TurboFuge

High Speed Benchtop Microcentrifuge

AAMC-2410

Operation Manual

Ver 1.0

Table of Contents

1. Safety Precautions

Before using this product for the first time, please read this entire operation manual carefully. To guarantee problem free and safe operation, it is essential to observe the following:

1.1 Intended Use

This instrument is intended to be used by trained personnel. This manual we assume users will have knowledge of basic laboratory procedures.

1.2 General Instrument Safety

Physical Injury Hazard. Using the instrument in a manner not specified by Blue-Ray Biotech may result in personal injury or damage to the instrument.

1.2.1 Transportation and Storage

This instrument should be transported or stored at a temperature of -20 ~ 60°C, and a relative humidity of 20 ~ 80%.

1.2.2 Moving and Lifting the Instrument

The instrument should be moved and positioned only by the personnel or vendor specified in the applicable site preparation guide. If you decide to lift or move the instrument after it has been installed, take the proper care and get help if necessary. Improper lifting can cause painful and even permanent back injury.

1.2.3 Installation and Operation

1. Do not use the device in a potentially explosive environment or with explosive chemicals.
2. Install the device in a location free of excessive dust.
3. Avoid placing the device in direct sunlight.
4. Choose a flat and stable surface capable of bearing the weight of the centrifuge.
5. Install it in a room with a temperature of 15 ~ 30°C, and a relative humidity of 20 ~ 80%.
6. Make sure the air vents are unobstructed.
7. Keep the front and rear of the device at least 30 cm from a wall or other equipment.
8. Make sure the power source conforms to the required power supply specifications.
9. To avoid electric shock, make sure the device is plugged into a grounded electrical outlet.
10. Do not allow water or any foreign objects to enter the various openings of the device.

1.2.4 Cleaning, Decontaminating and Servicing the Instrument

Before using a cleaning or decontamination method other than those recommended by the manufacturer, verify with the manufacturer that the proposed method will not damage the equipment. Switch off and unplug the device before cleaning, servicing, or replacing the fuses.

Repairs should be carried out by authorized service personnel only.

1.2.5 Instructions for removal from use, transportation or disposal

Do not dispose of this product as unsorted municipal waste. Follow local ordinances for disposal to reduce the environmental impact of waste electrical and electronic equipment (WEEE).

European Union customers:

Call your local Blue-Ray Biotech Customer Service office or distributor for equipment pick-up and recycling.

1.3 Chemical Safety

1.3.1 Chemical Hazard Warning

Before using any chemicals, refer to the Material Safety Data Sheet (MSDS) provided by the manufacturer, and observe all the relevant precautions.

1.3.2 About MSDSs

Chemical manufacturers supply current Material Safety Data Sheets (MSDSs) with shipments of hazardous chemicals to new customers. They also provide MSDSs with the first shipment of a hazardous chemical to a customer after an MSDS has been updated. MSDSs provide the safety information you need to safely store, handle, transport, and dispose of the chemical.

Each time you receive a new MSDS included in a hazardous chemical package, be sure to replace the appropriate MSDS in your files.

1.3.3 Chemical Safety Guidelines

To minimize the hazards of chemicals:

- Read and understand the Material Safety Data Sheets (MSDSs) provided by the chemical manufacturer before you store, handle, or work with any chemicals or hazardous materials.
- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing). For additional safety guidelines, consult the MSDS.
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation (for example, a fume hood). For additional safety guidelines, consult the MSDS.
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer's cleanup procedures as recommended in the MSDS.
- Comply with all local, state/provincial, or national laws and regulations related to

chemical storage, handling, and disposal.

1.4 Chemical Waste Safety

1.4.1 Chemical Waste Hazard

Hazardous Waste. Refer to Material Safety Data Sheets and local regulations for handling and disposal.

1.5 Electrical Safety

Electrical shock hazard. Do not remove instrument panels. High-voltage contacts are exposed when instrument panels are removed from the instrument.

1.5.1 Fuses

Fire Hazard. Improper fuses or incorrect mains voltage can damage the instrument wiring system and cause a fire. Before turning on the instrument, verify that the fuses are properly installed and that the instrument voltage matches the power supply in your laboratory. Replace fuses only with those of the type and rating specified for the instrument.

1.5.2 Power

Electrical Hazard. Grounding circuit continuity is vital for the safe operation of equipment. Never operate the centrifuge without a proper ground connection. Use properly configured and approved mains cables for the voltage supply in your facility. Plug the system into a properly grounded receptacle with adequate current capacity.

1.6 Safety Symbols

Explanations of symbols related to safety which are used on the equipment.

	Temperature limit		Protective conductor terminal
	Humidity limitation		Caution-Risk of danger
	Atmospheric pressure limitation	IVD	In vitro diagnostic medical device
	Waste Electrical and Electronic Equipment (WEEE) recycling instructions		

2. General Description

The **TurboFuge Microcentrifuge** is an excellent laboratory centrifuge designed for the separation of components in aqueous solution. This centrifuge should be operated by qualified personnel only.

2.1 Features

- Brushless motor drive.
- Control speed up to 15,000 rpm/21,400 x *g*
- An exceptionally compact bench centrifuge.
- User-friendly operation interface.
  - ✻ LED indicators for status monitoring.
  - ✻ Graphic icons for setting.
- Highly-efficient ventilation design.
- Low noise level.
- Lid drop protection design.
- Air-tight rotor design with metal lid (optional).

2.2 Product Overview

Feature	Description
Centrifuge Lid	Lid cover for centrifuge
Chamber	Metal rotor chamber
Display	Displays operation status and parameters
Control Panel	Keypad and knob for centrifuge operation
Rotor	Aluminum alloy
Emergency Lid Release	Aperture for access to emergency lid release
Ventilation Slot	Narrow openings for ventilation.

3. Getting Started

3.1 Unpacking

Open the **TurboFuge Microcentrifuge** package and confirm that all the items on the list below are included:

- **TurboFuge Microcentrifuge** unit x 1
- 24-well rotor x 1
- Plastic rotor lid x 1
- Quick guide x 1
- Power cord x 1
- Allen key wrench x 1
- Fuse (10 A, 250 W) x 1
- Rotor screw x 1

If there are any items missing, damaged, or any incorrect items in the package, please contact your distributor or sales representative.

3.2 Preparing Installation

After checking the centrifuge package, please follow the steps below to install the instrument.

1. Remove the package and the rotor transport protection.
2. The centrifuge should only be operated indoors. Please note the installation requirements below:
   - To ensure proper ventilation, make sure the centrifuge has at least 30 cm of free space all around.
   - The supporting structure must be solid, stable and free of vibration.
   - The supporting surface where the centrifuge is to stand must be flat and level.
   - The location must be clean, dry and free from dust.
   - The centrifuge should not be exposed to heat or direct sunlight.

Please note that the horizontal leveling of the centrifuge must be checked every time after it is moved to a different location.

3. Connect the instrument to a wall power outlet with the power cord supplied. Check that the mains voltage and frequency match the requirements.

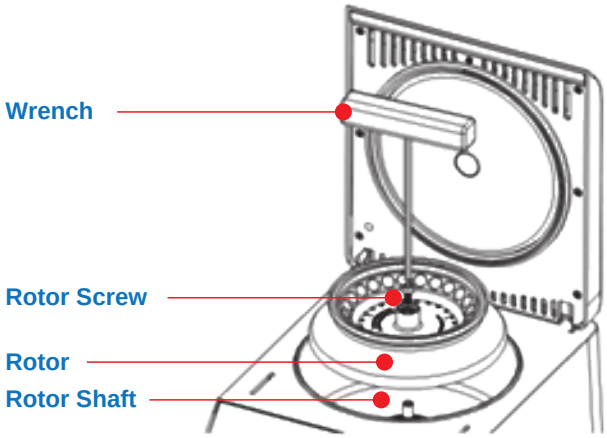
3.3 Load the Rotor and Rotor Lid

1. Turn on the switch.
2. Press **“Lid Open”** key on the control panel to open the lid.
3. Place the rotor on the motor shaft.
4. Insert the rotor screw and tighten it securely using the wrench provided. See the

drawing below.

5. Place the rotor lid on the rotor and tighten the knob securely.

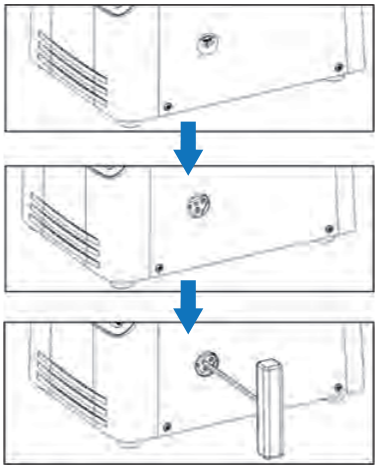
Warning: If the rotor screw, or the rotor lid knob are not tightened properly, they might become loose when the rotor is running and cause damage and injury.



3.4 Emergency Lid Release

If the lid can't be opened by pressing the **Lid Open** key, users can open the lid manually.

1. Turn off the power to the centrifuge.
2. Use a flat-head screw driver or other tool to remove the emergency lid release cover on the right-hand side of the machine.
3. Use the accessory wrench to open the lid by rotating it clockwise.



4. Operation

4.1 Overview of Operating Controls

The following section provides an introduction to the control panel of the **TurboFuge**. The control panel contains 7 keypads and1 knob. The table below describes the function of each item.

Feature	Description
Lid Open	Press to open the centrifuge lid
Start/Stop	Start and Stop share the same key
Short/Spin	Short run at current rpm or rcf setting
Speed	Press for speed setting
Time	Press for time setting
RCF	Press for speed parameter conversion
Selection Knob	Parameter adjustment, has both select and confirm function
System	Advanced settings

4.2 Overview of System Functions

The system function applies to the advance settings. Press the **System** key and **Selection Knob** to access settings. The following table shows the function of each setting.

Feature	Description
System	1. Auto lid function: on/off 2. Alarm: off / Vol1 / Vol2 / Vol3 3. Slow: on/off 4. Count up: on/off 5. Short spin: on/off
Parameter Adjustment (Selection Knob)	Rotate the Selection Knob to select the setting and press the knob in to confirm the selection.

(Advanced setting method can be found in section 4.9 System Navigation.)

4.3 Switching on the Centrifuge

1. Switch on the centrifuge using the mains switch. (Parameter settings of the last run will be displayed).
2. Place the rotor vertically on the motor shaft.

3. Insert the rotor screw and use the wrench supplied to tighten it firmly clockwise.
4. Place the rotor lid on the rotor and tighten the knob securely.

4.4 Centrifuge with Preset Time and Speed

Carry out the following steps to set run time and speed.

1. Press the **Time** key to set run time.
2. Turn the **Selection Knob** to select the time required.
3. Press the **Selection Knob** to confirm the selection. The system will confirm the selection automatically a few seconds after the knob has been pressed.
4. Press the **Speed** key to set the speed.
5. Turn the **Selection Knob** to set the speed required.
6. Press the **Selection Knob** to confirm the selection. The system will confirm the selection automatically a few seconds after the knob has been pressed.
7. Close the centrifuge lid.
8. Press **Start/Stop** to start the run.

4.5 During Centrifugation

The Running icon in the display will spin while the rotor is running and the actual speed (rpm) or *g* x force (rcf) is displayed. The **Lid open, System**, **Short Spin** keys are blocked during centrifugation. The total run time and speed can be changed during the run. The display can be switched between speed (rpm) or *g* x force (rcf).The run can also be terminated at any time by pressing the **Start/Stop** key.

4.6 End Centrifugation

After the run has ended and the rotor has come to a stop, the blue LED indicator and the lid open key will light up. You can then press the **Lid open** key to open the lid and remove the microcentrifuge tubes. The blue LED will go off when the lid is opened.

4.7 Centrifuge in Continuous Operation

1. Continuous run can be selected by setting time and turning the **Selection Knob** to less than 30 seconds or more than 99:00 minutes..
2. Select **Speed** and turn the **Selection Knob** to the speed (rpm) *g* x force (rcf) required.
3. Press **Start/Stop** to start the run.
4. Press **Start/Stop** to end the run after the desired time period.

4.8 Short/Spin

The centrifuge can be operated for a short run by pressing and holding the Short/Spin key. The centrifuge will continue to run as long as the key is held down and the time, in seconds, will appear and count up on the time display.

4.9 System Navigation

Pressing the **System** key will allow five advanced settings to be made. The table below describes the function of each setting. (The **System** key is disabled while the rotor is running).

Leve1	Level2	Function	Display
Auto-lid	On	The lid opens automatically after a run.	
	Off	The lid must be opened manually with the lid open button after a run.	
Alarm (ALM)	Off	Switch off the operation beep sound.	
	Vol1 Vol2 Vol3	Switch on the beep sound with a different volume.	
Slow	On	Rotor accelerates and decelerates slowly.	
	Off	Rotor accelerates and decelerates rapidly.	
Count up (C UP)	On	Counts the time after a run. (Only when Auto-Lid function is off).	NA
	Off	Count up function is off.	
Short Spin (SPIN)	On	Short run at set speed (rpm) or *g* x force (rcf).	NA
	Off	Short spins run at maximum *g* x force (rcf) or speed (rpm).	

5. Preventative Maintenance

5.1 Cleaning/Disinfection

Clean the entire accessible surface and its accessories on a weekly basis or when contaminated.

Please take note of the following when cleaning the centrifuge.

- Never use caustic cleaning agents such as soap suds, phosphoric acid, bleaching solutions or scrubbing powder.
- Use a soft brush to remove residue.
- Choose the disinfection method corresponding to the legal regulations and guidelines in place for your range of applications. For example, use 70% ethanol or isopropanol.

5.2 Rotor Cleaning

Clean the rotor regularly to maintain its durability and prolong working life.

(Inspect the rotor and accessories regularly for damage and corrosion. Do not use a damaged rotor or any other damaged items for a run).

5.3 Autoclaving

The rotor, rotor lid and rotor screw can be autoclaved under standard autoclave conditions: 121°C, 2 bar atmospheric pressure, 20 minutes.

5.4 Additional service instructions for the Turbofuge

Annual preventive service is recommended for the **TurboFuge**. The service technician should check the installation and setup, the door lock and the safety system, the condition of the rotor, the electronic equipment, and the rotor fixing screw and the drive shaft.

Blue-Ray biotech offers inspection and service contracts for this work. These are only valid for centrifuge that have been maintained by a properly authorized and trained service engineer.

5.5 Replacing fuses

Check the fuses as recommended in the Technical Specifications of this manual. Disconnect the power cord from the power inlet. Open the fuse holder drawer by inserting a small screwdriver under the tab and lifting. Remove the innermost (operative) fuse from its retaining tabs and replace it if necessary. A spare fuse is stored in the accessory bag of **TurboFuge**. Replace only with a fuse of the exact same value as the original.

6. Troubleshooting

This centrifuge is of high quality and performance and has been designed to be robust and long-lasting. If the solution to a problem cannot be found below, please contact the authorized distributors to arrange a DOA/RMA service.

6.1 General Error

Symptom	Possible Cause	Solution
No power, or the centrifuge will not start.	No power supply.	Confirm that the mains power source is present and correct.
		Check that the power cable and connectors are securely inserted.
		Check the fuse and make sure it is the right kind.
	Blown fuse.	Replace the fuse.
Centrifuge cannot be started, although power is on.	Lid not closed properly.	Close lid properly.
	Display does not turn on at all.	Contact service representative.
Lid Lock will not release. Lid does not open when **Lid Open** key is pressed.	Lid lock jammed.	Use emergency lid release.
	No power to display board.	Call for service.
	Centrifuge is not receiving power.	See “Centrifuge will not start”.
	Defective lid lock.	Call for service.
E20 Error (rotor imbalance)	Tubes are not inserted symmetrically in rotor holes.	Load tubes symmetrically.
	Sample liquid in tubes not properly balanced.	Make sure that all the tubes have equal volumes of liquid.
	Defective or improperly adjusted balance sensor.	Call for service.
	Rotor does not turn when a run is started.	Call for service.

6.2 Error Code

Code	Cause	Short Remedy
E01	Error in speed measurement system (acceleration).	Switch the centrifuge off and back on again after 30 seconds.
E02	Error in speed measurement system (deceleration).	Switch the centrifuge off and back on again after 30 seconds.
E03	Error in speed measurement system (2% higher).	Switch the centrifuge off and back on again after 30 seconds.
E04	Error in speed measurement system (2% lower).	Switch the centrifuge off and back on again after 30 seconds.
E05	Drive current abnormal.	1. Wait for the rotor to stop. 2. Repeat run.
E06	Drive voltage abnormal.	1. Wait for the rotor to stop. 2. Repeat run.
E07	Motor overheated.	Switch the centrifuge off and back on again after 10 minutes.
E08	Hall sensor signal abnormal.	Switch the centrifuge off and back on again after 30 seconds.
E09	Electronics error.	Switch the centrifuge off and back on again after 30 seconds.
E10	Electronics error.	Switch the centrifuge off and back on again after 30 seconds.
E21	Lid does not close.	1. Switch the centrifuge off and back on again after 30 seconds. 2. Press the Lid Open key. If the error occurs again, 1. Switch off the centrifuge. 2. Use the emergency lid release.
E22	Electronics error.	Switch the centrifuge off and back on again after 30 seconds.
E23	Electronics error.	Switch the centrifuge off and back on again after 30 seconds.
E24	Detect Lid OPEN while motor is running.	Try to close the centrifuge again. Switch the centrifuge off and back on again after 30 seconds.

Please contact a service representative if these steps do not clear the error.

Appendix A: Technical Specifications

Brand Name /Model name	Blue-Ray/Turbofuge
g- force (rcf)	50 ~ 21,400 x *g*
Speed	100 ~ 15,000 rpm
Max Capacity	24 x 1.5/2.0ml
Acceleration Time (or ramp)	15 s
Braking Time	16 s
Timer	30 s to 99 m, with continuous mode
Power Supply	AC 100-240 V, 50/60 Hz
Power Requirement	250 W Max
Dimensions (W x D x H)	29 x 48 x 26 cm
Weight without rotor	10 kg
Certifications	CE, RoHS

Appendix B: Warranty

The warranty covers the **TurboFuge Microcentrifuge** for one year against defects in materials and workmanship. This period begins from the date of purchase, and within this period all defective parts will be replaced by the manufacturer without charge. The warranty does not cover defects caused by excessive wear and tear or damage due to shipping, accident, abuse, misuse, problems with electrical power, or usage not in accordance with product instructions, or if spare parts other than original ones supplied by the manufacturer have been used. Each **TurboFuge** is tested and documented by the manufacturer before shipping.

Serial No:_____

Date Purchased:_____

Supplier:_____

Appendix C: CE Declaration

CE

BLUE-RAY BIOTECH CORP
4F, No. 31, Sec 2, Chang-An E Rd,
Zhong-Shan Dist, Taipei City 10456,
Taiwan (ROC)

Declaration of Conformity

Product Name: TurboFuge High Speed Benchtop Microcentrifuge

Model Names: AAMC-2410

All models comply with the following European standards:

EMC: EN 61326 (Group 1, Class A)

Safety: EN 61010-1 and EN 61010-2-020

The units conform to these standards to the best of my knowledge and belief.

Name: Jimmy Kuo

Position: Quality Assurance Manager

Issue Date: 2018.4.10

Appendix D: Ordering Information

Catalog No.	Description
AAMC-2410	TurboFuge with aluminum rotor and plastic lid
AAMC-a001	Metal lid

Appendix E: Rotor Accessories

Tubes	Tube Capacity	Tube Diameter	Max. *g*-force
1.5 ml microcentrifuge tube	1.5 ml	11 mm	21,400 x *g*
2.0 ml microcentrifuge tube	2.0 ml	11 mm	21,400 x *g*

www.blue-raybio.com

4F, No. 31, Sec 2, Chang-An E Rd, Zhong-Shan Dist,
Taipei City 10456, Taiwan (ROC)

P/N: 401-TFBR00-00