Laboratory Equipment Manufacturer
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Operation Manual for
LARGE-SIZED REFRIGERATED CENTRIFUGE

LGCENR-401

PLEASE READ THIS MANUAL CAREFULLY BEFORE OPERATION

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（I） SPECIFICATION

Speed (rpm)	500 ~ 6,000 LCD digital display
Centrifugal Force	4,840 x g
Max. Capacity	1000 ml
Temperature Range	0 ℃ ~ 40 ℃
Electronic	Microprocessor control system
	10 memory programs available
Safety Device	Imbalance and cut off power system
	Protective device for preventing motor over heat
	Triple balance system
	Automatic lid-interlock; Automatic power-off for lid lifting
	Fuse
Timer	99 min : 59 sec (Digital time-setting device)
Weight (kg)	75
Dimension (cm)	80 x 60 x 38
Power	AC220V, 50 / 60Hz

（II） ROTOR AND ACCESSORY

1. Centrifugal force calculation: Use its speed and radius to calculate force as following formula.
   RCF=$(rpm)^2$ x 0.00001118 x R
   R: radius (cm)
   RCF: Relative Centrifugal Force (x g)

2. Cautions for using the rotor:
   The rotor is made of steel or aluminum with high density coating and highly resistant to corrosion, but not fit to alkaline and strong acid substance. Furthermore, don't heat the rotor to a high temperature for a cleaning or sterilizing purpose, or the quality of the rotor would be getting inferior.
   ※ Please don't use the rotor any more when it is with any splits, deforming, or other strange conditions.
   ※ Suggestion: Under the normal use situation, the usable life of the rotor is suggested to be not over 5 years.

3. Rotor specifications :

Rotor	Type	Capacity (ml x pcs)	Max. speed (rpm)	Max. RCF (x g)	Tube size (⦸ x L) mm	
					Max. tube size (mm)	Min. tube size (mm)
RS-250		1.5 x 96	3,500	2,360	10.7 x 100	8 x 41
		6 x 112			12 x 110	8.5 x 60
		10 x 80			15.8 x 100	12 x 60
		15 x 40TC			16.5 x 122	14 x 60
		15 x 48			17.2 x 122	14.5 x 60
		50 x 16TC			29.5 x 125	27.5 x 50
		250 x 4			62 x 130	58 x 70
RS-100		6 x 56	3,500	2,160	13 x 105	10 x 50
		10 x 48	3,500	2,160	16 x 107	13 x 50
		15 x 16TC	3,500	2,290	16.7 x 135	13.5 x 86
		15 x 32	3,500	2,110	17.5 x 112	14 x 85
		50 x 4	4,000	2,880	35 x 135	32 x 90
		50 x 4TC	5,000	4,640	29.5 x 137	26.5 x 90
		50 x 8	3,500	2,210	35 x 120	32 x 90
		50 x 8TC	3,500	2,280	29.5 x 127	26.5 x 90
		100 x 4	4,000	2,970	45.5 x 130	42 x 95

** Tubes are not included.**

When users operate the centrifuge, please refer to the max. speed limit from sorts of different rotors or carriers.

Rotor	Type	Capacity (ml x pcs)	Max. speed (rpm)	Max. RCF (x g)	Tube size (⦸ x L) mm	
					Max. tube size (mm)	Max. tube size (mm)
RS-50		15 x 16	4,500	3,270	17.5 x 112	14 x 85
		50 x 4	4,000	2,490	35 x 117	32 x 90
		50 x 4TC	5,500	4,840	29.5 x 120	26.5 x 90
		100 x 4	5,000	4,030	45 x 112	42 x 95
RS-1548		15 x 48	3,500	2,280	17.5 x 112	14 x 85
RS-2504		250 x 4	3,500	2,320	65.5 x 130	61 x 90
RS-9602		96micro x 4	2,500	1,180	129 x 86	126 x 83
RA-5008		50 x 8	6,000	4,270	29.5 x 118	27.5 x 90
RA-1512H		15 x 12	6,000	4,270	16.7 x 130	13.5 x 86

** Tubes are not included.**

When users operate the centrifuge, please refer to the max. speed limit from sorts of different rotors or carriers.

（III） INSTALLATION

1. When you take out centrifuge from carton, please check if there is any scratch, press trace or damage. If yes, please contact the local dealer immediately.

2. Please install the centrifuge on a horizontal and stable table or bench. If not, the machine will be affected its anti-vibration efficiency.

3. Please use power voltage as following range. For avoiding electric shock, please make sure to connect ground wire to the ground terminal.

Power voltage	Acceptable voltage range
AC220V	200V ~ 230V

4. Please keep the front and back exhausts of the compressor be free.
   Any disturbing will affect the efficiency.

5. Keep it away from dusty and moist working place.

6. Avoid the same power source with the large electric consumption machine at the same time.

7. After dismantling or cleaning the rotor, please screw it tightly.

8. After moving this refrigerated centrifuge, please wait 30 ~ 60 minutes to start using it.

（IV） OPERATION

1. Setting of Carriers

(1) Carrier is composed of turning ring and bucket. Four carriers should be same type and put onto rotor at one time. Different type of carriers or to use separate bucket and carrier are prohibited.

(2) Adapter is kind of accessory and available for the situation that it can prevent tubes breaking from rotation when the tube's diameter is much smaller than the carrier's.

.**Caution:**

a. Adapter should be placed into carrier properly, if it is slanted, then tube is difficult to take out from carrier. If glass tube is broken or if rotor elapsed over one year, then rotor needs to be renewed. Damaged rotor or rotor containing broken glass will cause glass tube broken easily.

b. Carrier should be placed onto rotor properly, if not, it will be imbalance and destroy centrifuge, meanwhile to check if carriers swing normally by hand first.

c. Stainless steel tube carrier can be used for acidity and alkalinity tube samples. (Please purchase separately.)

Adapter		
		
50cc→15cc	15cc→6cc	Stainless steel adapter

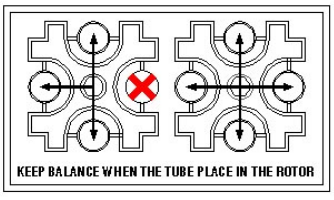
2. Proper Setting of Tube & Sample

(1) Tubes and samples in use must be arranged in even number. Glass tubes must be placed in the carriers, which are positioned symmetrically toward rotor center. If tubes are in odd number, then put same volume of water in a separate tube and place such tubes into carrier for dummy purpose.

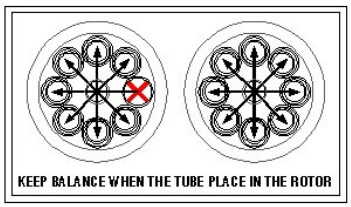
(2) Tube strength should consider if it could bear speed and centrifugal force or not. If not, the tube will be easy broken.

(3) Please note tube length, if it is too long then the top of tube will hit the rotor and break.

Swing rotor



Angle rotor



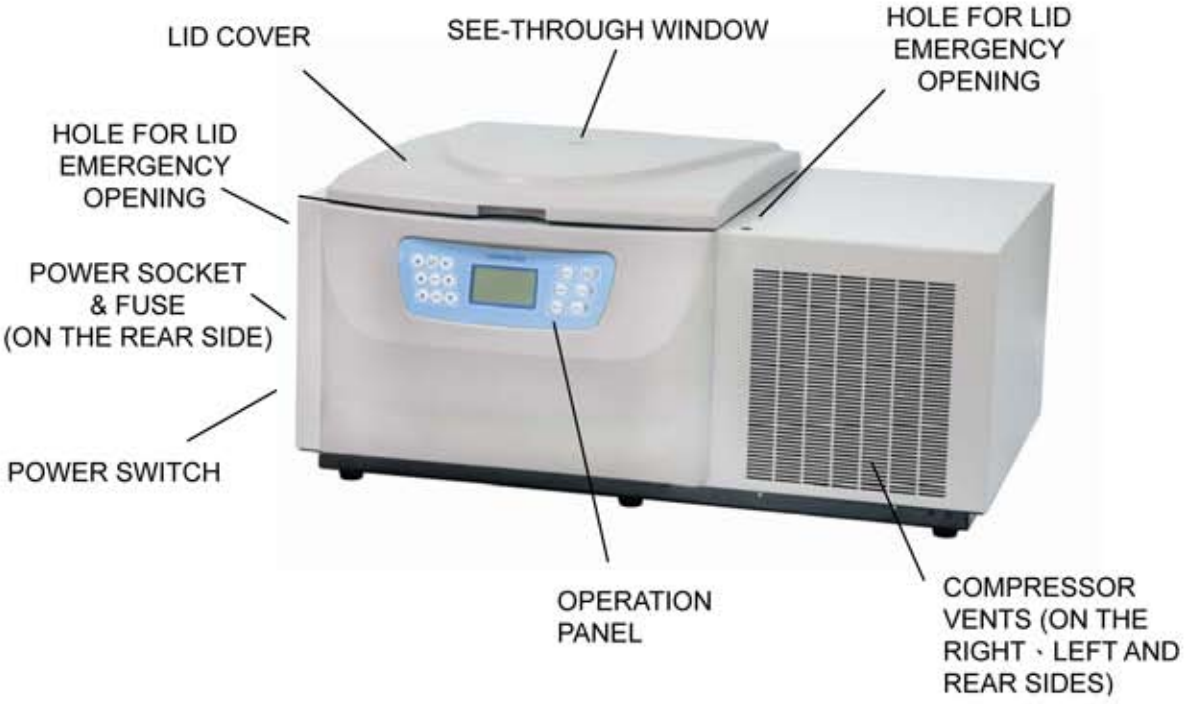
3. Lid and interlock: The lid is with one automatic safety interlock.

(1) The machine cannot start running if its lid isn't closed tightly, and its lid cannot be opened while running.

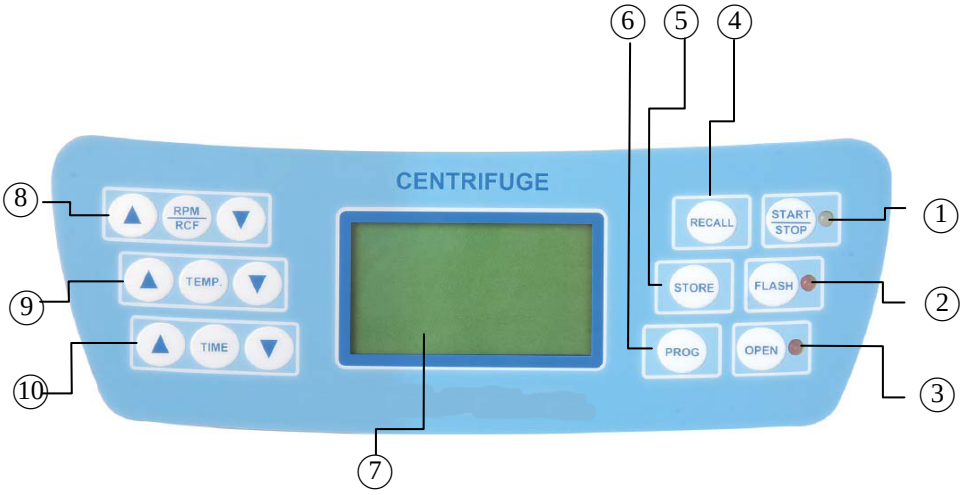
(2) Switch on the machine, and then press "OPEN" button to open the lid. Otherwise, the lid cannot be opened.

(3) There's one small hole on both right and left side of each machine for emergency lid-opening under a power failure.

4. Outline :



5. The operation panel



① START/STOP : Switch on the main power, the key controls the start and also the stop.

② FLASH : For getting a short time rotation. Press the key and the motor starts rotating immediately. Release the key, the motor stops rotating.

③ OPEN : Press the key to open the lid, and please note that the key only functions when the rotor is stopped absolutely.

④ RECALL : For recalling the set speed 、rcf and time.
Step 1 - Press RECALL key.
Step 2 - Press PROG key after seeing " P" flash.
Step 3 - Select the program.
Step 4 – Again press RECALL key to confirm and end the function.

⑤ STORE : For setting the speed (rpm), (rcf) and timer into the memory :
Step 1 - Set the speed and timer and push STORE key.
Step 2 - Press PROG key after seeing " P" flash.
Step 3 – Select the group no. (no. 0~9)
Step 4 –Again press STORE key to confirm and end the function.

⑥ PROG : For choosing from the pre-set program group (no. 0~9).

⑦ LCD displayer: Displays the speed (rpm), rcf、temperature、timer , and the pre-set program no.

⑧ RPM setting & RCF setting : Press RPM key, and then press ▲▼to set the speed. Press again RPM key to confirm. Press RCF key, and then press ▲▼ to set the rcf. Press again RCF key to confirm.

⑨ TEMP setting : Press TEMP key (LCD shows now the last record), and press again TEMP key to get a flash figure in front of ℃ , then use ▲▼ to adjust the temperature. Finally, Press again TEMP key to confirm.

⑩ Timer setting : Press TIME key to start flashing. And press ▲▼key to set min and sec. Again press TIME key to confirm.

6. Operation steps:

1) Make sure the power is correct for the machine before starting to use. Plug in and turn on the witch. (The switch is on the front right of the machine body.)

2) Set SPEED、RCF and TIMER if necessary , even you may recall the memory program from pre set ones. Then push START/STOP key to start running the centrifuge. START/STOP should show in red during the machine running.

3) The temperature setting range is 0℃~40℃. Press TEMP key two times to do the temperature setting.

4) LCD DISPLAY shows with “error” if unbalance and causes the machine to be an auto stop. Wait till the rotor stop, then press OPEN key to open the lid. Check again to see if the rotor is with any unbalance.

5) When the set time runs out, the auto buzzer sounds up at the same time, and the rotor is getting to stop completely. LCD display starts flashing.

6) OPEN key is no function while the rotor is running, this is necessary and for safety reason. It works only when the rotor is stopped completely.

7) OPEN key lights in red when the lid is open. START/STOP key lights in green, which is no function when the door is opened.

8) You may change the speed and the timer during the rotation, but doing the time-setting change will cause the timer to restart.

9) The microcomputer device carries on the safety detecting in speed、timer display and error message display.

10) There’s a small hole on each of 2 sides of the machine for an emergency lid opening purpose.

11) It’s available for 10 memory program groups of the parameter pre-setting.

12) The parameters won’t be deleted for the power-off/on.

13) Concerning with the speed setting, kindly reference with the max speed from sort of rotors.

Please note : Not only the centrifuge but also each optional rotor should be kept in the available ranges. Any overtaking in speed setting or overloading in carrier capacity may damage the motor or cause an accident. The machine is not suitable for flammable items.

（V） MAINTAIN

1. Checking before/after using the centrifuge:

   1) Check the rotor, adapter and inner tank and keep them clean and dry.

   2) Check if the fixing screw is loose. It should keep the screw tight all the time.

   3) Check if the carriers are well to swing. If not, clean up the carriers before using.

   4) Check if the carriers could be hung. If not, please don't use them and contact with the local dealer.

   5) Check if the lid is closed tightly or screws are loose. Any one abnormal situation should be corrected before using or contact with the local dealer.

   6) Check if the both power wire and ground wire are with the correct connection.

   7) Check if the lights and power witch are operated normally.

   8) It's important to keep the exhaust of the compressor free or possible to affect the machine's heat-discharge.

2. Daily routing checking content:
   Clean up the inside of the machine and check if the carriers are with any splits, deformation, or other.

3. Yearly routing checking content:
   Check if the fixing screw of the rotor is loose and improve it.
   If displaying speed and true speed are different, please contact with the local dealer for the problem.

4. Cleaning
   If the rotor and carriers were stained by the sample, please clean up with just little detergent and wipe with the dry cloth. Then sterilize the rotor and carriers but they are not suitable to the temper. over 100℃.

5. Possible situations and reasons

Reason / Situation	Power source	Power board	Lid	Motor	Imbalance
LCD abnormal	*	*			
Fuse burned often	*	*		*	
Motor can not run	*	*	*	*	*
Cannot reach the set speed	*	*		*	
Serious vibration			*		*
Unusual noise			*	*	*
Compressor cannot start	*	*			

Reason	***Situation***	***Solution***
Power problem	1) No power connection, fuse burn out 2) Wrong voltage	1) Make sure the connection between the plug and socket. 2) Check the voltage.
Lid problem	Lid cannot be opened/closed.	Contact with the distributor or our company. (Check the lid's interior bolt pin.)
PC board problem	Breakdown/bad connection of some part	Contact with the distributor or our company.
Motor problem	Motor cannot run normally.	Contact with the distributor or our company.
Imbalance	Improper setting of rotor/tubes	Refer to **IV. OPERATION**
Compressor problem	1. No power connection. Fuse is burned out. 2. Incorrect voltage 3. Parts problem Bad connection	1. Make sure the wire with a well plug-in into the socket. Change the fuse. 2. Check the voltage. 3. Contact with the distributor or our company.

（VI） ERROR INFORMATION

Display	Status	Reason/Explanation	Solution
E r r – 1	1. Motor can not run during working	1. Wire route setting fault 2. Control system fault	1. Check on the wire route setting 2. Change the control system
	2. Speed error	1. Hall IC(speed sensor) fault 2. Wire route setting fault 3. Control system fault	1. Change the new sensor 2. Check on the wire route setting. 3. Change the control system
E r r – 3	1. Door open during the rotation	1. Lid switch fault	1. Check on the lid switch, or change a new one. 2. Check on the wire route setting.
E r r – 4	1. No timer setting	1. None setting on the timer	1. Check on the timer or re-set the timer.
E r r – 5	1. Imbalance	1. Imbalance with tube or carrier loading 2. Imbalance sensor fault	1. Check on the carriers carefully even the tubes are balanced. 2. Check on the imbalance sensor switch or change the new one. 3. Check on the wire route setting.
E r r –7	1. Brushless motor controller raised the alarm	1. Starting on the protection function of the drive	1. Push【OPEN】key to release it

（VII） PARTS LIST

ITEMS	Q'TY
MOTOR	1
LCD	1
KEY BOARD	2
MOTOR CONTROLL	1
RELAY	2
POWER SWITCH	1
LID SOLENOID VALVE	2
FUSE	2
METAL POWER SOCKET	1
DOOR LOCK SWITCH	1
MAIN BOARD	1
IMBALANCE DEVICE	1
TEMPERATURE SENSOR	1
COMPRESSOR SET	1
Surge Absorber	1

（**VIII**） CIRCUIT DIAGRAM