FOUR E'S®
SCIENTIFIC

Hematocrit Centrifuge (with Hematocrit Rotor)

CFG400101

Operating Instructions

RCF Calculation Method and Attention for Max. Speed Setting

◆ RCF Calculation Method

The RCF (Relative Centrifugal Force) value is related to the revolutions per minute (RPM) and the centrifugal radius. You can apply the following formula to calculate it:

RCF=1.118×10-5×n2×r（×g）

n——speed (r/min）

r——Max. centrifugal radius（cm）

g——acceleration of gravity（9.8m/s²）

◆ Attention for Setting Max. Speed

The standard maximum speed of this product has been determined and verified based on a sample with a density of 1.2 g/ml. The term 'sample' refers to the total contents of any compartment, including specimens, tubes, sealing assemblies, and adapters. If the density of the centrifuged samples exceeds 1.2 g/ml, the maximum allowable speed for the rotor should be adjusted accordingly. This adjustment can be calculated using the following formula:

$$\text{Nmax allowable speed} = \text{Nmax.} \sqrt{\frac{1.2}{\mathbf{P}\ \text{actual–density}}}$$

speed×**P**: actual density（g/ml）

Note: Under no circumstances should the maximum allowable speed of the rotor be increased, even if the sample's density is less than 1.2 g/ml.

In the formula provided above: Max speed represents the maximum allowable speed for a sample with a density equal to 1.2 g/ml. Please refer to the available rotor in section 2.3 for the standard maximum speed.

Dear Valued Customers,

Thank you for using our centrifuge. We are dedicated to delivering products with the highest quality and performance. To ensure smooth operation, please carefully read the manual and follow the provided instructions before use. Should you encounter any questions or issues during operation, please don't hesitate to contact us. We are committed to resolving any problems you may encounter.

This manual provides instructions for the correct usage of the CFG400101 Centrifuge. Before proceeding with installation, operation, maintenance, or inspection, we kindly ask that you thoroughly review the manual. Please operate the product only after fully understanding the safety guidelines.

Attentions:

- To provide detailed descriptions of the parts, this manual includes graphic illustrations without the outer housing or protective cover. When using this product, ensure that the outer housing or protective cover is correctly installed and follow the provided instructions.
- Please note that the graphic illustrations in this manual are for explanatory purposes and may differ from the product you have purchased.
- To improve the convenience and accuracy of the instruction manual, its content may be modified depending on product updates or specification changes.
- If the instruction manual is damaged or lost, please contact your local agent or reach out to us directly for assistance.

Content

Symbol and Explanation

Symbol	Explanation
~	Alternating current
ON	Power on
OFF	Power off
	Protective earth (grounding)
	Warning! (see label)

Safety Instructions

 Please read the safe operating instructions carefully before installation, operation, maintenance and repairing. Following the warnings and the operation instructions will minimize the risk of injury and the damage of centrifuge.

 Product specifications and features are subject to change without notice.

Attention during installation and maintenance

- Always disconnect power before performing any repairs. Exercise caution in case the instrument must be repaired with the power on. Before opening the cover, ensure electricity is cut off and wait for 4 minutes.
- Ensure the centrifuge is placed on a level surface.
- The centrifuge is designed to be used only with the power supply in dicated on the nameplate. If you have any problem regarding the in put power, please consult your local dealer.
- The centrifuge is equipped with a single-phase three-wire cable, with the longer cable connected to the casing for grounding. If your

electrical socket lacks proper grounding, please contact your electrician to replace the original socket. This is essential to ensure safe function.

- When replacing parts, the service technician should only use parts specified by the manufacturer. The use of unrecognized alternative parts may pose a risk of fire, electric shock, or other hazards.
- The room should be temperature controlled and maintained below 35°C.
- Please make sure the centrifuge installation area is clean.
- Do not attempt to open or repair the instrument on your own. Please contact supplier for assistance.

Attention regarding electrical systems

- To minimize the risk of electric shock, the centrifuge uses a three-pronged plug that must be connected to a socket with a ground lead.
- Ensure that the wall socket is connected to the ground wire. The voltage of the power supply must match the voltage requirements of the centrifuge.
- Do not use a power adapter that converts from three-pin to two-pin sockets.
- It is forbidden to use a two-line extension socket or a universal power adapter without a ground wire.
- Do not place containers with liquids on or around the centrifuge. If a container is accidentally knocked over, the liquid may seep into the centrifuge and damage its electrical or mechanical components.

Attention against fire hazards

- The small breaker (air switch) is designed to protect the circuit in case of centrifuge over-current. When replacing it, make sure to use a breaker (air switch) with the same specifications.
- The centrifuge is not designed for use with flammable or explosive materials. Do not use the centrifuge for substances like chloroform or acetaldehyde, and do not place these materials in or store them

within 30cm of the centrifuge.

Attention for safe operation

- Please only use rotor and accessories which are designed for this centrifuge.
- Please check rotor, buckets and other accessories carefully before operation.
- Ensure that you input the correct rotor number before operation to avoid exceeding its maximum speed. Attention: The Max. speed of rotor, buckets and accessories may be different.
- Make sure that rotor is installed on main spindle correctly without damaging the spindle part.
- Put all buckets (same model) in rotor before operation without exceeding its Max. imbalance volume, and close the rotor lid.
- Make sure if the centrifugal chamber is cleaned before operation.
- Don't try to stop rotor movement by hand when it is rotating.
- Don't open the lid when rotor is running.
- Don't move centrifuge lid when rotor is running.
- No external substances should get into centrifuge while in operation.
- If a tube is broken in centrifugal chamber, please clean out the fragments before next operation.
- If there is condensed water in the centrifugal chamber, please wipe up it with clean cloth.
- Do not place liquid containers near the centrifuge, as water splashing could potentially damage its electrical components.
- If centrifuge is irradiated by ultraviolet radiation for long time, the outer casing may be fade. Please cover it with cloth to prevent exposure.
- This centrifuge must not be used to separate the samples which produce flammable and explosive gases. Also storing such samples around centrifuge is also forbidden.
- Check rotor and buckets carefully before installation. Do not use any

cracked rotor or buckets; otherwise, the user will be responsible for any resulting consequences.

- It is forbidden to operate the rotor beyond its Max. speed. If the user fails to set the rotor type according to the number on the rotor lid, any damages resulting from such improper operation will be the responsibility of the user.
- After removing the rotor, please clean it with a neutral cleaning agent to prevent corrosion. Store it in a dry, well-ventilated place. Apply some lubricating grease to the central hole in the rotor for protection.
- Please be gentle when removing the rotor, and rotor should be taken out vertically without damaging the shaft.
- If the centrifuge is not in use for a long period, please wipe up any moisture in the centrifugal chamber. Additionally, apply some lubricating grease to the drive shaft for protection.
- Ensure that there is a minimum interval of 5 minutes between two operations to prevent damage to the compressor.
- When disassembling rotor and replacing rotor accessories and samples under low temperature, the operator must take protective measures to prevent frostbite.
- If any abnormal phenomena occur or an error code is displayed, the centrifuge must be immediately stopped. Please promptly inform the distributor or authorized service agent.

Attention while handling chemical & biological substances

- Routine operations may involve various liquids and test samples, some of which could be disease-causing or poisonous substances. The centrifuge should not be operated with such materials unless necessary protective measures have been taken.
- Be careful when handing infectious liquids. If you are not sure about the provided samples, ensure that they do not contain any

microorganisms. For substances like the hepatitis viruses (B or C), HIV, atypical mycobacteria, and structurally resilient fungi, please take additional aerosol protection measures to prevent the dispersion of airborne particles, such as smoke and mist.

- Infectious samples must be handled as per the laboratory's prescribed program and methods to prevent the spread of diseases.
- Spilled substances may generate aerosols, so please heed the warning regarding aerosols.
- Use only the appropriate rotor and adapter. The centrifuge should not be used with disease-causing, toxic, or radioactive materials unless necessary protective measures have been taken. When handling hazardous substances (according to the 'Laboratory Biosafety Manual' of the World Health Organization), air safety levels must be monitored. More hazardous substances demand higher levels of safety protection measures.
- When disposing of discarded liquids, please adhere to environmental security and protection requirements.
- Please clean and sterilize centrifuge and accessories before sending the device back to the supplier for maintenance.

Chapter 1 Installation and Adjustment

1.1.Installation Requirements and Procedures

Warning: Don't install centrifuge in the place with flammable and explosive substances, as it may lead to fire hazards. Before use, ensure that the centrifuge is properly installed and check the Centrifugal Chamber. Using the centrifuge without proper installation may damage the equipment.

1.2.Installation Environment

- The working environment temperature is 10°C to 35°C, and the relative humidity is no more than 85%.
- It is prohibited to place lab equipment that emits heat and produces strong vibration near the centrifuge.
- Avoid direct sunlight and damp places.
- Avoid installing the device in areas with corrosion, flammable and explosive gases in the air.
- Avoid installing the device in a dusty environment.

1.3.Place of Installation

- The centrifuge should be installed on the flat and solid platform.
- The distance between centrifuge and wall should be at least 30cm to ensure proper ventilation.

1.4.Installation Procedures

- Please check whether the package is complete or not, if there is any damage, please contact your local dealer or supplier.
- Open the outer package and gently remove the centrifuge with the foam packaging. Place it on the flat platform and take off the foam packaging. The four rubber feet of centrifuge are in uniform contact with the platform.
- Open the lid： Disconnect the power and move the centrifuge to the edge of the platform so that the emergency screw on the bottom is visible. Unscrew the screw nut and pull out the line to open the lid. Then inspect the centrifuge chamber, remove all items from it, and clean the chamber.
- Check the packing list to ensure all mentioned items have been received including Accessories, and Tools.
- Rotor installation: take the Rotor out of the package and check the Rotor for any damage or deformation during transport. Hold the rotor by hand and place it vertically and securely onto the rotor shaft.

With one hand holding the rotor yoke, use the spanner to securely tighten the rotor. Ensure the rotor is tightly installed before use.

- Ensure that the voltage of the power supply is consistent with the voltage requirements on the name plate. Insert the plug into the power socket at the back of the centrifuge, then connect the other end of the power cord to the power supply, and power on.

1.5.Inspection

- Before use, please check whether the rotor is loose, and ensure that the centrifuge is on the flat surface. Close the lid and start the centrifuge directly (do not use sample in the rotor). The Max. Speed setting is 1000 rpm, once it reaches 1000 rpm, stop the device. Then set it to 2000 rpm and stop once it reaches 2000 rpm. Similarly test it at 3000, 4000 and maximum speed of 12,000 rpm. If no abnormality is observed, the device is ready to use.
- Then use the Rotor with its Max. Loading Capacity. If using a Swing Rotor, and then press the tube hanger to check whether there is any no abnormal phenomenon. If everything is normal, then start to run, first set 1000 rpm, once it reaches 1000 rpm, stop the device; Similarly test at increments of 1000 rpm, until to the Max. speed of the Machine is reached. If there is no abnormal phenomenon, the adjustment is complete.

Chapter 2 Operation Instruction

1.2.2.1.Technical Parameters

Model Name	CFG400101
Max speed	12000 rpm
Max RCF	14800×g
Max Capacity	24 Capillary Tube Rotor
Net Weight	11Kg
Dimension（L×W×H）	370mm×320mm×235mm
Power Supply	220V 50Hz 3A
Time range	1～99min
Speed Accuracy	±30r/min
Noise	≤ 65dB（A）

Figure 2.2-1、2.2. Main Technical parameters

2.2.Rotor Options

You can choose, use and set the Max. speed, Max. RCF and Max. Capacity according this table.

Rotor No.	Max. Speed(rpm)	Capacity	Max. RCF
No. 6	12000	12-place hematocrit rotor	14800×g
No. 7	12000	24-place hematocrit rotor	14800×g

Figure 2.3-1、Rotor options

2.3. Main Structure and Display Panel

CFG400101 Tabletop high speed micro-centrifuge is composed of outer casing, centrifugal chamber, drive system, control system and display panel. The rotor belongs to accessories.

2.3.1 Operation Instruction of Touch Screen Buttons

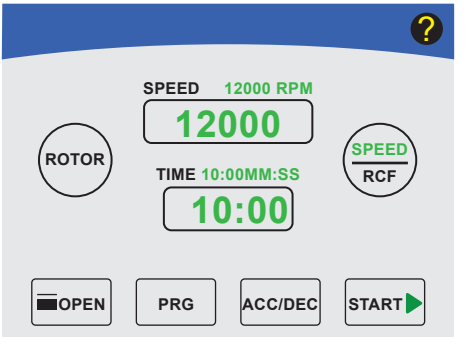


Figure 2.4-2、Touch Screen Display

SPEED 12000 RPM 12000	Display the speed setting value and the actual running speed. Touch this display panel to set the desired speed. Under RCF settings, it shows the RCF values.
TIME 10:00MM:SS 10:00	Display the time setting value and the actual running time. Touch this display panel to set the desired time.
ROTOR	Setting Rotor No.: Click ROTOR button on main interface to access to the “Rotor Library” interface, choose the needed rotor No.

SPEED / RCF	Click SPEED/RCF button on main interface to switch the parameter between ‘Speed’ and ‘RCF’.

2.3.2 Operation Instruction

	• When the status bar on the top of main interface is blue, it means the centrifuge is not running. • When the status bar on the top of main interface is green, it means the centrifuge is running. • When the status bar on the top of main interface is red, it means the system has errors and show the error messages. Press the red bar to clear the error messages.
START	“Start” button Click START button to run the centrifuge, and the running status bar shows blue.
STOP	“Stop” button While the centrifuge is running, click STOP button to manually stop the device. Once it is stopped completely, the “ STOP ” button turns to “ START ” button.
OPEN	“Open” button When the centrifuge completely stops running (Speed is “0”), press the OPEN button to release the electronic lock and open the lid.
?	“Help” button Click ? button to enter into the help information menu.

	“Program” button
PRG	In standby mode, click “ PRG ” button to enter into the Program Library Menu for editing or deleting programs.
ACC/DEC	Click “ ACC/DEC ” button to enter to the Acceleration/ Deceleration setting menu，input [0~9] number to set the desired ACC, then click ok to confirm. The bigger the number is, the faster the ACC /DEC speed will be.

2.3.3 Operation Steps

1. Check Rotors and Tubes: Please check the rotors and tubes carefully before use. It is forbidden to use the cracked and damaged rotors and tubes, which may damage the device.
2. Rotor installation: take the Rotor out of the package and check the Rotor for any damage or deformation during transport. Hold the rotor by hand and place it vertically and securely onto the rotor shaft. With one hand holding the rotor yoke, use the spanner to securely tighten the rotor. Ensure the rotor is tightly installed before use.
3. When loading the sample into the centrifuge tube, place two tubes of equal weights symmetrically in the rotor. The weights of the tubes on each side of the rotor should be equal. Centrifuge tubes should be positioned symmetrically to prevent imbalance. Imbalance can cause vibrations and noise. (Note: Tubes should be placed in even numbers, such as 2, 4, 6, 8, etc.)
4. Close the lid until you hear a "clicking" sound, indicating that the lid pin has securely entered the hook. Check the lid to verify that it is completely closed. If the lid cannot be opened, this confirms that it is closed properly.
5. Set the parameter of the Rotor No, speed, time, ACC, DEC and so on.
6. Start/Stop the centrifuge:

Warning: Do not start the centrifuge before inspecting the chamber. Failure to do so may result in damage to the centrifuge.

Warning: It is forbidden to exceed the Max. Speed for a rotor, as over-speed may damage the instrument and even cause personal injury.

a) Start: Click the START button to start the centrifuge, and then the Start Indicator Light is on.

b) Automatically stop: The centrifuge will slow down and stop automatically. When the speed is 0r/min, open the lid lock.

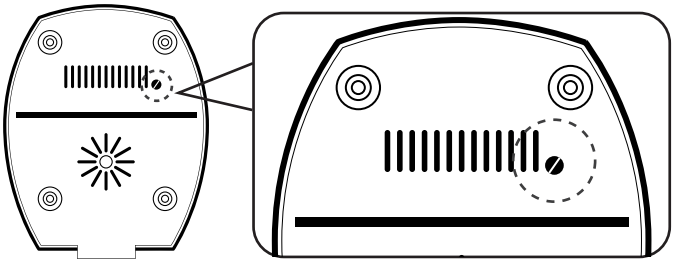
c) Manually stop: When the centrifuge is running, click the STOP button, and the centrifuge will stop. When the speed slow down to 0 rpm, open the Lid.

Attention: In case of power outage, the electrical lock will become inoperative, preventing the lid from opening. In this case, please wait until the speed reaches 0 rpm before opening the lid.

The lid can be opened as below method in an emergency:
Manually unlock:

1) Disconnect the power and move the centrifuge to the edge of the platform so that the emergency screw on the bottom is visible.

2) Unscrew and pull out the emergency line.



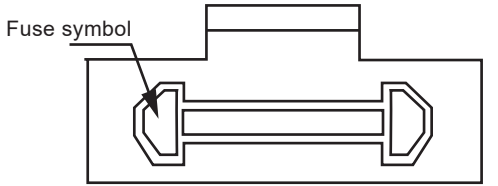
7. Disassemble the rotor: When replacing the rotor, remove the used rotor, unscrew the bolt with screwdriver and take out the rotor after removing spacer.
8. Disconnect the Power when the centrifugation is complete.

Disassemble and remove the rotor after use.

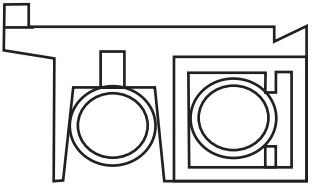
Chapter 3 Cleaning and Maintenance

- After removing the rotor, please clean it with a neutral cleaning solution to prevent corrosion. Store it in a dry and well-ventilated place. Additionally, apply some lubricating oil to the central hole of the rotor for protection.
- If the centrifuge is not in use for a long period, please wipe up any moisture in the centrifugal chamber. Additionally, apply some lubricating grease to the drive shaft for protection.
- Replace fuse

(1) Disconnect the device from the power supply.
(2) There is a fuse box below the electric outlet on the back of the instrument. (See figure 3). Look for a marking with fuse symbol and find the V-shape slot on fuse case. (See figure 4) Pull out the fuse case by inserting a slotted point screwdriver into the V-shape slot.
(3) Take out the damaged fuse and replace it. The model of fuse of the centrifuge is BGXP 5×20, 250V 3A.
(4) Put the fuse case into electric outlet.



Front view of fuse case



Side view of fuse case

figure 3

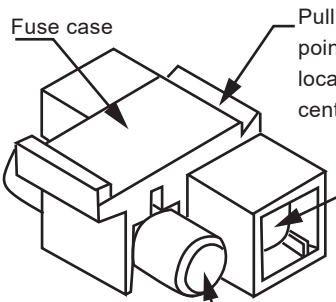


figure 4

Chapter 4 Troubleshooting

4.1. Troubleshooting

During operation, you may encounter the following failures. Please refer to the following methods for easy troubleshooting:

• Power on but no display

1) Check whether the input power is accordance with centrifuge rated voltage by multimeter. If it is a power-related issue, proceed with troubleshooting.
2) Check whether the power cord is connected to the power socket properly. If it is loose or not connected properly, troubleshoot accordingly.

• Rotor Imbalance Troubleshooting

1) Ensure tubes are symmetrically placed with the same weight. Rebalance if necessary.
2) Check for broken tubes. Replace and balance if needed.
3) Verify tubes are symmetrically placed in the rotor.
4) Ensure the centrifuge is on a stable, level platform with even stress on all four feet.
5) Check for rotor bending and environmental stability.
6) Inspect damping absorber parts for damage. Replace under professional guidance if necessary.

• Centrifuge not working

1) Check for loose connections at connecting terminals on the circuit board. Secure connections.
2) Verify input/output voltage with a multimeter. Replace the power supply transformer if it's faulty.
3) Test the motor with a multimeter. If the motor is energized but not rotating, it's damaged and needs replacement.
4) If the motor rotates but the rotor doesn't spin, check rotor installation. If no issues are found, contact us.

For any faults that are not mentioned above, please contact your local agent or supplier for assistance.

4.2.Error Code

Error code	Reasons	Solution
Lid Protection Failure	The lid is open or isn't closed properly during running	Check and Close lid
Overspeed Protection Failure	Select the wrong rotor number or power control board is faulty	Check and replace
	Motor was damaged	Replace
Speed Measuring Protection Failure	Motor runs at low speed; faulty power control board; or no rated power supplied	Check and replace
	Loose speed sensor cable	Check and replace
Communication Protection Failure	Communication failure, the connecting wire between display board and power control board was loose or damaged.	Check and replace

Attention: For any errors that are not mentioned in above table, please contact your dealer or supplier for technical support.

• Lid Protection Failure

Diagnostics: Since the centrifuge is a high-speed running equipment, the system will not start if the lid is not closed properly. If the lid is forced to open during operation, the system will automatically stop. In this case, the status bar at the top of the main interface will turn red, and error code will be displayed. Please refer to Figure 4.2-1 for troubleshooting steps.

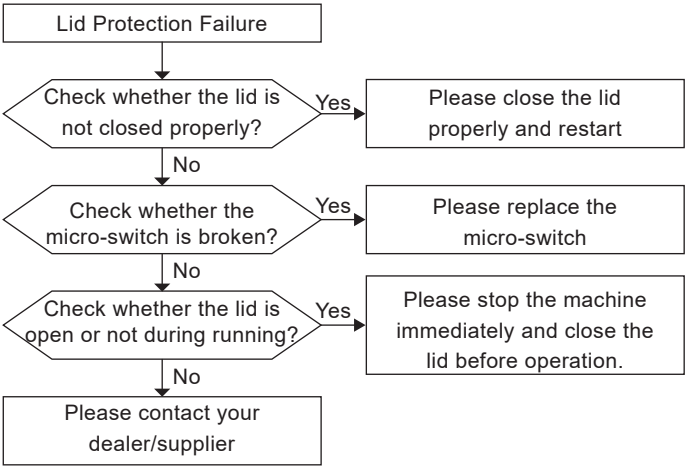


Figure 4.2-1 Lid Failure Troubleshooting Flow

• Overspeed Protection Failure

Diagnostics: When the set speed exceeds the allowable speed for the selected rotor, the system will not operate. If the speed exceeds the set speed by 500rpm during centrifuge operation, the system will automatically stop. In this case, the status bar at the top of the main interface will turn red, and error information will be displayed. Please refer to Figure 4.2-2 for troubleshooting steps.

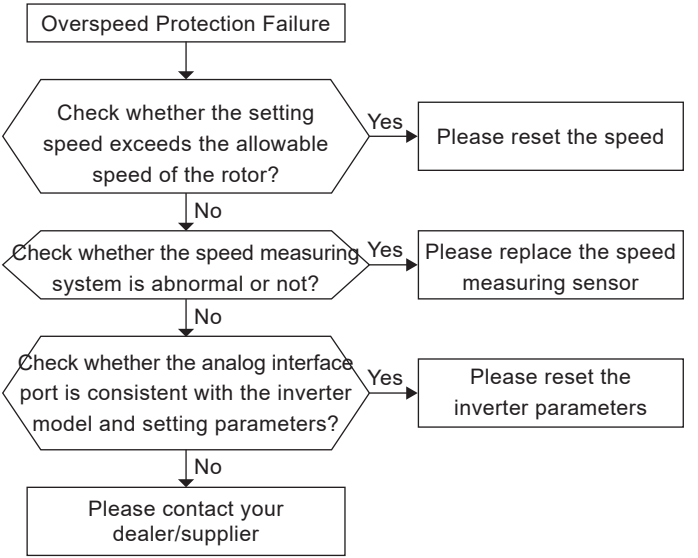


Figure 4.2-2 Overspeed Failure Troubleshooting Flow

• Speed Measuring Protection Failure

Diagnostics: In the event of a speed measuring failure, the system will not stop, and the status bar at the top of the main interface will turn red, displaying error information. Please refer to Figure 4.2-3 for troubleshooting steps.

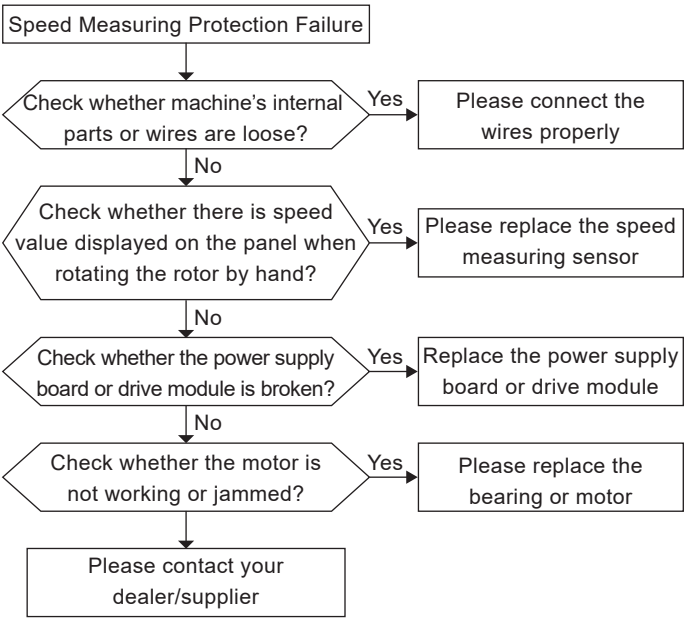


Figure 4.2-3 Speed Measuring Failure Troubleshooting Flow

• Communication Protection

Diagnostics: When a communication signal fault occurs, the system will cease to function, and the status bar at the top of the main interface will turn red, displaying error information. Refer to Figure 4.2-7 for troubleshooting steps.

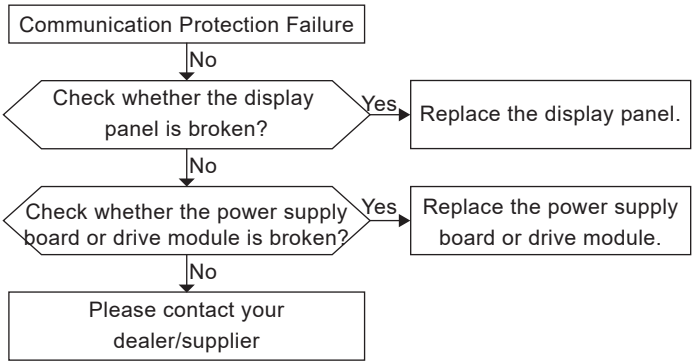


Figure 4.2-7 Communication Protection Failure Troubleshooting Flow

Chapter 5 Transportation and Storage

5.1 Transportation

- For long-distance transportation, please use a wooden case and carton. Place the centrifuge inside the case with the dust cap secured and fill any remaining space with foam or plastic shock-absorbing materials. Any impacts, inversions, rolling, and exposure to rain or snow during transit has to be avoided.
- When moving the centrifuge, please be gentle to avoid excessive vibrations, impacts, and inversion.

5.2 Storage

- If the device will not be in use for an extended period of time, close the lid and store in a well-ventilated, dry, and clean room that is free from corrosive, flammable, and explosive substances.
- Since technology evolves over time, please feel free to consult us if you encounter any discrepancies or have questions regarding this instruction manual.

Chapter 6 Warranty

You have purchased an original laboratory machine which meets the highest engineering and quality standards. In accordance with our warranty conditions, the warranty period is 1 years from our shipment. For claims under the warranty, please contact your local supplier. You may also send the instrument directly to us with an invoice and a description note of the problem. The shipping costs will be borne by the user and will be confirmed prior to shipping.

The warranty does not cover natural wear and tear of parts, nor does it apply to faults or damage caused by negligence, improper operation, including use of incompatible rotors or failure to use and maintain the machine in accordance with the instructions in this operating manual.

We reserve the right to change or modify or improve any of our

instruments without any obligation to make corresponding changes to any instruments previously sold.

Packing List

Item	No	Name	Quantity	Unit	Remarks
Centrifuge	1	CFG400101	1	set	
Rotor and accessories	1	Fuse BGXP 5×20 250V 3A	5	pc	Two in fuse box
	2	Power cord	1	pc	
	3	24-place hematocrit rotor	1	pc	
	4	Scale reader	1	set	
Tools	1	T-shaped inner hexagon spanner	1	pc	Rotor tool
Documents	1	Instruction Manual	1	copy	

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