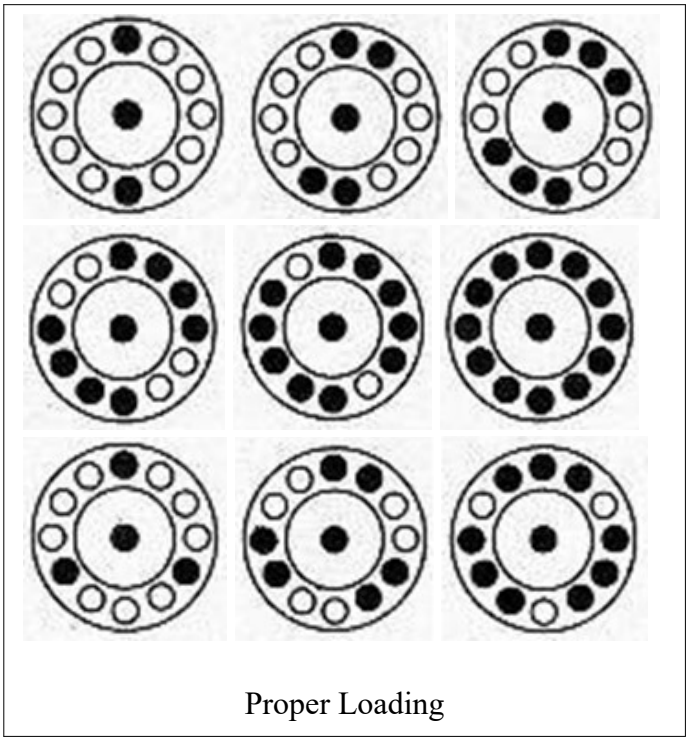


Fig.4 fixed-angle rotor loading sketch

(2) Loading swing-out rotors

For swing-out rotor, all of the buckets or tube racks must be installed inside the rotor cross before load the bottles / tubes into the rotor (if the swing-out rotor comes with tube racks, make sure all the steel sleeves were installed into the tube rack before load the tube in it as well.). To enable the rotor can centrifuge at a balance state, please always obey the two criterion mentioned below during the rotor loading process:
1). For each bucket / tube rack, the placed tubes should enable the gravity center of the bucket / tube rack is at the center of the bucket/tube rack.
2). Opposing buckets / must be equally loaded.
The opposite bucket / tube rack loading should according to the bucket / tube rack which already loaded, make sure the loaded buckets / tube rack be opposite each other.

⚠ It is allowed to operate a 4 place rotor with 2 loaded buckets only, the loaded buckets must be opposite of each other. Make sure that the unloaded buckets are placed inside the rotor.

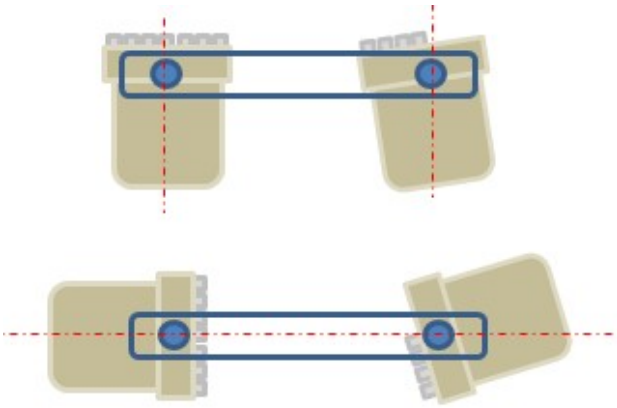


Fig.5 Bucket Improper Loading

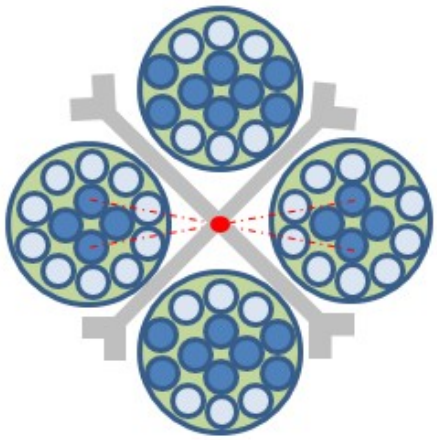


Fig.6 Rotor Proper Loading

5.6 Close the lid

Press the lid down after the test tubes / bottles were well loaded, the lid was locked after you heard a sound.

⚠ Do not put your fingers between lid and the housing.

⚠ Do not bang the lid shut

5.7 Connect the power

Make sure the power connected with an earth wire before you connect the machine to the power, then switch on the power switch.

5.8 Debug requirements.

Operate the centrifuge like the operation sequence No.6 described below, first choose low speed running, then select the higher speed gradually. If there is no exception, the debugging is successful.

06. Operation

6.1 Graphic user-intuitive touchscreen interface

This centrifuge adopted graphic user-intuitive touchscreen interface. The home screen shows as below(fig 7):
Icons & display explanation

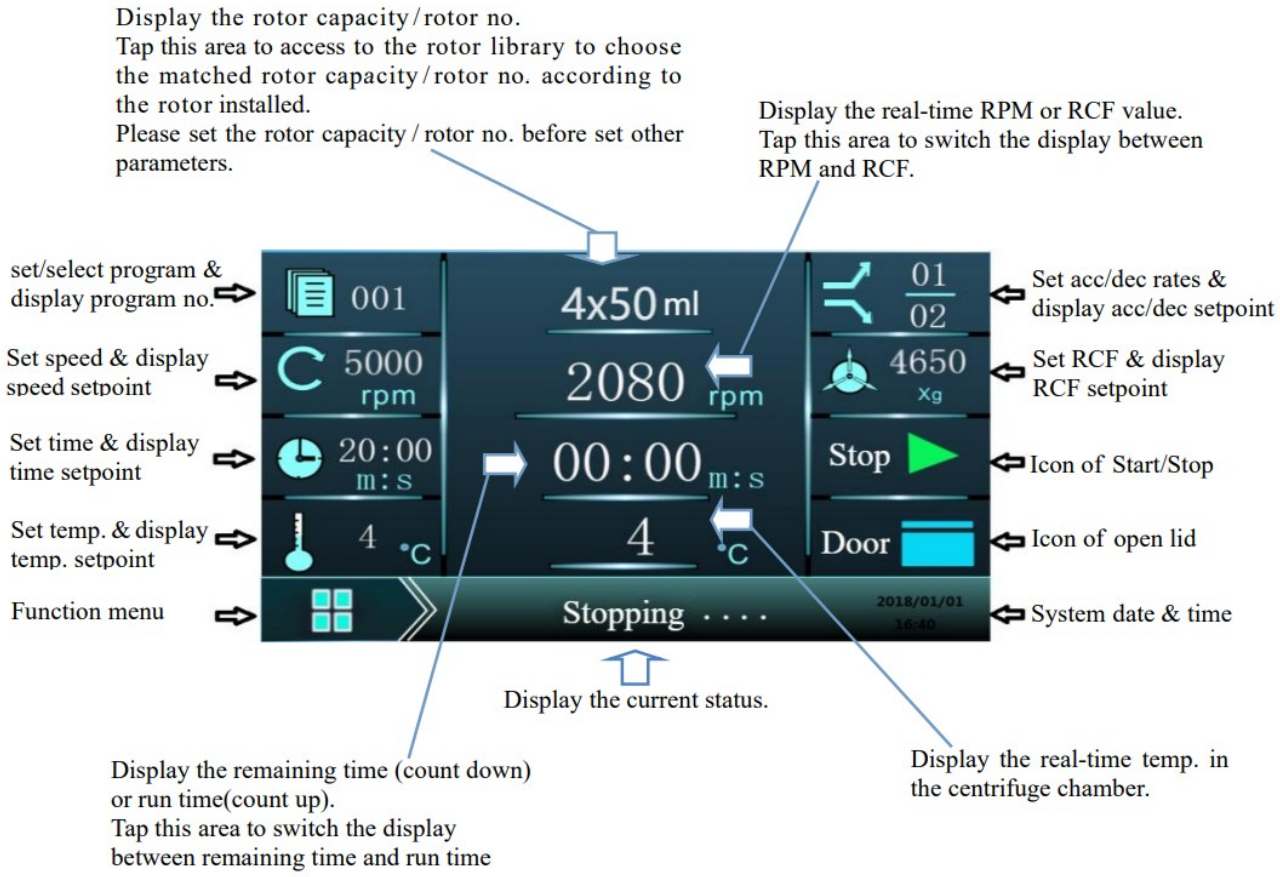
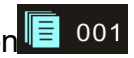


Fig. 7 “Home” screen

6.2 Set basic centrifugation parameters

For user convenience, this centrifuge can store 1 000 programs, including the 999 user-defined programs numbered from 001 to 999 and 1 temporary program numbered 000.

(1) user-defined programs

1)Tap the icon  on the home screen to access to the program group interface (see fig. 8). You can choose program or edit program parameters after enter into the program group interface. Tap the program number can call the program to the home screen. Tap any parameter of a program to enter the edit interface then can modify the parameter.
2) After modify the parameters of the program called from the stored program group on the home screen, the modified parameters are automatically stored as the temporary program

No. 000, and the parameters of the original program will not be modified. If you want to modify the parameters of the original program, please enter into the program group interface to modify it.

3) The program group also can be locked to prevent other users from modifying the set parameters. You can tap the small lock icon behind the program to lock or tap again to unlock it. (after setting the user password, you need to enter the password for locking and unlocking).

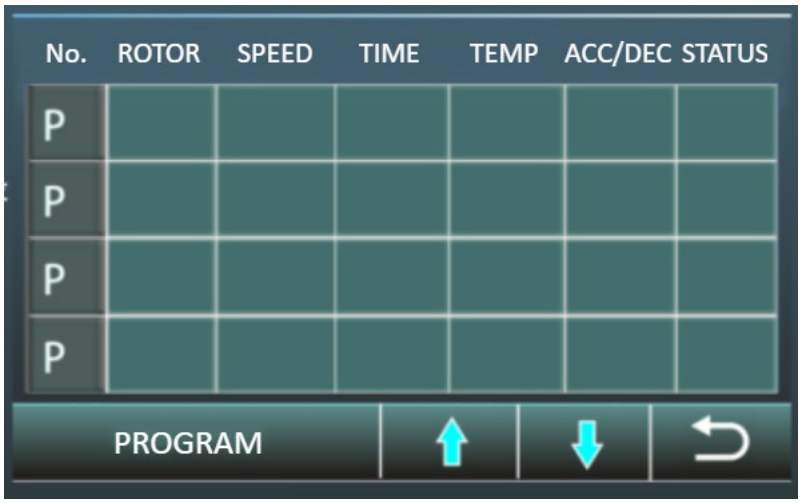


Fig. 8 program set interface

(2) Set the rotor capacity / rotor no.

Tap the area where shows the rotor capacity / rotor no. on the home screen to access to the rotor library to choose the matched rotor capacity /rotor no. you are going to spin(see fig. 9).

⚠ **NOTICE Due to the low speed serials centrifuge do not design with automatic rotor identification function, thus this step is very important. This step will enable the machine show the right RCF of the installed rotor during running and prevent the overspeed accident might occur. Please set the rotor capacity / rotor no. before set other parameters.**

(3) Set Speed / RCF Value

Tap the icon 

on the home screen to access to the speed set interface(see fig. 9), then enter the desire speed value on the keypad directly, tap “OK” to save the setting. According to the current rotor, the set speed value will be converted to centrifugal force automatically and displayed (Then centrifugal force will also be automatically converted to rotational speed when setting centrifugal force, thus just set the speed or set the RCF is ok). After set the rotor capacity / rotor no., if the speed setpoint or centrifugal force setpint is greater than the upper limit of the rotor installed, the machine will give an alarm.

Fig. 9 speed / rcf set interface

(4) Set run time

Tap the icon on the home screen to access to the time set interface(see fig. 10), then enter the desire time value on the keypad directly, tap “OK” to save the setting. If the time setpoint is greater than or equal to 1 hour, the timer in the home interface will automatically display hours : minutes; if the time setpoint is less than 1 hour, the timer in the home interface will automatically display minutes : seconds

Fig. 10 run time set interface

(5) Set temperature

Tap the icon on the home screen to access to the temperature set interface(see fig. 11), then enter the desire temperature value on the keypad directly, tap “OK” to save the setting. The temperature set range is -20℃ to 40℃, if the setpoint beyond the range then the system will default to the maximum or minimum automatically.

According to the use environment and set parameters, the refrigeration rate will be different. This centrifuge will begin to refrigerate toward the set temperature automatically after switch on the power switch. The factory commissioning is when the room temperature ≤35℃, all the rotors for this centrifuge can reach below 4 ℃ at full speed within 20 minutes.

(6) Set acceleration and deceleration rate

Tap the icon on the home screen to access to the acceleration and deceleration rates set interface(see fig. 12), then enter the desire acceleration and deceleration on the keypad directly, tap “OK” to save the setting. The acceleration and deceleration set range is 1 to 40, 1 is fastest, 40 is the slowest(the declaration rate 40 is unbraked deceleration). The acceleration and deceleration rates time are varies according to the different capacity rotor, the larger the capacity of the rotor the acceleration and deceleration time will be longer, the smaller the rotor capacity is the faster the acceleration and deceleration.

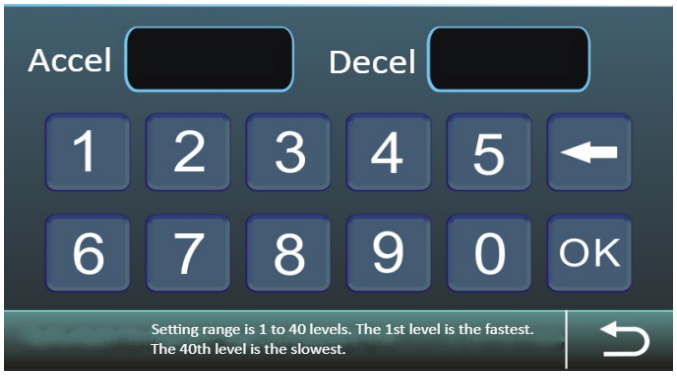


Fig. 12 acc/dec set interface

⚠For the larger volume rotor, we suggest the user do not select the too fast acceleration and too fast deceleration, this is to protect the spindle of the motor and to enable the centrifuge can have longer service time.

(7) Function menu explanation
Tap the icon on the home screen to access to the function menu interface (see fig. 13)

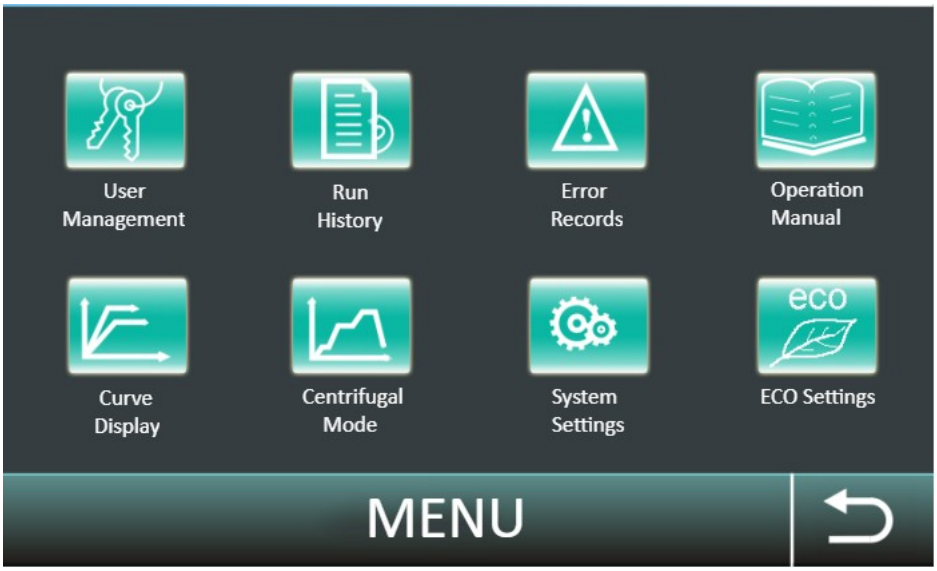


Fig. 13 function menu interface

Function icon explanation

1) User Management: enter into set password to lock the centrifuge and program group.

2) Run History: enter into view run history (can view 1000 usage records in the run history.

3) Error Records: enter into view error record (can record 1000 error messages

4) Operation Instruction: the built-in electronic instruction manual.

Note: the built-in electronic instruction manual may delay update, please read this paper manual when operate this centrifuge.

5) Curve Display: use coordinate system to display the relationship between the rotational speed, centrifugal force temperature and time.

6) Centrifugal Mode: enter into choose multi-stage centrifugal mode or general centrifugal model.

7) System Setting: enter into level 3 menu settings and view other functions.

8) ECO mode: enter into the intelligent temperature control or turn off the

refrigeration function(this is optional function, not available if the machine did not install this function at factory).

9) 

Sound Settings: enter into turn on or turn off the system prompt and touch screen sound

10) 

Date/Time: enter into calibrate or reset the system time/date.

11) 

Language: used to convert system display language (currently built in Chinese and English only)

12) 

Rotor Information: enter into view the rotor information.

13) 

Device Information: enter into view the centrifuge's

14) 

Advanced Settings: used for factory commissioning.

6.3 Rotor standstill cool, rotor pre-cooling, and rotor pre-heating (only in centrifuge with cooling)

⚠For all of our refrigerated models except the two micro refrigerated models, all the rotors listed for each model can reach below 4 ℃ at full speed and -20 ℃ at low speed. (the rotors listed for the two micro refrigerated models can reach below 4 ℃ at full speed and -10 ℃ at low speed only, because the temperature range for these two micro refrigerated centrifuge is -10 ℃ to 35 ℃).

⚠Don't open the lid for a long time while the machine is switch on (please always try to keep the lid closed when the machine is switch on), otherwise the ice in the centrifuge chamber will change into condensate water later and it may wet the motor.

1). Standstill cool

When the machine is switched on, even the rotor is standstill, the centrifuge chamber is refrigerating toward to the set temperature.

2). Rotor pre-cooling

If the samples are "temperature sensitive", it is critical to pre-cool the centrifuge chamber. First installed the desired rotor on the spindle properly and set the desired temperature. Second, set speed that is 40%-60% of the permitted rational speed of the rotor installed. After the temperature in the centrifuge chamber reached the set temperature and kept for a while, you can stop the pre-cooling run by tap the icon "Stop".

Note: When the real-time temperature in the centrifuge chamber reached the set temperature first time during the pre-cooling process, the real-time temperature value may fluctuate. For example, the set temperature is 4 ℃, the real-time temperature in the centrifuge chamber which shows on the LCD display screen may go to 4 ℃, later go to 3 ℃ or lower, them back to 4.5 ℃ or even 5℃, this phenomenon is the temperature automatic adjustment process, its normal, the temperature will keep at the set temperature 4 ℃ soon, this automatic adjustment process may take one or two minutes.

Since the high speed run rotor always release energy, thus we suggest to stop the pre-cooling

run then load the test tubes / bottles in the rotor after the temperature kept at the set speed for a while to ensure the rotor was totally pre-cooled. This rotor pre-cooling process is to protect the test sample always in a low temperature condition.
For example, if the samples is temperature sensitive and you want to spin it at a low temperature, such as 4 ℃, you need to pre-cool the rotor. The process is below:
Suppose the rotor already been proper installed on the spindle and has been securely fastened, the lid is closed. First, set the desired temperature to 4 ℃ (the temperature will begin to go toward 4 ℃ once the you tap “OK” to save the setting). Second, select speed that is 40%-60% of the permitted rational speed of the rotor installed (for example, if the max allowed speed for the rotor is 4 000 rpm, you can set at 2 500 rpm, or 2 200 rpm, etc). Third, set the run time 20 minutes and tap the “OK” to save the setting. Forth, tap the icon ”Start” to start pre-cooling run. The temperature will reach the set temperature soon. After the temperature kept at the pre-selected temperature for a while, then you can tap the icon “Stop” to interrupt the pre-cooling run, then tap the icon “Door” to unlock and open the lid, load the test tubes / bottles into the rotor, close the lid, set the desired speed / time experiment required and set other parameters as well, then tap the icon “Start” to start the centrifugation run.

⚠The pre-cooling may take several minutes such as 6 minutes or 8 minutes to reach pre-selected temperature, this required pre-cooling time was affected by the room temperature and the installed rotor

.

3). Rotor pre-heating

If you want to pre-heat the rotor or rise the centrifuge chamber’s temperature (rise the temperature for melting the ice in the centrifuge chamber after a long time low temperature run. Users use this way to dry and clean the centrifuge chamber before switch off the machine after the use as usual), you can set a higher temperature value, such as 30 ℃, then start the centrifuge run to spin the rotor at full speed for a while, the temperature will rise to the set temperature soon.

6.4 Start

After all the parameters were set or called a stored program to the home screen, tap the icon “Start”, the centrifuge begins the centrifugation run.

⚠Always balance the samples before each run. The rotor must be evenly loaded at all times. The test tubes / bottles have to be filled evenly, the weight difference of the loaded tube racks / buckets should not exceed 1 g. Imbalanced running is strictly prohibited. There is serious accident will occur due to the imbalanced running.

⚠Please check the maximum permissible revolutions of the test tubes / bottles (producer indication) .

⚠Please observing if the machine can work properly after you tap the icon “Start” to start the centrifugation run, tap the icon “Stop” to interrupt the run if there is any abnormal phenomenon, such as the abnormal noise generated. Checking where is the problem if it exist and eliminate it, then start the centrifugation run again.

6.5 Stop

When the run time decelerates to zero, the centrifugation run will stop according to the deceleration rate which has been set. When the rotor stop running completely and the machine give a audible signal of stop, the user can tap the icon “Door” to open and lift the lid.

The centrifugation run can be interrupted by tapping the icon “Stop”. If the user want to stop the centrifugation run before the centrifugation run finished, the user can tap the icon “Stop”, the machine will stop the centrifugation run according to the deceleration rate has been set.

6.6 More operation cautions

⚠For safety, always ensure the rotor has been securely fastened on the spindle before each run.

⚠Always balance the samples before each run.

Make sure the test tubes / bottles were loaded with same volume solutions and the test tubes / bottles were loaded into the rotor at a symmetric balance state. Imbalanced running is strictly prohibited.

⚠Do not run rotors overspeed. The user should be responsible for the loss which was caused by overspeed running of the rotor.

⚠When need to change rotor, the rotor capacity/ rotor no. must be reset after the rotor was changed, set the rotor capacity/ rotor no to actual rotor which you are going to run.

⚠For fixed-angle rotors, the solution in the test tube / bottle should not exceed 75% of the nominal capacity as usual unless you can make sure the test tube / bottle can be 100% sealed.

⚠Discharge the rotor and take it out from the centrifuge chamber before you are ready to move or transport the machine.

07. Troubleshooting

The error messages are listed below to help find possible errors faster.
The possible errors referred to below may not always be the case, as they are theoretically occurring errors and solutions.

7.1 Fault phenomenon, possible causes and their solutions

Fault	Fault Phenomenon	Fault point	Solutions	Remarks
Power supply	The switch indicator light does not light after switching on the power switch.	The fuse blew out.	Replace the fuse with a new one.	The specifications of the fuse is BGXP ¢5×20, 250V 15A.
		The power line poor connected or the power line is broken.	Connect the power line well or replace the power line with a new one.	3X1 National standard suffix power cord.
		No power in the power socket	Plug to other power socket.	200V - 240V 50/60Hz
	The switch indicator light is on but the LCD screen no display.	Internal circuit fault		Contact manufacturer for maintenance.
Lid lock	The lid won't open.	The lid lock motor is broken	Use the emergency release switch to open the lid	Contact manufacturer for maintenance.
	The lid lock won't lock..	lid lock motor has no return.	Tap the icon “Door” for several times, then lock again.	
		The lock is out of alignment.	Adjust the lock position and its length.	
Can't get into	The prompt	Circuit		Contact

the Home screen/main interface	keeps ringing (fast).	board memory is broken.		manufacturer for maintenance.
	The prompt keeps ringing (slow).	LCD screen communicat ion failure.		Contact manufacturer for maintenance.
Imbalance	The machine vibrates when switch on.		Switch off then switch on again.	
	The imbalance sensor is broken.			Contact manufacturer for maintenance.
Temperature	Cool down slowly.	Refrigerant leakage.		Contact manufacturer for maintenance.
		The refrigeration system was blocked.		Contact manufacturer for maintenance.
	Can’t cool.	Refrigeratio n system failure.		Contact manufacturer for maintenance.
Can’t start the centrifugation run	Speed set.		Set the right run speed.	
	Time set to 0.		Set time	
	Lid did not lock.		Close the lid well.	

7.2 Other errors and its solutions

Fault phenomenon	**Reason analysis**	**Elimination methods**
Imbalance protection	Solution in test tubes/bottles is not at a balance state or the rotor was not evenly loaded.	Check and make sure the solution in test tubes/bottles is at a balance state and the rotor is been evenly loaded.
	There is solution or water in buckets.	Dry the solution or water with cotton cloth.
	The absorber of the motor aged or the ring flange of	Replace the absorber with new one, or

	the motor is loose.	tightening the screw on the ring flange.
Loud noise	Spare parts is loose.	Tighten the spare parts.
	Motor is broken.	Replace the motor with a new motor, please contact manufacturer.
	Buckets or rotor was corrosion by long-term inappropriate or incorrect use.	Replace with new buckets or rotor, please contact manufacturer.
	Centrifuge is at heeling condition.	Make sure the machine is at horizontal condition.
	Worktable for place the centrifuge is not stable.	Put the centrifuge on the stable horizontal worktable.

Exclude the above mentioned errors, the machine still can’t work properly, please contact with our company or our service station for help.

Many thanks in advance for your support.

08. Maintenance notice

(1) To keep the motor do not to be wet by the condensate water or by the test solution, please

⚠Don't load too much test solution in the each test tube. For angle rotor, the solution in the tube should not exceed 75% of the nominal capacity as usual unless you can make sure the test tube / bottle can be 100% sealed.
⚠Don't open the lid for a long time while the machine is switch on (please always try to keep the lid closed when the machine is switch on), otherwise the ice in the centrifuge chamber will change into condensate water later and it may wet the motor.
⚠If the test solution was spill into the centrifuge chamber or spill on the rotor, try itwith cotton cloth immediately.
Switch off the centrifuge after use, leave the lid open and empty the tray which may have condensation water in it.

(2) Inspect the rotor regularly, stop use the rotor and keep us informed when discover any crack or corrosion spot on its rotor cross, buckets, tube racks, or sleeves.
(3) The service life of this machine is 6 years. Please properly handle it to avoid damage to the environment after it reached its service life. Please refer to the nameplate for the production date.
(4) The service life of the rotors is 6 years, or 50 000 times cumulative frequency use. The rotor was prohibited to use when any of these two service life was reach.

(5) In order to prevent the spindle being bended, please be gently when you install or

discharge the rotor from the spindle. Unscrew the nut, then taking out the rotor vertically.
(6) If the rotor equipped with lid, the lid must not be fastened tightly during storage.
(7) Do not use rigidity object impact the rotor, be careful when carry the rotor or during the install & discharge process.
(8) To protect the oxide layer of the rotor, please use cotton cloth / sponge which with neutral cleaning mixture on it to clean the rotor, then wash off the neutral cleaning mixture by using distilled water or erase the neutral cleaning mixture by using 70% ethyl alcohol, dry it after the wash.
(9) Clean the centrifuge chamber after every use. Put few grease on the spindle for protection, put some desiccant bag in the centrifuge chamber to avoid spindle corrosion as well.
(10) When you are not going to use this machine in the near future, clean the chamber, dry it. Take out the rotor from centrifugal chamber, clean it with neutral cleaning mixture, dry it with a clean cotton cloth, preventing chemical corrosion, put it in a dry and ventilated place. The center hole of rotor should have a little grease for protection.
(11) When you are not going to use this machine in the near future or are ready to maintain it, make sure you have pulled the plug from the socket. Because if you just switch off the power button but not pull the plug from the socket, the machine is still with electricity, under this circumstances, the accident may occur, especially when the machine is under maintain.
(12) When using stainless steel tube, the speed should be reduced to a maximum speed of 80% or less to ensure safe use, if Proportion of liquid is greater than 1.2, you need to recalculate the max speed according the following method:
$N= n\sqrt{1.2/S}$
(the “N” is the max speed allowed; “n” is the maximum speed of the original; S is the proportion of the centrifugation liquid).
(13) When using stainless steel tube, the speed should be reduced to a maximum speed of 80% or less to ensure safe use, if Proportion of liquid is greater than 1.2, you need to recalculate the max speed according the following method:
$N= n\sqrt{1.2/S}$
(the “N” is the max speed allowed; “n” is the maximum speed of the original; S is the proportion of the centrifugation liquid).
The centrifuge tube should be replaced regularly, strictly prohibit to use the tube which is about to burst.
(14)Polypropylene (PP) tube (bottle) can’t loading concentrated nitric acid (95%), aqua regia, toluene, benzene, gasoline, kerosene. Polycarbonate (PC) centrifuge tube (bottle) can’t come with hydrofluoric acid, hydrochloric acid (30%, 50%), sulfuric acid (10%), nitric acid nitric acid (95%), aqua regia, potassium hydroxide, magnesium hydroxide, ammonium hydroxide, aluminum fluoride, ammonium sulfide, ammonium acetate, ammonium carbonate, sodium nitrate, chromic acid (50%), toluene, benzene, gasoline, acetaldehyde, acetone, ethanol, isobutanol, ethyl ether, cresol, and others to use together. Polyethylene (PE) centrifuge tube (bottle) can not loading sulfuric acid (50%, 75%), benzene, gasoline, kerosene.

09.Transportation & storage

9.1 Transportation

Do not move the centrifuge with a rotor installed on the centrifuge spindle as drive damage may result.
When the centrifuge need a long distance transportation, wooden case should be used. The centrifuge should be cover with dust mask, and fill up with damping materials all around the machine, it is strictly prohibited of collision, rolling and dipping in the rain or snow in the process of the transportation.
Movement indoor can do directly, but also should avoid big shock, collision, convert.

9.2 Storage

When the centrifuges will not put to use for a long period, the lid should be open, store in a ventilated, dry and clean room. The storage place should not have corrosive, inflammable and explosive materials.
Due to the technology is constantly updating, if there is something different with this manual, please contact our company for help.

10.Warranty regulations

All the centrifuges of our company, the buyers get one year warranty. The warranty time will begin from the 16th day after the centrifuge were delivered. When there is any problem with the machine beyond the warranty time, we will also provide the maintain service, the users only need to pay the parts cost and the shipping cost for the parts.

Any of the following conditions is not in the free maintenance range:

• Failures which caused by incorrect installation, operation or maintenance
• Failures which caused by trying to dismantle, change the relevant components parameters
• Failures which caused by using rotors and accessories not designed for this centrifuge
• Failures which caused by force majeure, such as war, natural disaster, etc. In order to make people understand our product, and provide better service for customers, please keep the warranty card and maintenance record.

11.Appendix

Technical specifications

Max. Speed	**5 000** rpm
Max. RCF	**5 200** Xg
Max. Capacity	**4 x 750** ml
Control System	Microprocessor
Refrigeration System	**CFC-Free**
Drive System	Direct, induction motor drive (brushless)
Display	Full color touchscreen interface
Programmability	via easy access touchscreen menu
Program Storage	1 000 user-defined
Running Time	1 s - 99 h : 59 min : 59 s
Timer	Count up or down
Speed Accuracy	± 10 r/min
Accel/Decel Profiles	40/40
Temp. Control Range	-20 ℃ to 40 ℃
Temp. Accuracy	± 1 ℃
Noise Level	≤ 56 dB(A)
Power Supply	AC 200-240 V, 50/60 Hz
Max. Power Consumption	1.5 KW
Dimension (W x D x H)	68 x 60 x 42 cm
Weight w/o Rotor	106 kg

Rotors parameters

<table>
<tr><th>Rotor capacity / rotor no. displayed on the touchscreen</th><th colspan="2">Rotor No. / Rotor Description</th><th>Rotor Capacity (places x volume,ml)</th><th>Max Speed (rpm)</th><th>Max RCF (g)</th></tr>
<tr><td rowspan="3">4 x 100 ml</td><td rowspan="3">No. 1 Swing-out Rotor</td><td colspan="4">Rotor Cross (order tube racks separately)</td></tr>
<tr><td rowspan="2">Tube Racks (set of 4 for each)</td><td>4 x 50 ml</td><td rowspan="2">5 000 rpm</td><td rowspan="2">4 650 Xg</td></tr>
<tr><td>4 x 100 ml</td></tr>
<tr><td>8 x 100 ml</td><td>No. 2-1</td><td colspan="4">Rotor Cross (order tube racks separately)</td></tr>
</table>

	Swing-out Rotor	**Tube Racks** (sets of 4 for each)	8 x 50 ml	4 000 rpm	2 980 Xg
			8 x 100 ml		
			24 x 10 ml		
			24 x 15 ml		
			32 x 10 ml		
			32 x 15 ml		
	No. **2-2** Swing-Bucket Rotor	4 x 175/225 ml Falcon conical bottle		4 000 rpm	2 980 Xg
	No. **2-3** Swing-Bucket Rotor	36 x 4 -10 ml blood collection tube		4 000 rpm	3 100 Xg
	No. **2-4** Swing-Bucket Rotor	48 x 1.6 -7 ml blood collection / urine tube			
	No. **2-5** Swing-Bucket Rotor	64 x 1.6 -7 ml blood collection / urine tube			
4 x 250 ml	No. **3** Swing-Bucket Rotor	**Rotor Cross** (with a wind shield) (**order** buckets, tube racks, adapters separately)			
		250ml Round Buckets (set of 4)	4 x 250 ml [2)]	5 000 rpm	5 200 Xg
		Adapters for 250 ml Round Buckets (sets of 4 for each)	4 x 100 ml		
			4 x 50 ml		
			8 x 50 ml conical		
			8 x 50 ml round		
			8 x 30 ml		
			20 x 15 ml		
			36 x 10 ml		
			20 x 5 ml conical		
			32 x 1.5/2.0 ml		
			32 x 2.0 ml [5)]		
			40 x 0.5 ml		
			20 x 10 ml virus sampling tube		

			28 x 4 -10 ml blood collection /urine tube		
			40 x 1.6 -7 ml blood collection /urine tube		
		Tube Racks (sets of 4)	32 x 15 ml		
2 x 3 x 96 holes	No. **4** Swing-Bucket Rotor	2 x 3 pcs microplates (96 wells) or 2 x 3 pcs microtiter plates or 2 x 2 pcs cell culture plates or 2 x 1 pc deep well plates		4 000 rpm	1 970 Xg
4 x 500 ml	No. **5-1** Swing-Bucket Rotor	**Rotor Cross** (**order** buckets, adapters separately)			
		500ml Round Buckets (set of 4)	4 x 500 ml [6]	4 200 rpm	3 550 Xg
		Adapters for 500 ml Round Buckets (sets of 4 for each)	4 x 250 ml		
			4 x 100 ml		
			12 x 50 ml conical		
			12 x 50 ml round		
			12 x 30 ml		
			36 x 15 ml		
			56 x 10 ml		
			36 x 5 ml conical		
			60 x 1.5/2.0 ml		
			60 x 2.0 ml [5]		
			72 x 0.5 ml		
			36 x 10 ml virus sampling tube		
			56 x 4 -10 ml blood collection /urine tube		
			72 x 1.6 -7 ml blood collection /urine tube		
			4 x 175/225 ml Falcon conical bottle		

		Rectangular Buckets (set of 4)			
		Adapters for Rectangular Buckets (sets of 4 for each)	20 x 50 ml conical		
			20 x 50 ml round		
			20 x 30 ml		
			40 x 15 ml		
			40 x 5 ml conical		
			100 x 1.5/2.0 ml		
			100 x 2.0 ml [5]		
			48 x 10 ml virus sampling tube		
			80 x 4 -10 ml blood collection /urine tube		
			112 x 1.6 -7 ml blood collection /urine tube		
		Round Buckets (sets of 4)	148 x 5 ml Radio-immunity tube		
		Round Buckets (sets of 4)	96 x 1.6 -7ml blood collection tube		
		Plate Buckets (set of 4)	4 x 3 pcs microplates (96 wells) or 4 x 3 pcs microtiter plates or 4 x 2 pcs cell culture plates or 4 x 1 pc deep well plates		
4 x 500 ml	No. **5-2** Swing-Bucket Rotor	4 x 250 ml Corning conical bottle or 4 x 200 ml Nunc™ bottle		4 000 rpm	3 550 Xg
4 x 750 ml	No. **6-1** Swing-Bucket Rotor	4 x 750 ml (Can spin 4 x 400 - 450 ml single, double, triple blood bag system without filter)		4 000 rpm	3 500 Xg
		Adapters	4 x 500 ml		

		for 4 x 750 ml Rotor (sets of 4 for each)	4 x 250 ml		
			12 x 100 ml		
			20 x 50 ml conical		
			20 x 50 ml round		
			20 x 30 ml		
			56 x 15 ml		
			72 x 10 ml		
			56 x 5 ml conical		
			88 x 1.5/2.0 ml		
			88 x 2.0 ml [5)]		
			96 x 0.5 ml		
			72 x 4 -10 ml blood collection /urine tube		
			96 x 1.6 -7ml blood collection /urine tube		
			148 x 5 ml Radio-immunity tube		
			4 x 175/225 ml Falcon conical bottle		
			4 x 30/50 ml Falcon® Cell Culture Flasks or 4 x 30/50 ml Corning Cell Culture Flasks		
			4 x 40 ml Nunc® Cell Culture Flasks		
			4 x 160 ml Nunc® Cell Culture Flasks		
			4 x 200 ml Falcon® Cell Culture Flasks or 4 x 200 ml Greiner Cell Culture Flasks or 4 x 200 ml		

<table>
<tr><td rowspan="2"></td><td></td><td colspan="2">Nunc® Cell Culture Flasks</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>No. 6-2 Swing-Bucket Rotor</td><td colspan="2">4 x 500 ml Corning conical bottle</td></tr>
<tr><td rowspan="15">6 x 250 ml</td><td rowspan="15">No. 7 Swing-Bucket Rotor</td><td colspan="2">6 x 250 ml</td><td rowspan="15">4 000 rpm</td><td rowspan="15">3 580 Xg</td></tr>
<tr><td rowspan="14">Adapters for 6 x 250 ml Rotor (sets of 6 for each)</td><td>6 x 100 ml</td></tr>
<tr><td>6 x 50 ml</td></tr>
<tr><td>12 x 50 ml conical</td></tr>
<tr><td>12 x 50 ml round</td></tr>
<tr><td>12 x 30 ml</td></tr>
<tr><td>30 x 15 ml</td></tr>
<tr><td>54 x 10 ml</td></tr>
<tr><td>30 x 5 ml conical</td></tr>
<tr><td>48 x 1.5/2.0 ml</td></tr>
<tr><td>48 x 2.0 ml [5)]</td></tr>
<tr><td>60 x 0.5 ml</td></tr>
<tr><td>30 x 10 ml virus sampling tube</td></tr>
<tr><td>42 x 4 -10 ml blood collection /urine tube</td></tr>
<tr><td>60 x 1.6 -7 ml blood collection /urine tube</td></tr>
<tr><td colspan="6">Notes: All footnotes in the rotor specifications, tube size information and more adapters information can be found on the latest brochure.</td></tr>
</table>

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