Large Capacity, High Speed Centrifuge

2236R

User's Manual
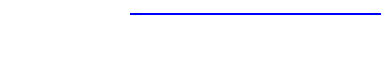
Let Professionals Serve Professionals!

GENESPPED®

THE BEST FUNCTIONAL QUALITY

☑ Manufactured and tested to IEC standards, stable spinning operation within +/-2% variation

☑ Steady and soft deceleration with dynamic brake technology

☑ Unique internal air flow design preventing from sample heating

☑ High-capacity, strong compressor ensures fast cooling of chamber and samples

☑ Fast cooling function to 4°C in 5 minutes for fast start up of cooled samples

☑ Automatic rotor identification

☑ Automatic RPM/RCF conversion

SAFETY and ROBUSTNESS

☑ Sturdy structured, two or three layered lid for noise-minimized and safe operation

☑ Safety lid lock scheme for safe and reliable work environment

☑ Lid-drop protection protecting the operator and samples

☑ Automatic rotor identification for safe operation

☑ Automatic detection and warning for imbalance, excess speed and over-heating

☑ Emergency lid-lock release for power blackout or sudden stoppage

☑ The eco-friendly compressor-off function on when lid is open

☑ The aerosol tight buckets and rotors to prevent contamination

☑ Autoclavable

Wide range of modern centrifuges
for a wide variety of laboratory applications

CONVENIENCE IN OPERATION

☑ Soft touch button/screen with intuitive controls

☑ Highly legible blue and white LCD display

☑ Time control functions of pulse, timed and continuous

☑ Automatic RPM/RCF conversion

☑ Easy to check actual rotation through the viewing port in the lid

☑ Program memory up to 100 (or 10) programs

☑ Automatic rotor identification

☑ Automatic lid realese at the completion of spinning

☑ A large assortment of rotors, buckets and adaptors for diverse applications

EASY CUSTOMIZATION

☑ Any rotors, sample containers and adaptors can be customized upon specified requirement

☑ High flexibility of structural & functional modifications

CERTIFICATES AND REGISTRATIONS

☑ Accredited with ISO 9001, ISO 13485, and KGMP

☑ Comply with CE conformity

GENESPEED®

Contents

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1. Meanings of Symbols & Safety Precautions

1-1. Meanings of Symbols

1-1-1. Symbols on the Instrument

Symbol	Meaning	Symbol	Meaning
⚠	Attention and warning.	⚡	Attention and warning for electric shock
		Attention and warning for correct way of sample balancing in the rotor. Attention and warning for rotor coupling. Attention and warning for lid opening and closing	

1-1-2. Symbols in this Document

Symbol	Meaning	Symbol	Meaning
⚠	This symbol refers to safety relevant warnings and indicates possible dangerous outcomes.	⊠	Note. This symbol refers to the important reminder.

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1-2. Safety Precautions

Before using the inst...

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of sample container should not be neglected.

14. The rotors should be cleaned and kept dry after every use for longer life and safety.

15. ALWAYS disconnect the power supply prior to maintenance care and service to avoid electrical shock.

16. ALWAYS use proven disinfection procedures after centrifun

2. Product Description & Technical Specifications

2-1. Product Description

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2-2. Technical Specifications

Max. RCF	Fixed angle	22,000 rpm / 54,111 xg
	Swing out	4,000 rpm / 3,134 xg
Max. capacity	Fixed angle	6 x 1,000 ml
	Swing out	4 x 250 ml
Temp. range(℃)		-20 ~ +40
FAST COOL button		Yes
OS / Control Display		Windows CE / 7' Touch Screen
Time control		pulse, timed < 100 hr or continuous
RCF conversion		Yes
Noise level (dB)		≤56
Acc/Dec		9/10 steps
Program memory		100
Rotor Identification		Automation
Imbalance cutout		Yes
Safety lid lock		Yes
Lid drop protection		Yes
Power supply(V/Hz)		220/50~60 (110V optional)
Power requirement (KVA)		4.0
Dimension(W x D x H, mm)		824 x 634 x 1,049
Weight without rotor (Kg)		240
CE mark		Yes
Cat. No.		CS-2236

☞ This instrument has following functions for safety.

1. Automatic rotor identification function.
2. Automatic detection and alarms for imbalance, excess speed and heating.
3. User ID and protocol management with historical tracking
4. Holding or changing of time and temperature possible while running

3. Preinstallation Requirements

3-1. Environmental Requirement

1. Install the instrument on the flat and rigid floor. If you place the centrifuge on the sloping area, the motor shaft might be distorted by the rotor weight and centrifugal force.

2. Install the instrument about 30cm away from the wall for the air circulation. It is also recommended to install the instrument at the dustless place as much as possible.

3. Install the instrument at the place with appropriate temperature and humidity. It has to be maintained at the proper temperature & humidity. (Permissible ambient temperature: +5°C ~ +35 °C, relative humidity: 30% ~ 85%)

4. Install the instrument at the place without any kinds of corrosive gases.

3-2. Electricity Requirement

1. The 2236 requires 4 kVA for optimal operation. Therefore, should secure sufficient power inflow in single phase current. The supplied Power Cord and Plug should make proper current connection with the supplied Wall Outlet Socket .
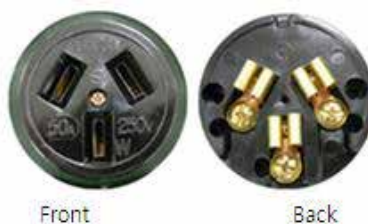
Wall Outlet Socket, 220V / Single Phase
(should be installed to proper voltage line and earth grounded)

| Power Cord and Plug | A Socket on the | Back of Device |

2. Check the proper voltage of your instrument and connect to adequate power outlet.
3. If the power input is more than +/ - 10% of the recommended voltage or fluctuates frequently , it may affect some functions of the instrument and often result serious damage.

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3-3. Unpacking

1. Untie the plastic banding over the paper box and get rid of box from the instrument main body.
2. Unwrap the vinyl coat surrounding the main body .
3. Place the instrument on a proper place by moving instrument 's wheel.
4. Removal of Safety Padding

☞ 2236 is delivered with its chamber filled with safety padding. Mount the rotor and press [START] button to recognize the rotor.

4. Installation

4-1. Balance Adjustment

Imbalancing of the instrument itself causes vibration, noise and error during operation. Check the level of the floor surface with a Bubble Leveler before installation.
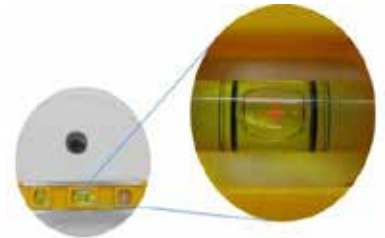
Action

After locating the instrument on the solid and flat floor, check the horizontality with a Bubble Leveler.

1. Place the Bubble Leveler on top of the instrument .
   - Try to locate all bubbles in the center of the Bubble Leveler with rotating the red gear which is in caster of the instrument.
2. Adjust the height of four -wheel, which is at the bottom of the instrument, with rotating the red gear (which is in caster of the instrument) for the first balance adjustment. (For the final balance adjustment, please refer to 4-5. Balance Adjustment –Final)
   - For fixing a wheel: rotate the red gear counterclockwise with a spanner.
   - For loosing a wheel: rotate the red gear clockwise with a spanner.

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4-2. Connection of the Drain Hose

To discharge liquid outwards, the Drain Hose should be connected properly.

1. Connect the two supplied Drain V/V, and then close the valve.
2. Connect the hose to the joint hole at the left bottom of the instrument.
   At usual time, rotate the drain lever counterclockwise to close, and so the refrigeration is not influenced by air inflow.
   From time to time, turn the lever in a straight line (→) for draining the liquid in side.

During running process, some water is condensed inside the device. It should be discharged for it can degrade the cooling capacity. So for this the device has a drain channel in a chamber. The drain channel is elongated to outside drain hose & valve and closed for most of time. The 2236 has a valve type drain channel as shown in below figure for easy drainage. (

Close
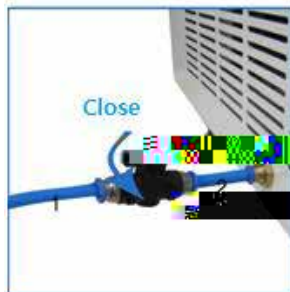
4-3. Power On/Off and Door Open

4-3-1. Power On/Off

⚠ To connect the AC power cord, the power socket should be installed which is supplied by manufacture.

1. Connect the AC power cord at the power socket on the right back of the instrument.

Power connection   Main body power socket   Power Concenton wall

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2. Turn on the instrument by pressing a switch on the right side of the instrument.

3. Now Loading··>> Loading images.. SD Card Found

4. Press [UNLOCK]

> After pressing [UNLOCK] the screen changes to main screen with automatic rotor recognition.

4-3-2. Door Open

Easy recognition with [OPEN DOOR] at the right bottom of main screen

1. For opening the door, touch [OPEN DOOR] marked with green color.

2. When the door is opened, the image of [DOOR] is at below of [START] button.

The door is not opened while the instrument is running.
If the door is opened, the instrument could not be operated even with pressing the [START] button.
For operational safety, this instrument has the automatic rotor recognition function.
The door is not automatically opened after finishing operation to keep the sample at proper temperature.
Power Failure: If there is any power failure during operation, door is not opened with touching [OPEN DOOR]. Door can be opened only when the operation is completely stopped and the power is on again. If you want to open the door at the power failure, please refer to '5-9. Emergency Door Open'.

4-3-3. Door Lock

The door should be closed only by gentle press-down motion.

AUTO – DOOR LOCK
Press Down Gently

As soon as the door latch touches the sensor inside, it is automatically closed by a geared motor of door locking system

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4-4. Rotor Coupling and Disassembling

Action

1. Before coupling a rotor, clean the motor shaft and rotor with soft dry towel.

4-4-1. Swing -Out Rotor

2. Mount a proper rotor into the motor shaft.
3. Grasp the rotor with one hand, and place Rotor Locking Tool at the center hole of the rotor.
   - To assemble the rotor: rotate the Rotor Locking Tool clockwise until tightly assembled.
   - To disassemble the rotor: rotate the Rotor Locking Tool counterclockwise.
4. Hang the appropriate buckets into the rotor.
   - Load the identical bucket at each wing for safety.(Do not leave a vacant wing without bucket. All wings should hold identical bucket.)
   - Remove dirt and dust around hooks of rotor and hanging part of bucket.
5. Spin the rotor manually to check if buckets swinging free enough and even. If they do not swing freely, apply the Lubricant (grease) to the linking area.

4-4-1. Fixed Angle Rotor

3. Mount the proper rotor into the motor shaft.
   Grasp the rotor with one hand, and place Rotor Locking Tool at the center hole of rotor.
   - To assemble the rotor: rotate the Rotor Locking Tool clockwise until tightly assembled.
   - To disassemble the rotor: rotate the Rotor Locking Tool counterclockwise.

4. To close of the rotor lid, rotate the rotor lid nut clockwise.
   - For closing lid: rotate the rotor lid nut clockwise .
   - For opening lid: rotate the rotor lid nut counterclockwise .

> ⚠️ When you run a fixed angle rotor, make sure that the rotor lid is tightly closed. If you don't close the rotor lid completely, it will be crushed.

☞ For operational safety, this instrument has the automatic rotor recognition function .

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4-5. Balance Adjustment – Final

1. Mount the rotor and place the Bubble Level on the middle of the top of a rotor.
   - Confirm that air bubbles of all three windows of the Bubble Level are within the black lines.

2. To adjust the balance status, rotate the red colored ring at the wheel caster clockwise or counterclockwise until the device is well balanced.

4-6. Positioning of Sample Tubes

1. Before loading sample tubes, check the water drop or dirt in the rotor hole or inner adaptor.
   - If there is a water drop or dirt in the rotor hole or inner adaptor, remove it with soft dry cloth.
2. Tubes should be placed in the rotor with same amount of samples at symmetrical positions.
   - Only use appropriate centrifugal tubes and do not exceed the speed beyond the tube 's max g-force.
   - For safety, fill the sample for 70~80% in the tubes.

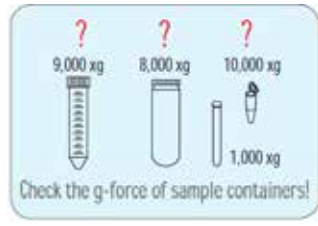| Correct Ways of Sample Balancing & Tube usage |
|---|
| |
| ✓ If the number of samples is not in pair, please load the control tubes at each symmetrical position. Otherwise, it results noise and vibration, which eventually damage the instrument. |

☞ For safety, the Imbalance Cut Off ' function will be occurred, if there is imbalance of loading tubes
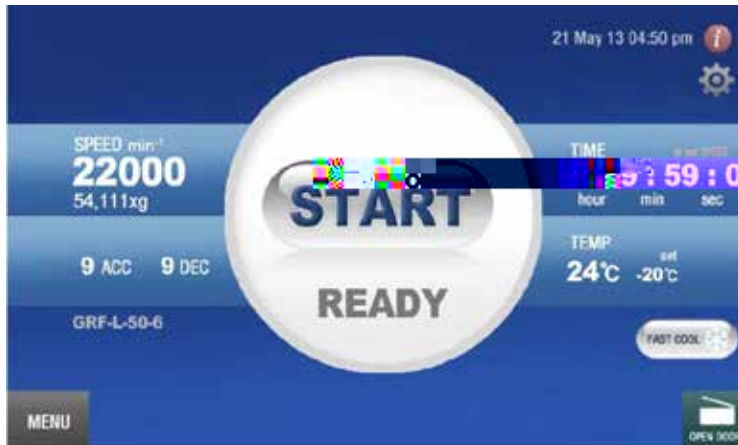
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(Imbalance error). Please refer to 7. Trouble Shooting.

5. Operation

5-1. Key Functions of Control Panel

☐ SPEED   For automatic conversion of   RPM/ RCF and to set the speed
☐ ACC   Use to set the acceleration level from 1 to 9 steps. Larger number means faster acceleration.
☐ DEC   Use to set the deceleration level from 0 to 9 steps. '0' step means natural deceleration. Larger number means faster deceleration.
☐ TIME   Use to set time up to 99 hours 59 min 59 sec(0:00:00: continuous).
☐ TEMP   Use to set temperature (-20℃ ~ 40 ℃).
☐ Rotor   Show the Cat. No. of coupled rotor .
☐ START   Use to start operation .
☐ FAST COOL   Use to reach rapid refrigeration up to the setting temperature.
☐ MENU   Use to set program, multi step and check history.
☐ OPEN DOOR   Use to open the instrument lid.
☐ INFORMATION   Use to check version of Main board/ Display board, brand, and model name.
☐ SETTINGS   Use to set volume, touch calibration, clock, and password.

5-1-1. Settings
▶ If [⚙] icon is touched, Menu is appeared on the screen.

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5-2. Rotor Identification

▶ When the door is closed after fixing a rotor, the instrument automatically recognizes a rotor.

▶ Main screen shows the rotor name below ACC/ DEC setting value.

▶ If you check the rotor specification, touch the rotor name.

Action

1. Touch the rotor name.
    A. A new screen is appeared for rotor list which can be used with the instrument.
    B. Rotor List shows each rotor's specification (RPM, RCF, Radius, and Capacity).

5-3. Setting the RPM/RCF Value

▶ Automatic RPM/ RCF conversion for prompt detection of g -force

▶ Speed setting unit: 1 rpm /1 rcf

Action

1. Touch a part of [SPEED].
    ● New screen is appeared for setting of RPM/ RCF.
2. Touch the small window for RPM or RCF to input value.
    ● Touch the number buttons to input value.
    ● This screen shows the minimum and maximum speed of fixed rotor.
    ● After touching [OK], the saved RPM value is showed on the [SPEED] as a setting value.

5-4.Setting the Time Value

▶ Time setting to 99hour 59min 59sec or continuous.

▶ *Normal* (Time display begins to count the run time when the acceleration begins and stops when the deceleration begins)
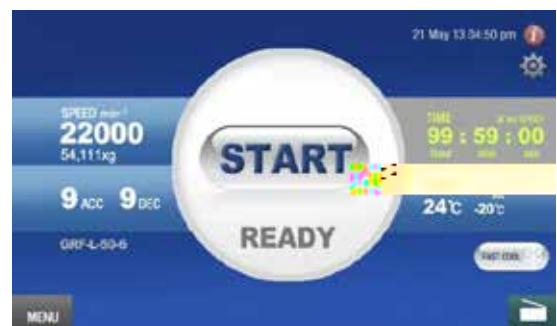
At Set SPEED (Time display begins to count the run time once the actual run speed reaches to the set speed value and stops when the deceleration begins)

Action

1. Touch a part of [TIME].
2. Click ' ' (Hour), MM' (Minute), and SS' (Second) individually and touch the number buttons to input value.
3. Choose a picture of 'Normal' or 'At Set SPEED' for run time.
4. Touch [Ok

   After touching [Ok the saved time value is showed on the [TIME] as a setting value.

   The time display shows the type of Normal or 'At Set SPEED after setting.

5-5. Acceleration/Deceleration

Use the adjustment function of acceleration & deceleration levels to protect sensitive samples and separate the layers clearly.

9 acceleration and 10 deceleration ramps (Level 0: Natural deceleration)

Action

1. Touch a part of [ACC] or [DEC].

   New screen is appeared for setting of ACC/DEC.
2. Touch the number buttons to input value and then touch [Ok

   After touching [Ok the saved ACC/DEC value is showed on the [ACC/DEC] as a setting value. ACC(DEC) can be set 1(0)~9 level (ACC/DEC 9: The fastest acceleration and

1. Touch a part of [TEMP]
   - New screen is appeared for setting of Temperature.
2. Scroll a gray bar from side to side or click the blue/red arrow to set the value and then touch [O_k]
   - After touching [O_k], the saved Temp value is showed on [TEMP] as a setting value.
   - To go to the main screen, touch [O_k] or [back]

5-6-2. Fast Cool

Action
1. Set the temperature. (Please refer to 5-6-1. Setting Temperature)
2. Touch the [FAST COOL] buttons for fast cooling.
   - The window shows a message: "Scanning rotor">> "recognition O_K"
   - By touching the [FAST COOL] button, the instrument is refrigerated down to the set temperature in a short time. During the fast cooling, the rotor runs at low speed (1,000 rpm) and a message "COOLING" is appeared.
   - The passed time is showed on time display of gauge.

☞
   √ If you'd like to load your sample tubes before pressing the [FAST COOL] button, please check if the sample is safe during spinning at 1,000 rpm.

   √ Before starting Fast Cooling, please check the rotor coupling and symmetrical arrangement of sample tubes.

5-7. Program
▶ Program memory up to 100 programs

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▶ MENU: SAVE PROG / CALL PROG / DEL PROG / HISTORY / MULTI STEP

5-7-1. Program Saving

Action

1. Set parameters. (Refer to 5-3 ~ 5-6: RPM/RCF, Time, ACC/DEC, and Temp.)
2. Touch the [MENU] and then select [SAVE PROG].
   - New screen is appeared for program saving.

3. Enter the name of protocol and user, and password and then touch [OK].
   - If user doesn't want to enter the name, user and password, please leave them blank.
   - To go to the previous screen, touch [back].
4. Touch [OK] when "Saving Program: Are you sure?" is showed.
   - After touching [OK], "Saving the properties.. Please wait" is showed.
   - To go to the previous screen, touch [CANCEL].

5-7-2. Program Recalling

Action

1. To recall the saved program, touch the [MENU] and then touch [CALL PROG].
   - New screen is appeared for program recalling.
2. Select the saved program to call the protocol.
3. Enter user name in small window of "Search by User" to quickly find the programs by the user.
4. Select the call program and then touch [OK].
   - When touch [OK], the setting values are showed up on the main screen.

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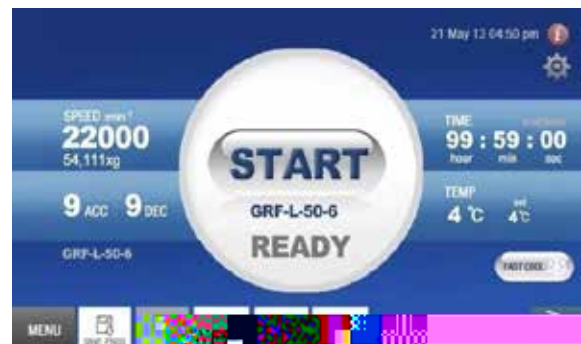
- To go to the main screen without any program recall, touch [back].

5-7-3. Program Deletion

Action

1. To delete the saved program, touch the [MENU] and then touch [DEL PROG].
   - New screen is appeared to delete program.
2. Select the saved program to delete the protocol and then touch [OK]
3. A message is appeared to enter password.
   - After touching a small window, a numerical keypad is appeared and enters the password saved before.
4. Touch [OK]
   - When touch [OK], the saved program is deleted totally.
   - To go to the previous screen, touch [CANCEL].

5-7-4. History

Action

1. Touch [MENU] and then touch [HISTORY].
   - The screen shows the running DATE, RPM, RCF, TIME, TEMP, and ROTOR.

5-7-5. Multi Steps

With the shift programming function, up to 5 steps of operating conditions can be linked together in a program memory and operate sequentially as a single run. This function is useful in density gradient centrifugation or complex cell separation.

The shift programming function can be used with saved program.

Action

1. Touch the [MENU] and then touch [MULTI STEP].
    A Warning message, "Time counting is fixed to
    AT SET SPEED During Multi -Step Mode." is
    appeared.
    Touch [O_k
    Step 2 is formed at left upper corner of main
    screen.
2. Set parameters at the selected step (marked with
    dark blue)
3. For additional step, touch [+] and then set the parameters for the step.
4. For step deletion, touch [-] above selected step (marked with dark blue).

5-8.Start/Stop

5-8-1. Start

Action

1. Touch [START] when the door is closed .
    The setting value is showed up for
    confirmation.

2. After checking the setting value, touch [O_k
    When touch [O_k the window shows the
    message as follows with running:
    "Scanning rotor" (rotor recognition

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- If the setting values are not correct, touch [CANCEL] to go to main screen.
- When the instrument is running, [SPEED], [ACC/DCC], [MENU] is not activated.
- When the instrument is running, only [TIME] and [TEMP] are activated.

5-8-2. Stop

Action

1. Touch [STOP] to stop the instrument running.
   A. A message "RUNNING" is changed to "STOPPING" in the gauge.
   B. When the instrument totally stops, the screen returns back to the main screen.

5-9. Emergency Door Open

For emergency door opening, you can use the Emergency Open Tool only when the instrument is completely stopped.

The door can be unlocked manually with Emergency Open Tool through the emergency opening hole.

1. Find the emergency door open hole at the center of the front case.

2. Pick out the silicon closure. (☞ After finishing Emergency Door Open, fit it again.)

3. Insert the Emergency Open Tool into the hole and revolve it counterclockwise until the door is released.
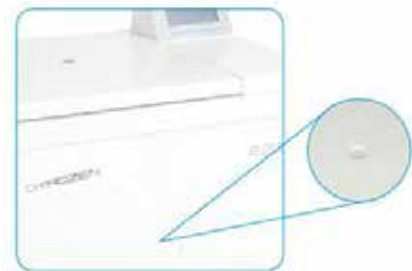
⚠️	✓ Manual opening should be performed only when spinning is completely stopped. Otherwise, harmful damage will be accompanied to not only operators but samples. ✓ After opening the door manually, it is recommended to wait until normal electricity comes back.

6. Maintenance

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6-1. Outer Part of Instrument

1. Clean the outside of the instrument with dry soft cloth. If necessary, dip the cloth in neutral detergent and clean contaminated area. Keep completely dry after cleaning.

2. Do not use any volatile chemicals such as alcohol and benzene, etc.

3. Be careful not to make scratches on the surface of the instrument. The scratches can cause corrosion on the surface of the instrument.

   ✓ If any rust appears, clean it with neutral detergents and keep dry.

6-2. Chamber

1. Keep dry inside the chamber after every use.

2. If the chamber is contaminated, dip the cloth in neutral detergent and clean contaminated area.

6-3. Shaft

1. Always make special attention to clean the motor shaft to avoid any imbalance problem due to the contaminants.

2. After using the instrument, take out the rotor from the shaft, and clean the shaft with dry soft cloth to keep dry.

6-4. Rotor

1. If any parts are contaminated with samples, clean the rotor with soft wet cloth and keep the rotor dry.

2. Be careful not to make scratches inside or on the surface of rotors. Any small scratches can cause corrosion of the rotor and big damage to the instrument.

3. If you do not use the instrument, keep the rotor separately from the motor shaft and stand it upside down.

6-5. Transportation of Instrument

1. If you need to move or ship the instrument, be cautious to protect the motor shaft from any physical impact or turbulence.

2. Do not mount a rotor in any cases of movement. Fill inside the chamber with proper materials to keep the motor shaft on place and not to be influenced by physical pressure.

7. Trouble Shooting

7-1. Check List

Symptom	Check List

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Power failure	Connect the AC power cord and make sure that the line is completely connected between the instrument and power outlet. Check the power switch is turned on. (Please refer to 4-3-1. Power On/Off)
Can't be started	If the door is not closed completely, the instrument can't run. Check the Door LED on the display window and close the door completely.
Can't open the door	If the power is out, check the main fuse for the laboratory to supply the power. If it is not solved in shortly, open the door with the Emergency Door Open Tool manually for safety of sample. (Please refer to 5-9. Emergency Door Open.)
Can't close the door	Remove the dirt at the door latch and then close the door completely again. If the door seems not being closed by mechanical reason, please contact our service team.
Noise and vibration during running	Please check the balanced status of both the table and the instrument.
	Please re-check the coupling status of the following three matches to minimize the noise 1. the balanced way of coupling of the rotor into the motor shaft 2. the completeness of fixing of the Rotor Locking Nut on the rotor 3. the matching status of Rotor Lid with the rotor (Please refer to 4-4. Rotor Coupling and Disassembling.)
	Check balances of samples in the rotor (Please refer to 4-6. Positioning of Sample Tubes) and load the same weight of samples symmetrically.

7-2.Error Message

If the instrument shows the error code with beeping sound, press[OK] button to stop the beeping sound and press[OK] button to release of the error status and make the instrument go to the default setting again.

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Error Message	Possible Causes	Actions
Over Speed error	Over Speed	- If the instrument is spun with over speed, there will be some problems in the overload of motor and the output of motor. - Shut off the power supply, and then, turn on the power switch again to check the instrument.
Low Speed error	RPM Sensor	- Shut off the power supply, and then, turn on the power switch again to check the instrument. - If the error code shows continuously although you try to operate again, please call please call Field Service Engineer.
Rotor missing error Rotor sensor error Rotor connect error	Rotor ID or RPM Sensor	- If the function of rotor recognition is failed, this message is appeared. - This message will be cleared by coupling an appropriate rotor (Please refer to 4-4. Rotor coupling and disassembling.) - If the error code shows continuously, please call Field Service Engineer.
Vibration error	Imbalance	- Check weight-balances of samples (Please refer to 4-6. Positioning of Sample Tubes) and then turn off and on the instrument for checking.
Input low voltage error	Low Voltage	- If the power input of power supply (V/Hz) is 10% less than required power, this message is appeared. - Shut off the power supply and then check the voltage of the power supply (V/Hz). - Use AVR to provide proper power.
Input high voltage error	High Voltage	- If the power input of power supply (V/Hz) is 10% more than required power, this message is appeared. - Shut off the power supply and then check the voltage of the power supply (V/Hz). - Use AVR to provide proper power.
Open door error during operation!	Door	- If the door opens during the instrument running or is troubled in door sensor, this message is appeared. - Remove the dirt at the door latch and then close the door completely again. Check the safety.

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