RANKIN | basics

OPERATOR MANUAL

Rankin Basics Cryostat

CRY85

Attention: Before using the instrument, please read this Instruction carefully, and keep the Instruction for further reference.

Please refer to the nameplate on the back of the instrument for the serial number and manufacturing date of the instrument

Table of Contents

1. OVERVIEW

This model has an ergonomic design and is manufactured using numerically - controlled machine tools. It is recommended for use in hospitals, medical schools, scientific research institutes, and food quarantine and inspection organizations.

With its novel design, this instrument has a high precision, stable performance, and easy operation. It possesses the following features:

- A specimen retraction function protects the specimen from blade damage.
- A trim button allows for easy switching between trim and sectioning mode.
- It has a counting function for the number of sections and the total thickness.
- The cryogenic refrigeration system utilizes a forced cooling structure. The refrigeration chamber, freezing shelf, blade holder, and specimen holder are cooled independently by a German double compressor to enhance cooling performance and increase cooling speed.
- Imported R404A non-CFC refrigerants that are environment-friendly.
- It achieves the desirable sectioning temperature within 60 minutes after turning on the unit when using the specimen head cooling.
- UV option enables surface disinfection of harmful bacteria, viruses, and spores by using 35 min after each use.
- The Peltier semiconductor cooling function on the quick freeze shelf can be turned on and off.
- Heated and removable glass door.
- Two defrosting modes: programmed defrosting and manual defrosting.
- Microtome is outside of the refrigeration chamber to avoid the effect of heat-expansion and cold-contraction, thus minimizing the need for maintenance.
- User-friendly intelligent operational interface is easy to learn and operate.
- LCD screen displays the number of sections and the total thickness, section thickness, specimen retraction value, temperature setting, date, time, temperature, and on/off timer are all included on the main display.
- Auto sleep function results in longer compressor life: the cryochamber temperature automatically stays in a range of -4 to -9℃ under the sleep mode, and returns to the sectioning temperature within 10 minutes after canceling the sleep mode.
- Keyboard locking function to avoid accident mis-operation.
- A mechanical handwheel lock ensure safe chamber access.
- A large quick-freezing shelf allows for the preparation of 26 specimens at the same time, two of which are cooled by a Peltier semiconductor.

2. TECHNICAL SPECIFICATIONS

Section thickness range: Adjustable range 1-100μm

1 – 20 μm Increment: 1 μm;

20 – 40 μm Increment: 2 μm;

40 – 100 μm Increment: 5 μm;

Trimming thickness range: Adjustable range 10-400 μm

10-50 μm Increment: 5 μm;

50-100 μm Increment: 10 μm;

100-400 μm Increment: 50 μm;

Specimen retraction: Adjustable range 0-80 μm Increment: 5 μm

Horizontal stroke: 20 mm

Vertical stroke: 60 mm

Voltage: AC 110V±10% / AC 220V±10%

Frequency: 50~60Hz

Power: 600W

Largest start-up current（5 second） 45A

Chamber temperature: -10℃ to - 40℃

Freezing shelf temperature: -10℃ to - 45℃

Number of freezing stations: 26

Pelletier number: 2

Refrigerant: R404a,300±10g

Compressor oil: 0.6L EMKARATE RL-22S, ICI

Working noise: 52dB(A)

Dimension size(mm): 650 x 805 x 1160

Net Weight: 240 Lbs.

3. INSTALLATION AND WORKING CONDITIONS

Package handling

- Please inspect the package and contact the shipper if the package has serious damage.
- Please place the instrument on a stable surface after taking it out from the wooden box.
- Do not place the instrument in an environment near explosive or flammable material.
- If the instrument may need to be transported again, we suggest using the original packaging materials.

Installation

- The instrument is a movable floor type with 4 caster wheels. Two front wheels can be adjusted up and down by turning the knobs on the foot, which should be used only when the instrument needs to be moved. After the package is opened, put the front wheels on the ground and move it to the working location; lock the front wheels to secure the instrument.
- Avoid obstruction around the instrument and leave a space at least 12 in wide on both sides as well as the back of the instrument to facilitate ventilation and heat dispersion.
- The instrument can be used after it is kept standing still for at least 2 hours.
- Please ensure the grounding wire of the 3-line power is securely connected before starting the instrument, which must comply with the GB9706.1 standard. Please ensure the socket is stable before connecting it and turning on the power switch.
- Insert the supplied power cord into the power socket and then connect the power cord to the mains supply.
- Install the blade holder if necessary.
- Close the heated window.
- Turn on the power switch.
- Program all settings if necessary.
- For the first time use, the default setting of the blade holder and specimen head temperature are -15°C.
- The cooling phase will take approximately 1 to 1.5 hours depending on the preset cryochamber temperature.

No other instruments should be connected to the circuit used for the cryostat, as the compressor needs high surge currents when started. Do not use multi-socket power outlets with small wire sizes for the supply of the instrument.

Working environmental conditions

- Temperature: +5℃ to +28℃

An ambient temperature below 26℃ is conducive to a longer lifetime of the cooling compressor

- Humidity: < 80%

High temperature or humidity will affect refrigeration performance.

4. OPERATION

4.1 Central Operation Panel (Fig 1)

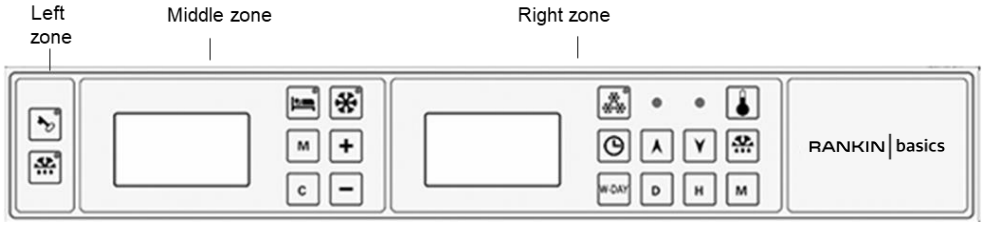


Fig 1

After the power source is connected to the rear of the cryostat, turn on the power switch at the rear to allow it to enter the working mode. The feeding arm will go back to the original position and the compressor starts running to cool down the freezing chamber.

Note: To protect the instrument from being damaged by an abrupt startup, the instrument cannot be re-started within 3 minutes after it is turned off.

The central operation panel includes three zones: left, middle and right.

Left zone

The left zone is to control software and fast defrost.

Programming ON/OFF switch

Press this button to turn on or off on the entire operation panel. When the indicator light is on, user may set up the instrument, such as adjusting on/off timer, defrost schedule, and temperature setting.

Fast defrost

Press this button to activate fast defrost function and put the system into a fast defrost

mode, as indicated by the indicator light. Fast defrost takes about 6 minutes. Press  again to stop fast defrost, and meanwhile the indicator light goes off. Freezing recovers after 25 seconds. In the case where the system automatically enters the defrost mode and the indicator lights is on, user may press this button to stop the defrost process.

Middle zone

The middle zone is for section/trimming settings, controlling the Peltier, and the standby mode.

Peltier freezing (not available under the standby mode)

 Press this Peltier switch button to run the Peltier element on the quick freeze shelf, as indicated by the indicator light. The 4th line on the screen shows the remaining cooling time of the Peltier, e.g., [15] indicates 15 minutes, which will count down to [14], [13] … [2], [1] until the Peltier stops cooling and the indicator light is off. User may also press this button to stop the Peltier when it is running. The Peltier stops running automatically if the temperature of the cooled storage is not below -10℃.

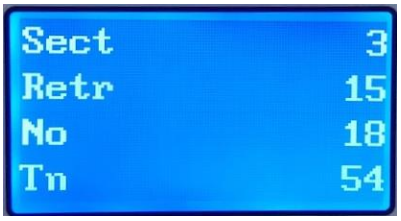
Standby

In the standby mode, the cryochamber remains at a temperature of -4℃ to -9℃. This mode is recommended if the instrument won't be in use for a period time, which may prolong the lifetime of the compressor.

 Press the standby button to turn on/off the standby mode, which is indicated by the bright or dim LCD screen, respectively.

Section/trimming setting

When the system is turned on, the LCD screen is as below:

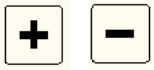


→ Section thickness
→ Retraction thickness
→ Number of sections
→ Total thickness

 Press this mode selection button to select between sectioning or trimming.

 Press this button to clear the displayed values of total number of sections and thickness into "0".

When both M and C buttons are pressed together, one "*****" signal appears in front of "Retr" to indicate that user can now press "**+**" or "**-**" to adjust the retraction value.



"**+**" or "**-**" is to increase or decrease the values for sectioning/trimming, or retraction (when "*****" appears in front of Retr).

Right zone

This zone is for time and temperature setting. The two red LED lights above indicate the working status of the big compressor (left) and the smaller Peltier compressor (right).  The left light is on when the compressor starts to work, and the right light turns on when pressing to activate fast freezing.

After the cryostat turns on, it automatically enters the initial mode as below:

Day	1
Time	12:00
T0	-21 [-24]
T1	-45 [off]

→ Current weekday (1-7 indicates Monday to Sunday)
→ Current time (00:00 - 23:59)
→ **T0**=Chamber **T2** = Spec. head (actual temp. [set temp.])
→ **T1** = Quick freeze shelf temp. (actual temp. [Peltier on/off]

Clock setting

The clock can be set by pressing "D" to adjust weekday and pressing "H" and "M" to adjust hour and minute, respectively.

Temperature setting

Press the temperature button, the third line on the LCD screen will shift between T0 (Chamber temperature) and T2 (Specimen head temperature).

These two buttons are to increase or decrease the temperature value for cryochamber (T0) or specimen head (T2). See Page 16 for optimal temperature settings per tissue type.

Fast freezing (invalid under standby mode)

This cryostat has two compressors: one large compressor for cryochamber, and one small compressor for the storage area and specimen head. The small compressor does not run if the system is in the standby mode. Fast freezing requires both compressors to run and can be activated only when the system is under the normal working mode. Once fast freezing is activated, the small compressor **starts in 3 minutes to cool the storage area and clamp**.

Fast freezing can be stopped by the user, or automatically if the Peltier begins to freeze over.

Press this button to activate/inactivate fast freezing, which is indicated by the right LED light and the running sound of both compressors.

Programming start-of-work timer

Press this timer setting button until the second line on the LED screen shows “T_{ON}”, then use the “D” ”H”, and “M” buttons to set the start-of-work time.

User can set single-day start-of-work time as following:

After pressing the “W-DAY” button, the first line in the LCD will show “Dwork 1&6” (“1&6” represents Monday to Saturday). Press the “D” button to select a working day, then press the ”H” and “M” buttons to adjust hour and minute, respectively. The system will automatically set 24 hours of the standby mode for non-working days.

Programming end-of-work timer

Press this timer setting button until the second line on the LED screen shows “T_{Off}”, then use the “D” ”H”, and “M” buttons to set the end-of-work time. After setting, press this timer setting button again to store the settings and return the LED screen to the initial mode.

Programming defrost timer

Press this defrost timer button, the first line on the LCD screen displays “Defrost” and the second line displays “Time”. User may press the ”H” and “M” buttons to adjust hour and minute. If defrost is not needed, please set “hours” to 24. Press this defrost timer button again to store the settings and return the LED screen to the initial mode.

4.2 Side operation panel

The panel on the left of the cryochamber controls the specimen head feeding, cryochamber illumination, and UV sterilizing.

UV sterilization

Press this UV sterilization button to turn on the UV lamp and sterilize the cryochamber, as indicated by the indicator light on the upper left corner of the button. The sterilization will be turned off automatically after 35 minutes or manually by pressing this button again any time.

Note:

1. Please keep the quartz tube clean, which is critical for successful sterilization. The sterilization should be conducted under the standby mode rather than the super-low temperature condition.
2. Please close the chamber glass window during UV sterilization to ensure the effectiveness of sterilization.

Cryochamber illumination

Press this button to turn on/off the light inside the cryochamber.

Fine Advance

Specimen position is adjustable by moving forward. Press "↓" button, specimen is moving towards user slowly.

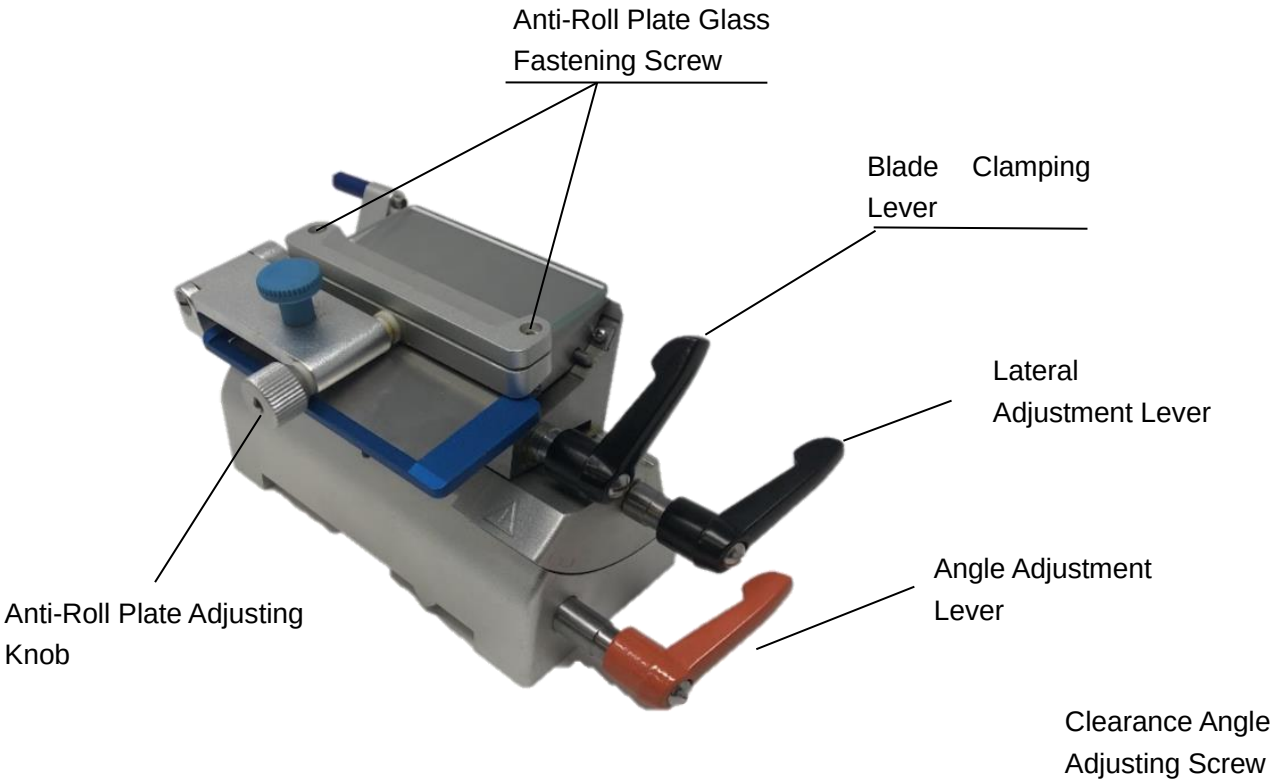
Fast Advance and Retract

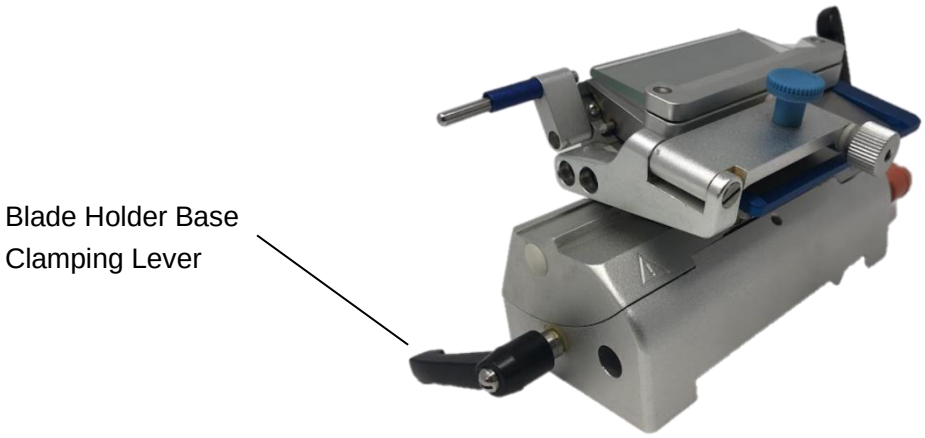
Press double arrow buttons to move the specimen head forward or backward. The indicator light on the button will turn on and alarm will beep when reaching the front or rear limit. When the fast retract button is pressed, the specimen head will return all the way to the rear limit.

Note: When adjusting the forward or backward movement of the specimen, the hand wheel must be locked.

4.3 Identification and Operation of Mechanical Parts

Blade holder





To move the entire blade holder forward or backward, release the base clamping lever (counterclockwise) on the left and then manually move the holder. After the holder is placed in the desired position, lock the lever (clockwise).

Note: Please lock the blade angle in a proper position before adjusting forward/backward movements.

Changing blade

Release the blade clamping lever on the upper right to open the blade clearance, insert a new blade from left to right and then lock the clamp lever.

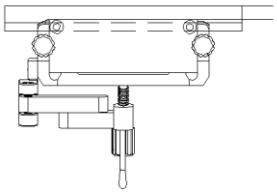
Note: Microtome blades are extremely sharp and can cause severe Injuries - please always use good laboratory practice when handling them!

Adjust the angle of the blade

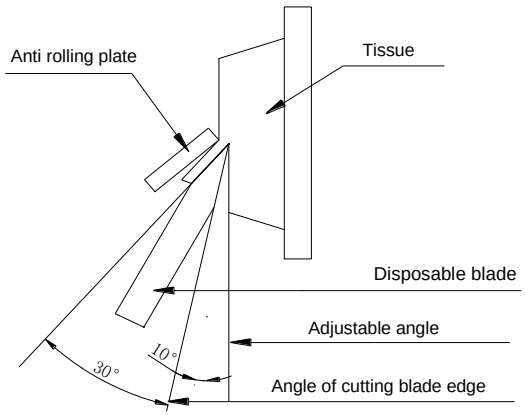
Release the angle adjustment level, adjust the blade holder to the desired angle and then tighten the shaft.

Fit and adjust the anti-roll plate

The anti-roll Plexiglas plate is fitted following the below procedures:



- The anti-roll plate is held in place by two screws.
- Ensure that the gap clearance side of the anti-roll plate is facing inwards.
- Position the anti-roll plate in the holder, gently pushing the glass to the bottom of the holder.
- The edge of the anti-roll plate should be parallel to the edge of the blade.
- Tighten the screws.



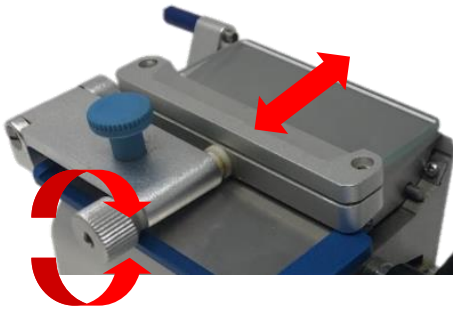
Note:

The cutting angle shall be no more than 10°

The edge of the anti-roll plate and edge of the blade must be flush.

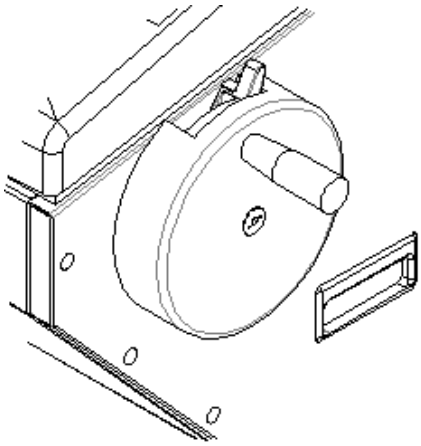
The anti-roll plate can be finely adjusted using the knurled screw.

- Turn the screw counter clockwise to raise the height of the anti-roll plate.
- Turn the screw clockwise to lower the height of the anti-roll plate.



Note:
Always adjust the height of the anti-roll plate in small increments.

Handwheel



The handwheel can be locked at any position. It is generally recommended that users lock the handwheel at the top position.

Specimen Setup

The specimen must be correctly secured and oriented in the specimen head for subsequent sectioning.

To secure and orient the specimen:

- Loosen the specimen chuck fixation screw and insert the specimen chuck into the hole of the specimen head.
- Rotate the chuck as required.
- Tighten the chuck fixation screw.
- Move the blade holder forward towards the specimen.

Sectioning procedures

- After the specimen orientation and the blade angle have been set, trimming can be carried out using the trimming function.
- Place the anti-roll plate against the blade.
- Turn the hand wheel in a clockwise direction to carry out sectioning.
    - The tissue sections move into the space between the blade and the anti-roll plate.
    - Use the handle to move the anti-roll plate assembly away from the specimen.
    - The section should remain on the clamping plate.
    - Arrange specimen section gently with a brush.
    - Transfer the specimen onto a glass microscope slide with help of adhesion forces.

Tips for Successful Sectioning

- Check the condition of the blade edge: move the blade horizontally to the left or right side to obtain a sharp cutting edge.
- Check the angle of anti-roll plate and correct it if necessary.
- Ensure that the edge of the anti-roll plate glass is clean and free of debris.
- Carefully remove frost from the front and the rear part of the blade, the anti-roll plate, and the clamping plate (i.e., with ethanol).
- Tighten all clamping screws and clamping levers on the blade holder and specimen head.
- Select the appropriate knife carrier and specimen temperature according to the specimen type
    - *See recommended Temperature Ranges for Sectioning of Different Types of Fresh Specimen on the next page.*
- Allow time for the temperatures within the chamber to stabilize.
- Select the appropriate freezing compound. Avoid excessive use of freezing compound.
    - *Note: If the specimen was frozen with liquid nitrogen or similar freezing techniques, the specimen must be allowed to adjust to the cutting temperature.*
- During defrosting, remove the specimens from the cryochamber, as the temperature inside the chamber will increase. Do not leave or store specimens inside the cryostat over a long period of time. due to a power failure or other unexpected malfunctions of the instrument, the specimen might be damaged.
- Adjustment of proper blade angle. Select a blade angle of 8-12°. The preset clearance angle is 10°.
- Select an appropriate cutting speed: The harder the material, the slower the cutting speed.
- Be very careful when bringing the blade and specimen together.

Recommended Temperature Ranges

for Sectioning of Different Types of Fresh Specimen

Specimen Type	Blade Temperature	Specimen Temperature
Adipose Tissue	-35°C to -40°C	-30°C or below
Bone Marrow	-25°C to -30°C	-20°C
Brain	-20°C	-12°C
Breast	-35°C	-25°C
Breast with Fat	-35°C to -40°C	-30°C or below
Cervix	-25°C to -30°C	-20°C
Connective Tissue	-25°C	-16°C
Gut	-25°C	-20°C
Heart	-25°C	-20°C
Kidney	-25°C	-15°C
Lip	-25°C	-13°C
Liver	-25°C	-13°C
Lung	-25°C	-15°C
Lymph Node	-25°C	-13°C
Muscle	-25°C	-16°C
Omentum	-35°C to -40°C	-35°C
Ovary	-25°C to -30°C	-20°C
Pancreas	-25°C to -30°C	-20°C
Prostate	-30°C	-20°C
Skin	-25°C	-16°C
Skin with Fat	-30°C to -35°C	-25°C
Spleen	-25°C	-16°C
Testis	-25°C	-10°C
Thyroid	-25°C	-15°C
Uterine curetting	-25°C	-7°C
Uterus	-25°C to -30°C	-20°C

5. Troubleshooting

Problem	Possible Causes → Solution
Sections overlap or crumple	1. Specimen is too warm → Lower specimen temperature 2. Blade holder too warm → Lower chamber temperature. *Tip – use freezer spray on clamp plate and blade to confirm.* 3. The anti-roll plate is too low → Raise the anti-roll plate towards specimen. 4. The anti-roll plate and/or clamp plate dirty → Clean with absolute alcohol & dry thoroughly.
Section rolls up under the anti-roll plate	1.Specimen is too cold → Raise specimen temperature.
Specimen curls after lifting the anti-roll plate	1. Anti-Roll plate & clamp plate too warm → Lower chamber temperature *Tip – use freezer spray on clamp plate and blade to confirm.* 2. Static electricity in chamber 3. Blade blunt → Change blade.
Sections tear or crack	1. Specimen too cold → Raise temperature. 2. Blade damaged or dirty → Change blade. 3. Specimen frozen too rapidly or specimen overly large.
Specimen and section chatter	1. Blade holder not correctly clamped → Check & tighten blade holder. 2. Blade incorrectly clamped → Blade clamping force can be increased by tightening clamp screw at the rear of the top stage. 3. Specimen incorrectly clamped → Check specimen is securely mounted and clamped in specimen head jaws. Check there is no debris or ice on the back of the chuck or on specimen head.
Tissue sections stick to the anti-roll plate	1. The anti-roll plate is dirty → Use a short brush to clean the anti-rolling plate. 2. The plate is too warm → Prolong the refrigeration time.
Vertical crack of tissue section	Edge of the blade has a defect or has a foreign object → use a new blade or remove the object gently with a brush
Sections thick-thin	1. Check blade holder and specimen correctly clamped. 2. Ensure specimen is securely attached to the cassette/chuck. 3. Temperature of specimen incorrect → Raise or lower temperature. 4. Blade not sharp → Change blade.
Vibration when slicing	1. Check blade holder and specimen correctly clamped. 2. The blade angle is too high or too low. 3. Ensure specimen is securely attached to the specimen disc/chuck. 4. Sectioning speed is too fast .

Notes:

- *For the examination and re-adjustment of the microtome, a routine maintenance should be performed by trained service technician once per year.*
- *Keep the glass window open to prevent the chamber from trapping moisture when the instrument is not in use.*

Cleaning Procedures:

The frequency of cleaning the cryostat depends on how often the instrument is used.

- Turn off the main switch.
- Remove the blade out of the blade holder and store it in safe place.
- Remove the cold section waste.
- The warming up of the cryochamber can actively be accelerated by softly using a hair dryer.
- Clean, wash, and dry the cryochamber with appropriate cleaning agents.
- Cleaning and care of the blade holder.
- Carefully clean and dry the dismounted blade holder.
- As there is condensate humidity inside the microtome structure, dry the microtome components inside the cryochamber very carefully. For this, use a hair dryer.

Emptying the Waste Liquid Bottle

The liquid from defrosting is collected in a bottle, located in the base of the cryostat.

- The capacity of the bottle is 2.5 Liters (approximately 0.66 Gallons).
- It is recommended to empty and disinfect the bottle once a week during the routine cleaning procedure.
- Disconnect and take out the bottle from the rack.
- Dispose the liquid in accordance with the laboratory regulations and clean the bottle.
- Wipe off any liquid from the rack.
- Put the bottle back into the rack and secure it.

Repair and Maintenance

Repair or maintenance work are normally carried out at the site of installation. If this is not possible, please contact support@rankinbiomed.com

7. Transportation

To guarantee trouble-free function of the instrument after transportation, please follow the instructions below for transportation:

- Shutting down the instrument for transportation: turn off the instrument, unplug the unit.
- Remove all section waste and movable parts out of the cryochamber, including the blade, brush shelf, blade holder, and all other accessories as well as tools
- Remove the defrosting condensate bottle.
- Clean and disinfect all accessories according to the respective applicable lab regulations and transport them in dry condition.
- Clean and disinfect the cryochamber.
- Unscrew the hand wheel handle for transportation if necessary.
- Close and secure the sliding chamber window to protect the window and avoid the formation of condensation water inside the chamber.

Note

I. Use original packaging materials for transportation of the instrument. If the original packaging is no longer available, please contact customer service via support@rankinbiomed.com.

II. The conditions for storage and transportation must be observed during the entire transportation – see "Technical Specifications".

III. Two persons are necessary for the transport of the instrument.

After moving the instrument, wait at least 8 hours before turning it on to allow the refrigerant to settle - failure to do so may cause damage to the instrument!

8. Safety Information

This instrument is designed for convenient and reliable service; however, incorrect actions by a user may damage the equipment, or cause a hazard to health.

All users MUST read and understand the following sections before using the instrument.

- Do not use this device in close proximity to strong electromagnetic radiation, as these may interfere with the proper operation.
- The electromagnetic environment should be evaluated prior to operation of the device.
- As with all scientific equipment, due care and good laboratory practice must be employed

when dealing with these chemicals, and consideration must be given to the potential for hazard when dealing with particular chemicals.

- Do not remove any panels or covers. The instrument does not have any user serviceable parts.
- The instrument must be properly connected to a grounded outlet via the Mains input supply.
- Position the instrument such that it is possible to interrupt the main supply at the source by removing the plug from the socket.
- If the equipment is used in a manner not specified by the manufacturer, the protection offered by the instrument may be impaired.
- Make sure that there is at least 100 mm (4”) clearance around any fan inlets on the instrument.
- In compliance with statutory requirements, this instrument is designed to accepted standards of safety. Its use does not entail any hazard if operated in accordance with the instructions given in the documentation. However, the following safety precautions must be obeyed:
    - All users must have read and understood the Operator Manual and these safety instructions; and only operate the instrument in accordance with the instructions.
    - Potentially lethal voltages are present inside the instrument. Do not remove any access covers unless specifically instructed to do so.
    - It is important that normal standards of safety and good laboratory practices are employed. Always use common sense when operating the instrument.
    - Correct maintenance procedures are essential for consistent performance. It is recommended that a maintenance contract is signed with our service department.
    - Use only factory approved accessories or replacement parts with this instrument.

9. Accessory List

Item	Description	Qty.	Special Note
1	Base Unit	1	
2	Disposable Blade Holder	1	2-in-1 low and high profile
3	Handwheel Handle	1	
4	Specimen Disc	3	
5	Power Cord	1	
6	Brush	2	
7	Heated Glass Door	1	Removable
8	Operator Manual	1	

10. Limited Warranty

What your warranty covers:

- Defects in materials or workmanship that occur under normal use and care.

For how long after your purchase:

- Two years from the date of shipment.

What we will do:

- Repair or replace your product.

How you get service:

- Locate your serial number and model > contact our customer service at support@rankinbiomed.com to open a service ticket or call (248) 625-4104 opt. 2

What your warranty does not cover:

- Damage from misuse or neglect
- Products purchased from non-authorized retailers, dealers, or resellers

Limitation of Warranty:

- The warranty stated above is the only warranty applicable to this product. All other warranties, expressor implied (including all implied warranties of merchantability or fitness for a particular purpose) are hereby disclaimed.
- Repair or replacement as provided under this warranty is the exclusive remedy of the consumer. The manufacturer shall not be liable for incidental or consequential damages resulting from the use of this product or arising out of any breach of any expressor implied warranty on this product. Any implied warranty of merchantability or fitness for a particular purpose on this product is limited to the applicable warranty period set forth above.