FISON

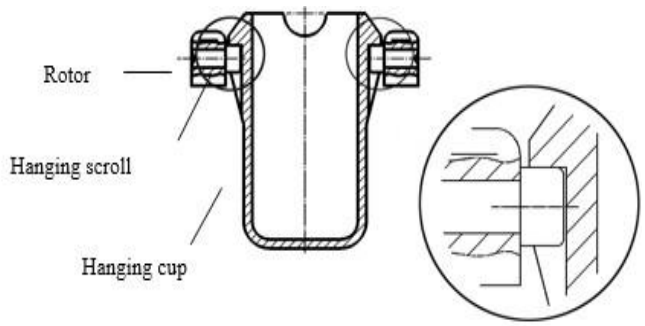
High Speed Refrigerated Centrifuge

FM-HRC-A101

Index

1. Safety Measures

1. Do not centrifuge the chemical flammable, or explosive, with a violent chemical reaction and caustic, otherwise will corrode the chamber, rotor parts, and other accessories, seriously damage the machine, and endanger personal safety.
2. When the Centrifuge is working, its working voltage shall be ensured within the specified range. If the machine cannot work normally, please check the power voltage first.
3. To ensure the safety of the Centrifuge and the operator, the set value of the speed shall not exceed the maximum speed when the instrument is running.
4. After the machine is powered off, please wait for enough time (more than 3min) before turning on the power again.
5. The centrifugal sample must be balanced before loading. The quality deviation of each centrifugal sample shall not be greater than 5g, and it shall be put into the sample socket symmetrically. Otherwise, the centrifugal machine will generate vibration and may damage the machine.
6. After the Centrifuge sample balanced placement, both hands should be forced to close the door cover and confirm whether the door cover is closed. If the door cover is not closed, the instrument will not start normally. Currently, open the door cover and close it again.
7. To avoid accidents, the lifting cup must be placed as shown in the figure below:



8. "⏚" is for protective earth marking. Power switch "0" as off， "1" as on.

Safety Precautions

1.1 Before Operation

1. Before using the machine, please check the rotor and the centrifugal tube for cracks. for serious corrosion phenomenon, should be immediately replaced.
2. Keep the inside of the centrifuge chamber clean, prevent water accumulation, and prevent the invasion of granular debris.
3. Should use the factory-supplied special rotor and the system must be operated when the machine is powered off.
4. In transportation, the rotor must be removed from the inner drum for separate packing.

5. The power supply must be the same as the input voltage of the centrifuge 220V 50Hz, it is also guaranteed that the power input terminal has a separate special socket for protecting the grounding line.
6. The centrifuge can only be used for specific experiments, and it is strictly prohibited to centrifuge inflammable, explosive, violent chemical reactions, and corrosive chemicals, otherwise it will corrode the parts such as the cavity and rotor, which will cause machine damage and endanger personal safety.
7. After balancing the centrifugal sample, both hands should be forced to close the door cover of the centrifuge.

1.2 In Operation

1. When the "centrifugal" indicator lights on, it means that the centrifugal work has started. Do not Force you to open the door.
2. In the process of machine acceleration or deceleration, instant vibration is normal. Please do not turn off the power switch of the main engine or the "stop" key on the operation panel.
3. During the operation of the centrifuge, if there is continuous vibration, please press the "stop" button to shut off the power. After the motor stops (about 3min), open the cover of the centrifuge, then check and rule out the cause of vibration.
4. In case of an imbalance (over-amplitude vibration), the centrifuge will automatically stop the centrifugation and give a rapid alarm sound (only for designated models). After 1min ~ 2min, please turn off the power and open the door to check the reason.
5. After the parameter setting is completed, press the "confirm" button for confirmation (only applicable for certain types with the "confirm" key on the operation panel, and type without the "confirm" key on the operation panel, and the system will confirm automatically after each parameter setting)
6. Do not flap or move the centrifuge during operation.
7. Do not open the door immediately if the power is off or the power switch of the host is forced to shut down. The door can only be opened after the motor stops (about 5min ~ 10min).
8. Please press the "stop" button on the operation panel, and then power it off. Wait for 2min ~ 3min before re-operation.
9. The speed setting shall not exceed the maximum speed of the centrifuge to ensure the safe operation of the instrument.

1.3 After Operation

1. After the centrifugation process, the centrifuge will wait for the user to open the door for sampling. When opening the door, press the door button on the outside of the centrifuge. and gently pull the door cover-up. If the door does not open for continued centrifugation, the centrifuge will not respond.
2. After use, the centrifuge should be protected, especially the rotor, hanging cup, basket, etc., to prevent corrosion caused by tarnish of acid and alkali liquid. The rotating head and centrifuge cavity can be wiped with a soft cloth with a neutral cleaning liquid.
3. After the use, please turn off the power and keep the door cover open to dry the air in the chamber.

4. The centrifugal chamber should be kept clean after use, if there is debris can be gently wiped with a dry cloth.
5. Please Check and clean the rotor and sample jack regularly to prevent contamination or corrosion of the residue after centrifugation. If the rotor, hanging cup, and basket are corroded or damaged, please contact the manufacturer and replace the original parts.

1.4 Conditions for Operations

1. To ensure the stable and reliable operation and normal function of the centrifuge, the following conditions shall be ensured.
2. Ambient temperature: 10℃～30℃
3. Relative humidity: ≤80%
4. Power: AC220V 50Hz
5. Atmospheric pressure: 86.0kPa～106.0kPa
6. The operating environment should be well-ventilated to ensure that dust, floccule, metal debris, and other debris do not invade the machine.
7. Ensure conductive dust, explosive gas, and corrosive gas not in the surrounding environment.
8. Place on a stable horizontal working platform/ground to prevent vibration during operation.
9. Conditions of storage and transport
10. A fully packaged centrifuge shall be stored in a room with relative humidity of less than 80%, and free of corrosive gases and good ventilation.
11. When the centrifuge is packed, it shall be transported according to the requirements of the order contract. During transportation, it shall be protected from severe shock, rain, and sun exposure.

2. Introduction

High Speed Refrigerated Centrifuge FM-HRC-A101 is a microcomputer controlled system with 23000 rpm maximum speed and 33097 × g maximum centrifugal force. Features angle rotors with ml maximum capacity. Equipped with brushless frequency motor offers smooth working of the unit. The digital LCD display offers convenient reading of test data, stores various parameter data information. Acceleration and deceleration of 9 kinds and 10 options for self-defined work mode selection.

3. Features

- ✓ Microcomputer control with LCD display
- ✓ High efficiency refrigeration compressor
- ✓ AC frequency conversion motor drive
- ✓ Maximum spin speed 23000 rpm with 33097 × g RCF
- ✓ Automatic balancing without need of trimming
- ✓ Acceleration and deceleration of 9 kinds
- ✓ Work mode selection with 10 options
- ✓ Mutual setting of rotating speed / centrifugal force and double synchronous display screen
- ✓ Automatic identification of rotor
- ✓ Stainless steel centrifugation chamber
- ✓ Parameter changes are adjustable at any time without disturbing the centrifugation process
- ✓ Equipped with air exhaust temperature system
- ✓ Electric safety door locks for protection

4. Specifications

Model No.	FM-HRC-A101
Maximum speed	23000 rpm
Maximum RCF	33097 × g
Maximum capacity	6 × 250 ml
Speed accuracy	± 100 rpm
Temperature range	-20°C to 40°C
Temperature accuracy	± 2°C
Time range	1 min to 99 h 99 m 99 s
Construction	Stainless steel centrifuge chamber
Noise	≤ 55 dB
Power	1600 W
Power supply	AC 220 V 50 Hz
Dimension (L × W × H)	690 × 630 × 520 mm
Net weight	110 kg

Optional Rotor Selection

Rotor Name	Max. Speed (rpm)	Max. Capacity (ml)	Max RCF (g)
Angel rotor 1	23000	24 × 0.2 ml	30375 × g
Angel rotor 2	23000	12 × 0.5 ml	32458 × g
Angel rotor 3	21000	24 × 0.5 ml	26614 × g
Angel rotor 4	21500	12 × 1.5 / 2.2 ml	33097 × g
Angel rotor 5	16000	24×1.5 / 2.2 ml	22810 × g
Angel rotor 6	16000	12 × 5 ml	17459 × g
Angel rotor 7	15000	12 × 7 ml	18743 × g
Angel rotor 8	12000	8 × 15 ml	14170 × g
Angel rotor 9	15000	12 × 10 ml	20880 × g
Angel rotor 10	12000	6 × 50 ml	16099 × g
Angel rotor 11	12000	6 × 100 ml	14645 × g
Angel rotor 12	8000	6 × 250 ml	9159 × g
Angel rotor 13	16000	36 × 1.5 / 2.2 ml	20376 × g
Angel rotor 14	18000	8 × 4 × 0.2 ml (PCR special rotor）	22097 × g
Angel rotor 15	16000	48 × 0.5 ml	31482 × g
Swing-out rotor	5000	4 × 100ml（Round hanging cup） 8 × 50 ml adapter 12 × 15 ml adapter 16 × 10 ml / Vacuum blood tube adapter	4137 × g
ELISA Plate rotor 1	4000	96 holes × 2	1651 × g
ELISA Plate rotor 2	4000	96 holes × 4	2263 × g

5. Applications

Used for cell separation at blood banks, precipitation purposes, sample processingin clinical protocols, cell culture applications, microplate processing and separation procedures in biochemistry, food safety and medical diagnosis.

6. Instrument Structure

6.1 Structural schematic diagram

The centrifuge is mainly composed of the control system, centrifugal chamber, driving system, rotor safety protection device, etc. Its structure diagram is as follows:

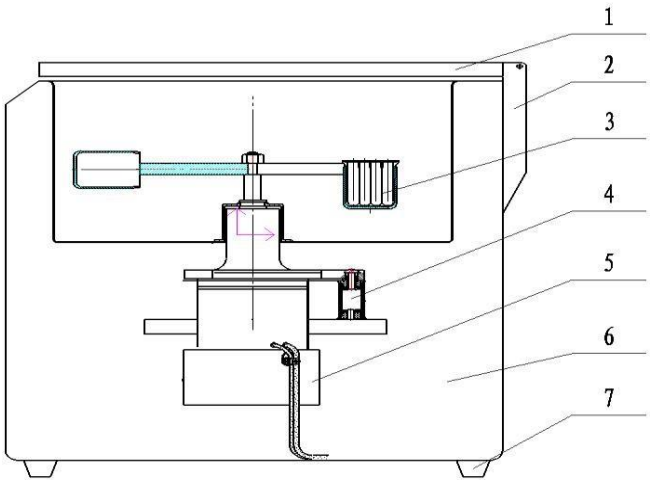
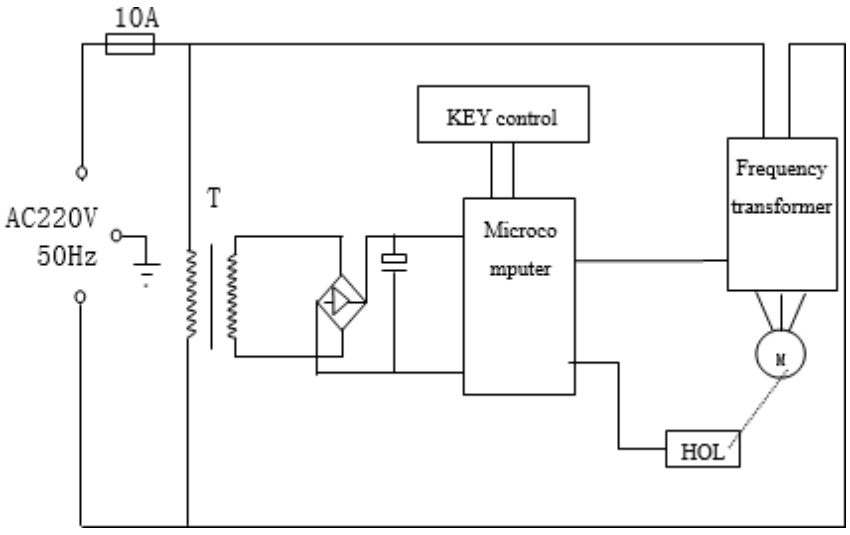


FIG 1

1. Door cover assembly 2. Hinge assembly 3. Rotor system
4. Shock absorption system 5. Motor system 6. Main case 7. Foot

6.2 The system chart



7. Installation

7.1 Installation Condition Requirement

1. To ensure the stable and reliable operation and normal function of the centrifuge, the following conditions shall be ensured
2. Ambient temperature: 10℃～30℃
3. Relative humidity: ≤80%
4. Power: AC220V 50Hz
5. Atmospheric pressure: 86.0kPa～106.0kPa

1. The operating environment should be well-ventilated to ensure that dust, floccule, metal debris, and other debris do not invade the machine.

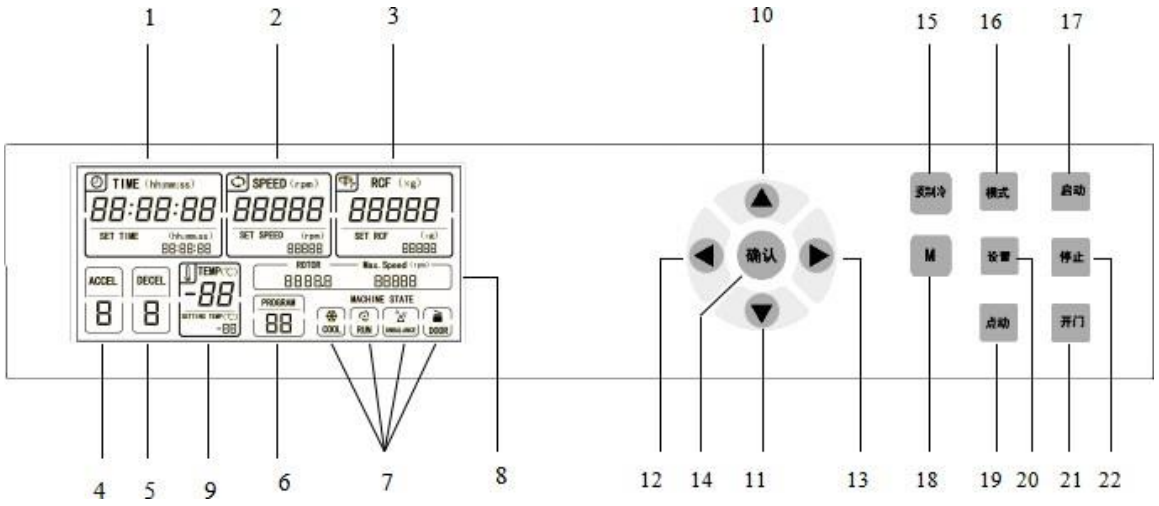
7.2 Rotor installation

1. When the machine is powered on, press the door button of the centrifuge, and gently pull the door cover to make the door cover bounce.
2. With the hand rotating the shaft, should be light and flexible, confirm no abnormal phenomenon before fixing the rotor.

Note: The test tube should be placed in the rotating head symmetrically. If the number of centrifugal tubes is not even, the empty test tube can be filled with water after leveling-. Otherwise, centrifugal machine vibration, and may damage the machine.

7.3 Operational instruction of control system

The control panel is shown below：



Functions Keyboards reference:

No	Item	Functions
1	Time	Setting the required time （H：M：S）
2	Speed	Setting the required speed
3	RCF	Setting the required RCF
4	Speed up	Set and display centrifugal speed up range
5	Speed down	Set and display centrifugal speed reduction range
6	Mode	Invoke and display modes
7	Instrument status	Instrument refrigeration, operation, imbalance, door statereal-time monitoring and display the current state.
8	Rotor parameter	Display current rotor number and maximum speed.
9	Temperature window	Set and display the current temperature.
10	Add	Add Nos 0～9
11	Reduce	Reduce Nos 0～9
12	The left key	Sets the window to move to the left
13	The right key	Sets the window to move to the right
14	Enter	Confirm after parameter setting
15	Pre-Cooling	Press this button to display "OF" or "ON", select "OF" to indicate pre-cooling closing, and "ON" to indicate pre-cooling opening
16	Mode	When the machine is not running, press the mode key toenter the mode setting
17	Start	Press the start button to start the machine
18	M	Reserve Keyboard
19	Jog	Press the key to centrifugal quickly

20	Set	Enter parameter setting
21	Stop	Press the stop button to stop the machine
22	Door open	Press the door button to open the door when the machinestops

8. Operations

8.1 Principle of Operation

During centrifugal operation, the centrifugal container (such as centrifugal bottle, centrifugal test tube, etc.) containing the same amount of test liquid will be placed symmetrically in the centrifugal hole around the rotor. The relative centrifugal force (RCF) depends on the rotation radius **r** and rotation speed **n** of the sample during centrifugation. The formula is as follows:

$$RCF=1.118\times10^{-5}\times n^2\times r\ (\times g) \quad \text{.....} \quad (1)$$

n——means Speed（r/min）
r——rotation radius（cm）
g——Acceleration of gravity（9.8N/KG）

The time required for particle separation and precipitation in the mixture T:

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

ρ——Mixture density（g/cm^3）

μ——Combined viscosity（P）

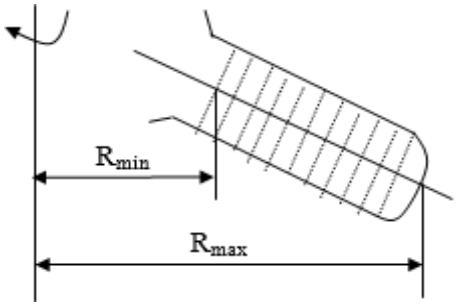
n ——Speed（r/ min）

r ——Particle radius（cm）

σ——Particle density（g/cm^3）

R_{max}——The horizontal distance from the bottom of the centrifugal test solution to the axis（cm）

R_{min}——The horizontal distance from the bottom of the centrifugal test solution to the axis（cm）



8.2 Operating instructions

Turn on the power switch, the centrifuge shows the manufacturer's set value. If you want to reset the centrifugal "parameters" or "mode", you can operate as follows:

8.2.1 Parameter setting

Press the "Set" key and the hour digit of the time window flashes, Wait for the user to set parameters, Press ▲▼"key, and the value inside the scintillation window is flipped, When the value is flipped to the value set by the user, The user presses the key ▶◀ to move to the next window, and the value of the next window flashes and waits for the user to set. The setting method is the same as the hour operation. The rotor and centrifugal force are converted to each other in the process of setting the rotation speed. The centrifugal force also changes when setting the rotor, and the rotor also changes with the centrifugal force when setting the centrifugal force. In the process of operation, if you find that the set parameters need to be modified, you can press the ▶ ▶ key, move to the window that needs to be modified, and then press ◀ ▶ to modify. After setting all parameters, press the "Enter" key to confirm setting parameters. During the operation of the centrifuge, the centrifuge parameters can be modified at any time. To modify the parameters, press "Set" first. The program will remember the last modified window and flash the value., press the ◀ ▶ key to switch the window, move to the parameter window to be modified, press ▲▼ modify, and then press the "Enter" key.

8.2.2 Model programming

Each rotor in the centrifuge contains 10 programmable program modes and 10 acceleration and deceleration gears. In each program mode, different timing time, rotation speed, centrifugal force, acceleration gear and deceleration gear can be stored, so that users can program different modes according to their needs for future use.

If you want to change the mode, press "Mode" key, and the mode window begins to blink. Currently, the program mode is displayed as the current program mode. Press the key to modify the mode until you need the mode. Press the "Enter" key to confirm, which brings up the mode you need.

If you want to set the content set in the program mode, press "Mode" key once, the mode window flashes, press the ▲ ▼ key, bring up the mode numb◀ ▶ press the key, switch the setting parameter window, use ▲ ▼ to set the parameter value, press "Enter "key to confirm and store to the machine after setting. In "mode" set or modify the parameters in the mode, a set and modify, can be repeated many times.

Note:

(1) Each program mode of acceleration and deceleration includes 10 files, of which 0 fileis the fastest file, and the ninth file is the slowest file.

(2) If the user USES a certain rotation head for the first time, the centrifuge software willdefault to the first program mode; If the user USES the program mode for the first time, the speed up and speed down gear all default to the 5th gear.

(3) If the radius of the head is too large, acceleration and deceleration will be limited.

(4) In the process of modification if for a long time, you do not press the "ok" key to

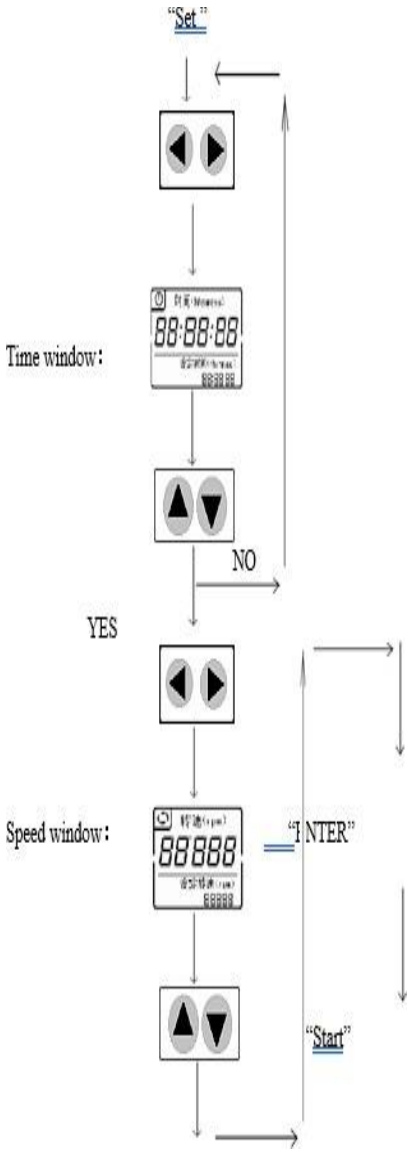
confirm, the software will automatically confirm, that is, delay confirmation.

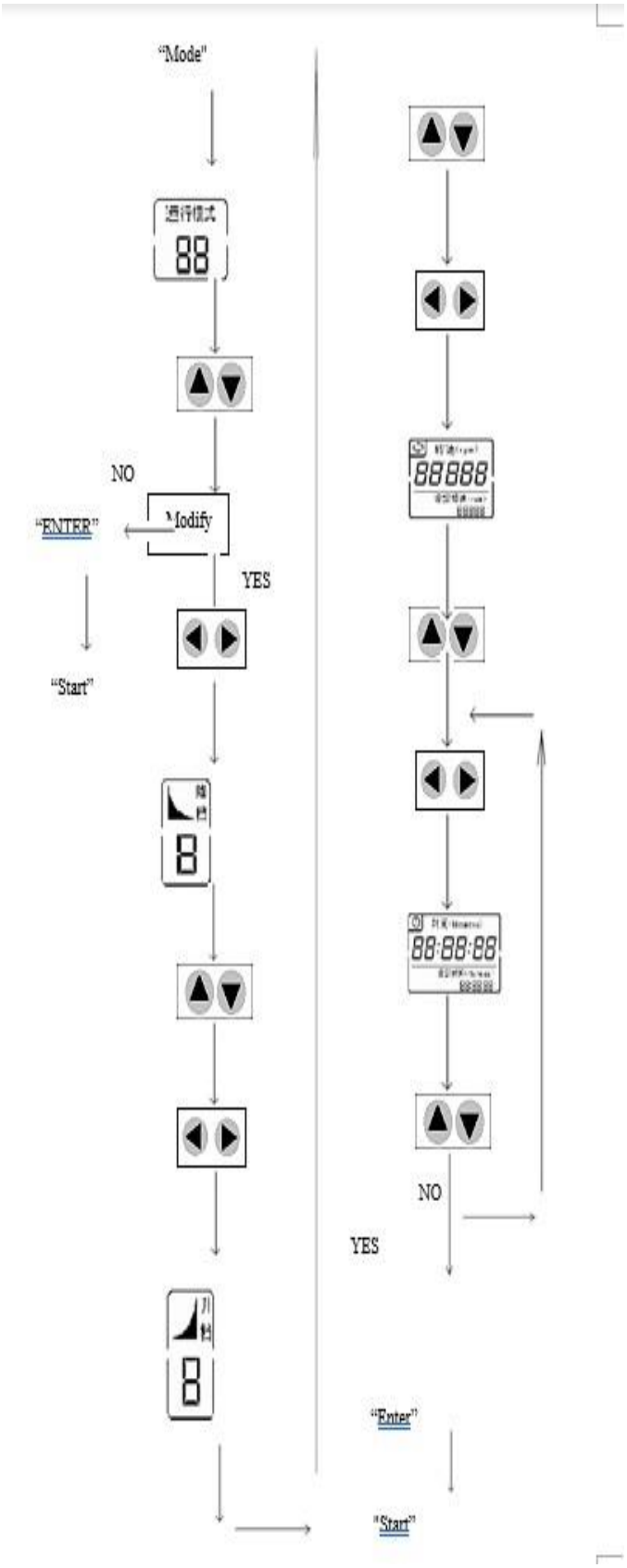
(5) program modes, independent, no priority, each mode can be set by the user according to needs.

(6) Only in the "mode" Settings to store centrifugal parameters. In "mode" set or modifythe parameters in the mode, a set and modify, can be repeated many times.

8.2.3 Use Flow

Example1: Parameter setting




"Mode"
NO
"ENTER"
Modify
YES
"Start"
NO
YES
"Enter"
"Start"

8.2.4 The centrifuge provides a short-term centrifugal function. Hold down the "point-motion " key and the centrifuge will start to operate at the set speed. If the "point-motion " key is released, the centrifuge will start to slow down and stop running.

8.2.5 Door open

When the machine is in the state of power on and in the state of stop, press the "Door open" function key to open the door cover.

8.2.6 Emergency unlock

When the machine breaks down or the power is suddenly cut off and the door button cannot be used to open the door, after waiting for the centrifuge to stop working completely, the matching unlock tool can be used to insert into the emergency unlock hole of the centrifuge (the small round hole on the right side of the cabinet), and push hard to open the door.

8.2.7 Failure warning

Alarm sound	Meaning
Tweet： Di di di... ,	Unbalanced operation
Tweet： Di di di di di di di....	Indicates that the timing centrifugation has ended.
Tweet： Di , di, di...	Indicates that the door was accidentally openedduring operation.
Tweet： Di di di... , Display： ----- ,	Indicates that the rotor reader is disturbed, etc. Itmay be that the control plate ground line and the motor housing are not connected.
Tweet： Du, Display: SLO-1,	This indicates that the motor speed is too slow, which may be the RS485 communication line problem, the inverter automatic protection, the motor speed line problem, and the motor plug.
Tweet： Du, Display: Err01,	Indicates that the rotor is not installed or that theidentified rotor cannot be used in this centrifuge.
The operation panel displayed as HOLD	The rotor, hanging cup operation life to reach the stipulated upper limit, contact the manufacturer to change new

9. Maintenance

1. The normal service life of the centrifuge swing rotor and hanging cup is 3 years, After the expiration of the production should immediately contact the replacement of a new rotor or may damage the machine and endanger personal safety.
2. Do not use a sharp object to crash the rotor, in transport and disassembly should prevent knocking, to prevent scratches, or trauma caused by the rotor.
3. The rotor should be checked regularly for corrosion spots, grooves, and tiny cracks. If any of the above conditions are found, please stop using the rotor immediately and contact the factory.
4. If the centrifugal sample is found to be spattered out and dripping on the rotor, it should be immediately sucked dry and partially cleaned.
5. To prevent damage to the surface oxidation layer when cleaning the rotor, please use detergent to wet the sponge or cotton cloth and then wash the detergent with distilled water or scrub it with 70% alcohol. After cleaning, please allow to turn it upside down to dry.
6. The centrifuge should be powered off when not in use.

10. Troubleshooting

Fault symptom	Analysis of cause	Maintenance method	Remark
No indication or indication disorder	The main circuit fuse (10A) fuses off	Replace fuse of the same type	
	The flat cable connected to the display panel is loose	Open the electrical case and tighten the flat cable	
	Single-chip computer misoperation, work procedures disorder	Turn off the power switch and wait for several minutes before starting up	
The centrifugation does not work properly	After setting parameters, do not press "Enter" to confirm"	Press the "Enter" button or restart	
	The door cover is not closed	Close the door cover again	
	The voltage is not enough, the speed is not up	Change the power supply	
	After the last centrifugation, the door was not opened to change the sample	Open the door then closeit	
	The key switch failed due to poor contact	Open the electrical case, check the key switch, and replace it if necessary	

Big noise	The fan cover and other fasteners are loose.	Tighten each fastener.	
	Drive motor damage	Change the motor	
	Hanging basket, hanging cup long-term improper use of corrosion.	Replace the hanging basket and hanging cup.	
	The instrument is tilted.	Adjust the instrument to level	
	The working platform on which the instrument is placed is unstable.	Place the instrument on a firm working platform.	
Rotate speed unsteadily	The controlling circuit or frequency converter failure	Replace the circuit boardor frequency converter	
Unbalance protection	Unbalanced sample placement within the hanging basket	Reposition the sample tube	
	There is sewage in the hanging cup or the weight of the hanging basket is inconsistent	Wipes clean the sewage or check the hanging basket	
	Motor shock absorber aging or motor flange is loose	Replace the same size of shock absorber or tighten flange mounting screws	
Not refrigerating	The refrigeration indicator is on but not refrigerated, and the main circuit fuse (15A) is fused	Replace fuse of the same specification (15A)	
	It is possible that the ambient temperature is too high or the working time is too long, resulting in the compressor overheating protection	Improve the ambient temperature or wait for the chamber temperature to drop before working	Can be set to low speed(below 2000) under low temperature (below 5 ℃) no-load running 5 min to 10 min.

Refrigerating efficiency is reduced.	Refrigerant leakage	Check the refrigeration system	
HOLD	The operating life of the rotor and hanging cup reaches the upper limit	Replace rotor and cup components	

11. Accessories

S.no	Accessory name	Quantity
1.	Main machine	1 pc
2.	Power line	1 set
3.	Operation manual	1 set
4.	Fuse	2 pcs
5.	qualification	1 pc
6.	spanner	1 pc
7.	Unlock tool	1 pc