OPERATING
MANUAL

slee solutions for pathology

CRYOSTAT
MNT

HIGH-END CRYOSTAT

DESIGN &
MANUFACTURING
MADE IN GERMANY

Dear Customer,

thank you very much for your confidence in Slee products!

Before you start operating the device, please read the operating instructions carefully to familiarize yourself with the proper operation and functions. The device should only be operated by specially trained and instructed staff. The specified safety measures as well as the regulations and hygiene standards of the respective laboratories must be respected.

Enjoy working with your new device!

Your team from SLEE medical GmbH

Please note:

Some of the images in this manual may show special equipment and / or accessories that are subject to a charge. The image may differ slightly from the product. Errors excepted.

We always try to keep our documents up-to-date and free of errors. However, should you notice any mistakes, we would be grateful if you could provide us with feedback. Comments on the actual content are also welcome at any time. Simply e-mail us at marketing@slee.de.

CONTENT

1 INTENDED USE

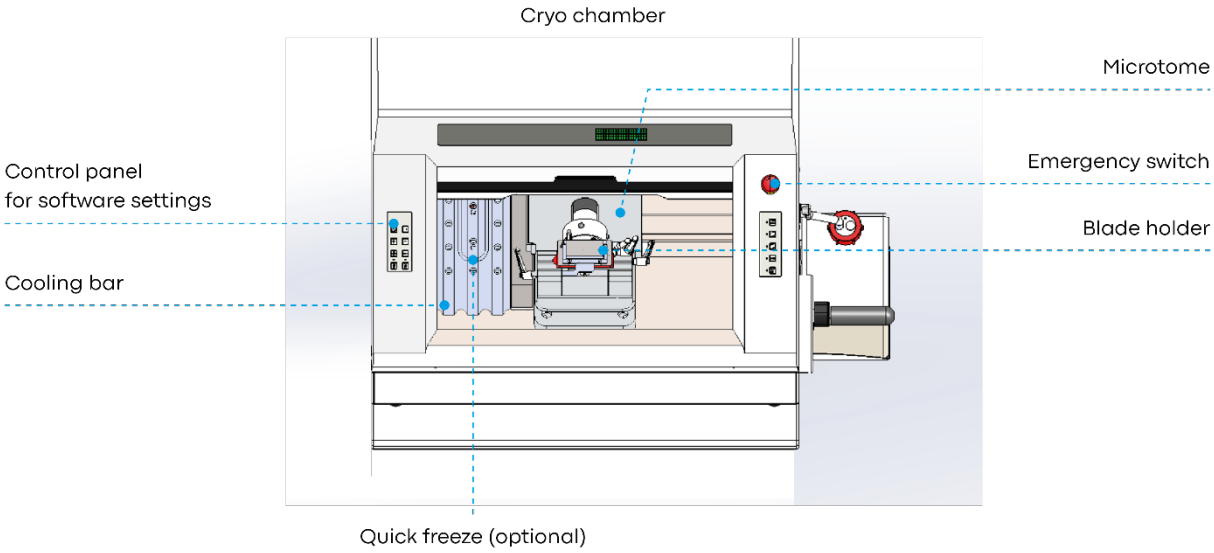
The floor standing open top cryostat MNT is a laboratory device and designed for rapid freezing and cutting thin sections of frozen specimens. It is intended for professional use in routine and research laboratories in the fields of biology, medicine and industry. Thanks to its ergonomic design, it can be optimally operated both sitting and standing.

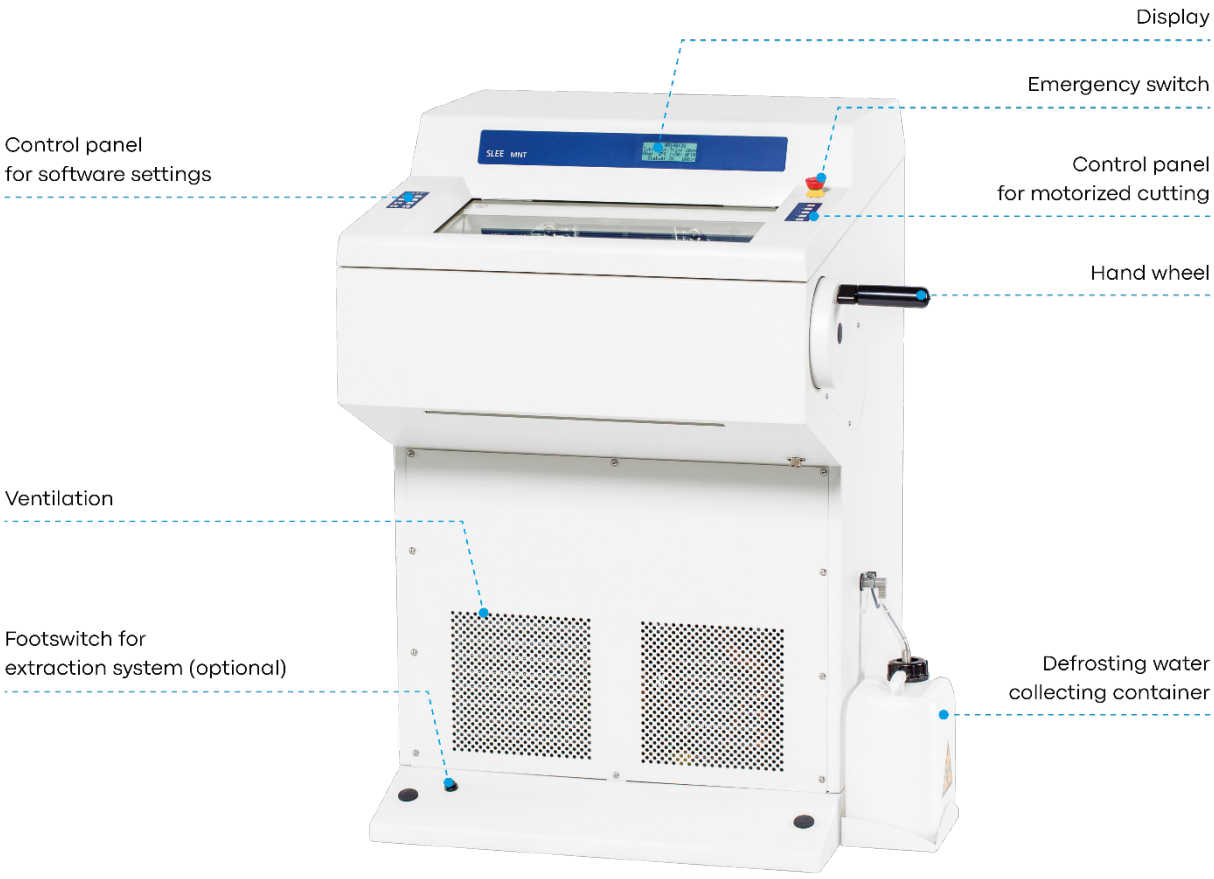
The device reliably cuts frozen samples in the cutting thickness range from 0.5 to 100 µm with a trimming thickness of up to 750 µm. The cutting quality is guaranteed by the electronically controlled retraction of the sample during the upward movement. Thus, a damage to the sample caused by grinding on the blade or knife is being prevented, increasing the service life of blades and knives.

2 SYMBOLS

	Dangers, warnings and cautions are marked by this symbol.
	Special instructions regarding the operation of the device are marked by this symbol.
	Mechanical components that can lead to injuries during operation are marked with this symbol.
	Flammable freezing sprays are prohibited.
	This device complies with the CE standard.

3 OVERVIEW DEVICE





4 SAFETY NOTES

The Slee open top cryostat MNT is provided with the following safety features:

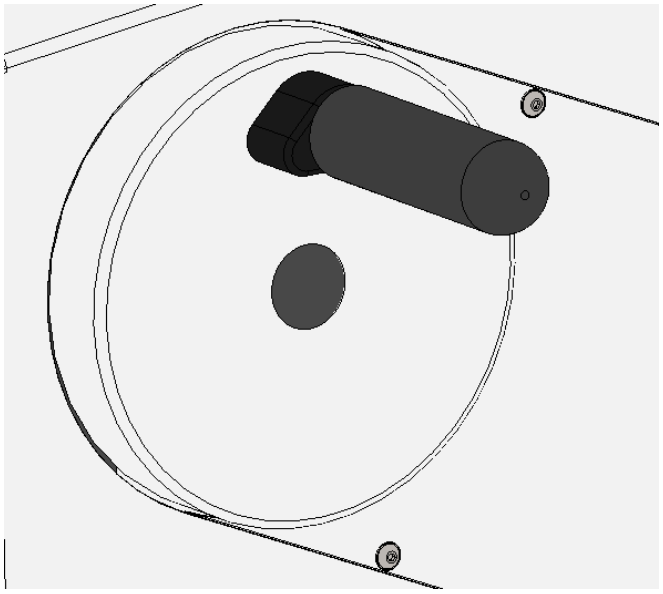
	MNT
Hand wheel stop	•
Finger protection for knife- and blade-holder	•
Emergency switch	•
Collapsible hand wheel lever	•

The institution which owns the unit and the persons working with the unit, servicing or repairing it have the responsibility for a hazard-free use.

4.1 Hand wheel stop

Always use the finger protection with the knife- / blade holder and put hand wheel in stop position

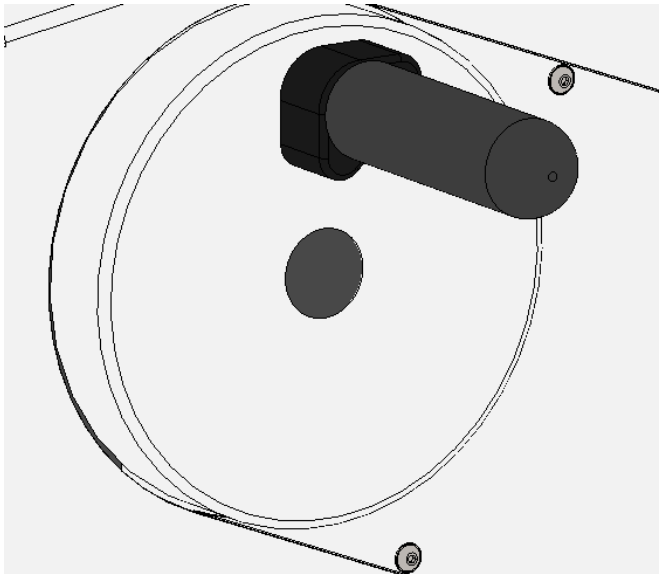
- if you adjust the blade, the knife or the specimen,
- before changing the specimen,
- if the appliance is not being used (break, weekend, etc.).



Released hand wheel lock. Hand wheel can be turned.

The hand wheel can be stopped in any position. To do so, turn the locking lever to the center of the hand wheel.

To release the stop, turn the locking lever outwards again.

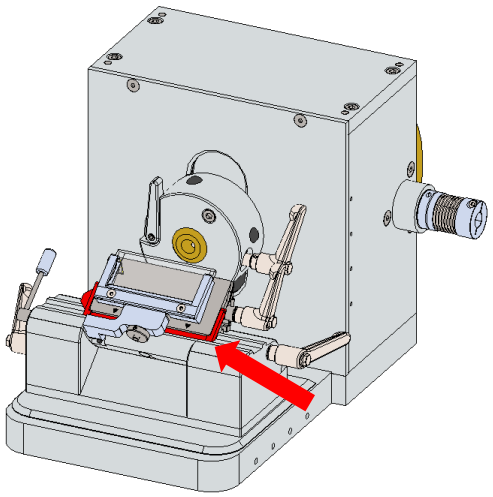


Activated hand wheel lock. It is not possible to turn the hand wheel.

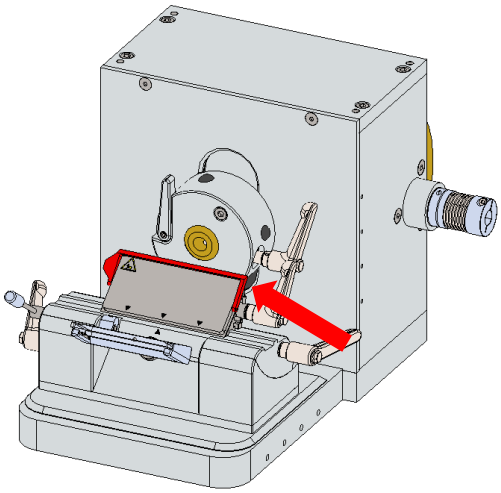
4.2 Finger protection

Always use the finger protection for the blade and knife holder and the hand wheel lock,

- before you start any work with the knife or specimen,
- before changing the specimen,
- if the appliance is not being used (break, weekend, etc.).



Finger protection open.



Finger protection closed.

Warning: Never leave a blade in the blade holder during a work break.

4.3 Electrical power connection

Do not use any extension lead.

	Before installing the device, make sure that the electrical connection values match the specifications on the type plate and that a constant power supply is guaranteed. Please note that the compressor requires a starting current of 25 to 35 A. The electrical circuit at the installation site must be checked by an electrical engineer to ensure that it meets the requirements for smooth operation of the device. • This should be examined during installation of the unit by a competent person. • Use a dedicated fuse for the unit. • Do not connect another device to the same power circuit. • Before turning on the device, check if the voltage of the mains supply is identical with the type plate of the device.

Illustration of type plate (example):

4.4 Working with knives and disposable blades

Microtome knives and disposable blades have extremely sharp edges that can cause serious injuries.

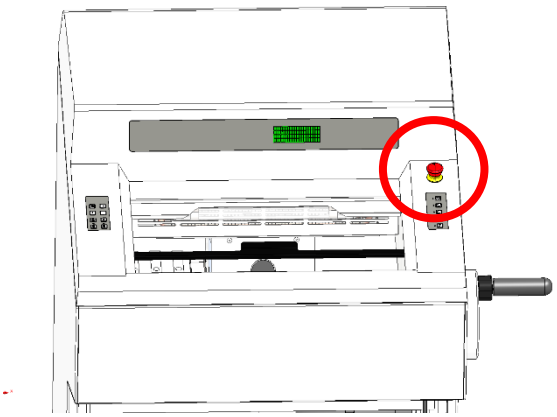
	• Do not place microtome knives or disposable blades at unsecured areas. • Never position microtome knives or disposable blades with the sharp edge pointing upwards. • Store used and new blades in a closed container. Use a container that has guides to hold the blades rigid. • Never try to catch a falling microtome knife. • Always insert the specimen first and then the microtome knife or disposable blade. • To increase the service life of knives and blades, avoid increased wear and tear by regularly cleaning the cutting edge and blade holder.

Please be extremely careful when handling microtome knives and disposable blades.

4.5 Emergency switch

By pressing the red emergency switch an emergency stop is activated. The device is switched off completely immediately.

To deactivate the emergency stop, turn the knob. The switch moves automatically back into the original position and the device switches back on automatically. The motor remains deactivated and must be reactivated and restarted for operation.



Emergency switch.

4.6 Motorized operation

To switch the motor on and off please always use the control buttons on the right-hand side of the device or the installed foot switch. To switch off, the motor speed should never simply be set to 0.

5 COMPONENTS

5.1 Standard components and optional components

The Slee open top cryostat MNT is supplied with standard components (•) and can be equipped with optional components (o).

	MNT
Fully automatic rotary microtome	•
Integrated section counter	•
Cutting motor, freely selectable speed	•
2 anti-roll plates (40 mm wide; 70 mm wide)	•
Intuitive control	•
Automatic defrost	•
24 freezing positions (24 standard resp. 21 + 2 [version incl. quick freezing positions])	•
2 quick freezing positions (quick freeze)	o
UV-C disinfection	o
Object cooling	o
Extraction system • Adjusted waste tray • Filter for extraction system (5 pcs.)	o
Heat extractor	•
Foot switch for cutting motor	•
Specimen holders (5 x Ø 22 mm; 5 x Ø 35 mm, each size comes in 5 different colors)	•
Rack for specimen holders (stainless steel)	•
Disposable blade holder (alternatively: standard knife holder)	•
Disposable blades (box with 50 pcs.)	•
Cover for cooling bar	•
CryoGlue embedding medium (4 x 125 ml)	•
Cryostat low temperature oil (50 ml)	•
Brush	•
Set of Allen keys	•
Mains cable	•
Manual	•

• = standard component, o = optional, - = not available

6 SPECIFICATIONS

All temperature specifications refer to an ambient temperature of +20 °C and a relative humidity of 60 %.

General

Nominal power	230 V AC ±10 %	115 V AC ±10 %
Nominal frequency	50 / 60 Hz	60 Hz
Power draw chamber	860 VA	
Power draw chamber and object cooling	1,380 VA	
Max. current for 5 sec	17 A	35 A
Protective class	I	
Fuses	2 x T 10 A	2 x T 20 A
Pollution class	2	
Overcurrent protective class	II	
Max. heat energy chamber cooling	860 J/s	
Max. heat energy chamber and object cooling	1,380 J/s	
Operating temperature range	+10 to +35 °C	
Operating humidity	max. rel. 80 % non-condensing	
Storage temperature range	+5 to +55 °C	
Storage humidity	max. rel. 80 % non-condensing	

Cryo chamber

Temperature range	0 °C down to -35 °C, selectable in 1 K steps, environment: 20 °C	
Cooling power	636 W	514 W
Switch off pressure	25 bar	
Current	3,69 A	6,45 A
Cooling gas	R 449 A, 320 g	R 449 A, 320 g

Object cooling (optional)

Temperature range	0 °C down to -50 °C ±3 K, selectable in 1 K steps, environment: 20 °C	
Cooling power	193 W	278 W
Switch off pressure	25 bar	
Current	1,69 A	3,06 A
Cooling gas	R 449 A, 50 g	

Chamber defrost

Automatic defrost	window must be closed. Hot gas defrost, time selectable, 1 - 3 times / 24 h or manual defrost on request
Automatic stop	at -5 °C chamber temperature / +20 °C evaporator temperature

Freezing bar

Minimum temperature	10 K below chamber temperature
Number of positions	24 (standard) resp. 21 + 2 (version incl. quick freeze positions)
Quick freeze positions	2 (optional), down to -55 °C (cooling)

Microtome

Type	rotary microtome, integrated, motorized feed, motorized cutting*
Thickness range	0.5 – 100 µm
Thickness settings	0 – 2 µm in 0.5 µm steps
	2 – 20 µm in 1 µm steps
	20 – 50 µm in 2 µm steps
	50 – 100 µm in 5 µm steps
Horizontal movement	28 mm
Vertical movement	58 mm
Retraction during upward stroke	0 – 200 µm, freely selectable (defined steps)
Trimming	0.5 – 750 µm, freely selectable (defined steps)
Specimen orientation	8° (x and y axes), 360° (z axes), zero-point detent x and y axis
Cutting speed	5 – 300 mm/s, freely selectable

* Dial gauge: ± 10 % tolerance delivery (standard deviation)

Cryostat

Dimensions (L x W x H)	760 mm x 760 mm x 1.110 mm
Weight (without accessories)	135 kg (without object cooling) 154 kg (with object cooling)

7 UNPACKING AND INSTALLATION

7.1 Unpacking the device

On delivery, you will receive the device packed upright in a cardboard box on a wooden pallet. It is equipped with four castors and two locking feet, height adjustable at the front.

i	When the device is delivered, check the tilt and impact indicators attached to the packaging. If the tilt indicators are active (blue arrowhead), the appliance was transported lying flat, tilted too much or fell over during transportation. If the impact indicators are active, the appliance has been tilted too much during transportation or has been subjected to excessive acceleration. Make a note on the shipping documents and inspect the device for possible damage.

Open the cardboard box from the top and remove the accessories together with the supporting foams. Then remove the cardboard box (lift it up).

Remove the screws on the two fixation brackets that hold the device on the wooden pallet.

Swing out the ramp. The device can then be rolled down the transport pallet. Due to the high weight of the device two (2) persons are required to ensure a safe transport.

Carefully lift the device slightly while rolling it down the ramp from the pallet. Roll the device to the desired installation location.

Tighten the device's locking feet to prevent it from rolling or slipping away during use. The height of the device can be adjusted via the feet.

Please only use the original packaging material for further transportation. Keep the packaging material if necessary.

7.2 Installation site requirements

The installation site for the MNT should meet the following conditions to ensure the specified device performance:

- Maximum ambient temperature of 22 °C
- No direct sunlight into or onto the cooling chamber
- Mains power supply within 3 m
- No air circulation (for example by air conditioning)
- Device may only be used inside rooms
- The mains supply should not be connected in series with other devices, such as multiple sockets - a separate circuit should be provided.
- Handwheel must be easy to reach
- Relative humidity lower than 60 %
- A minimum distance between wall and rear of the device of 10 - 20 cm must be guaranteed

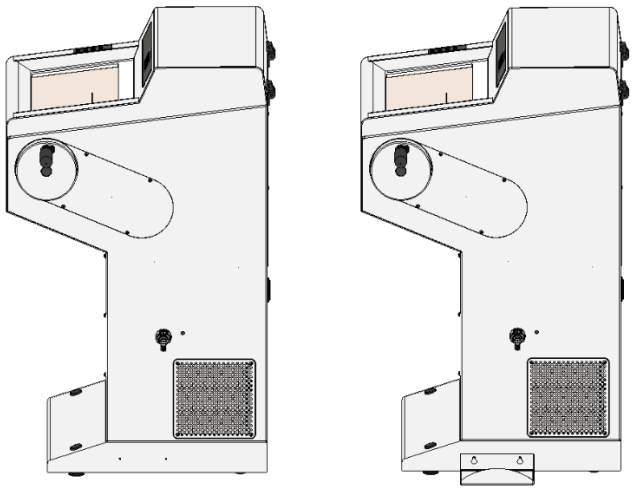
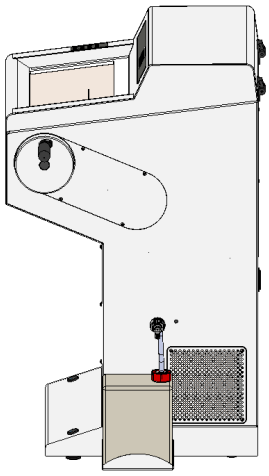
	High room temperatures and excessive humidity impair the cooling performance of the device and will lead to ice forming in the device!

7.3 Installation

To open the chamber, slide the window to the top.

Remove the transport security underneath the specimen holder and position the waste tray.

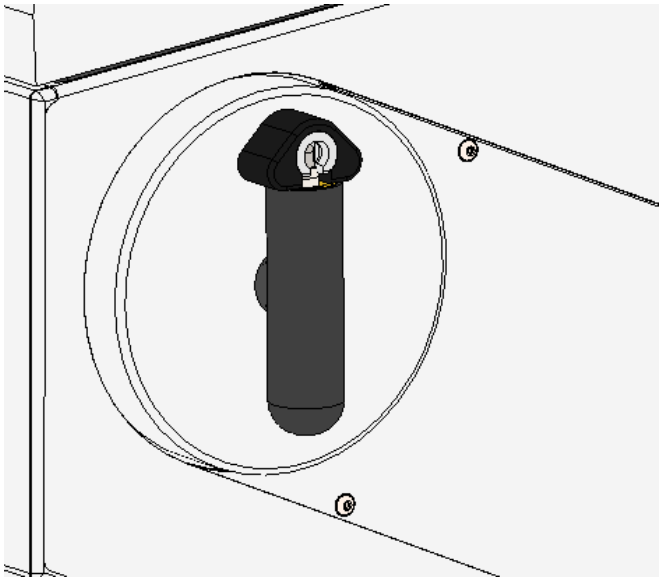
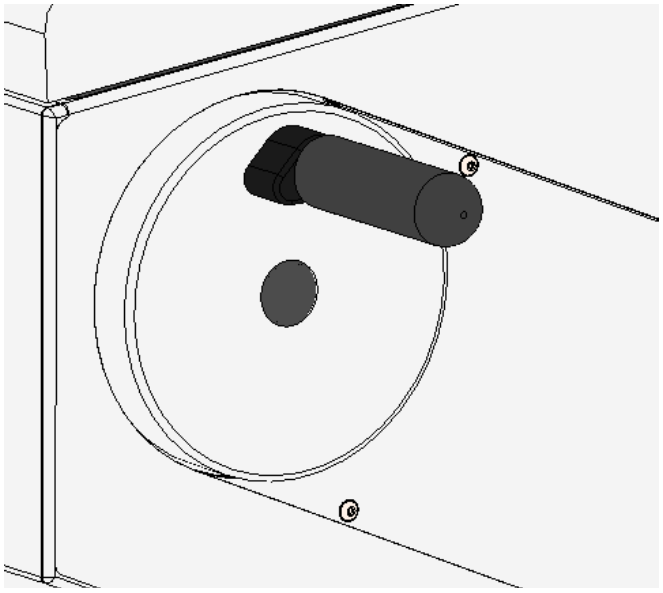
Wait at least 4 hours before switching on the device (especially if you are not sure that the device was not tilted). Failure to comply may result in severe damage to the device.

The device is supplied with a condensate water collecting container, which must be installed before the device is put into operation. First mount the metal bracket for the condensate water container on the right side of the device. Loosen the screws and hang the bracket onto the screws. Now tighten the screws.	 Installation of the metal bracket for the condensate water collector.
Place the condensate water container in the metal holder and connect the condensate water pipe and the level sensor to the device.	 Connection of the condensate water pipe and the level sensor to the device.

i	It is crucial to install the sidewards condensate water container, otherwise there may be icing on the evaporator! We recommend filling the container with 500 ml disinfectant before initial operation. After installation, wait at least 4 hours before switching on the device. Failure to comply may result in severe damage to the device.

7.4 Collapsible hand wheel lever

The device is delivered with a ready to use hand wheel lever. For safety reasons, the lever of the hand wheel is folded in for transportation.

Before you start any work unfold the hand wheel lever by simply pulling the lever into a horizontal position.	 Hand wheel lever collapsed.
To fold the lever back in, pull on it and fold it inwards.	 Hand wheel lever unfolded.

8 INITIAL OPERATION

8.1 Main display

The main display will show the day and time, the cutting thickness, the trimming thickness, the current chamber temperature, the target chamber temperature, the status of the quick freeze unit (optional), the total electronic status of the device and a cutting counter (optional).	Time THU 13:05:05	
	CUT: 7 µm	Trim: 19µm
	Cha: -20 °C (-22)	QF: 0
	Status:OK 0000	

8.2 Control panel

Software settings can be controlled via the control panel on the left-hand side of the device.

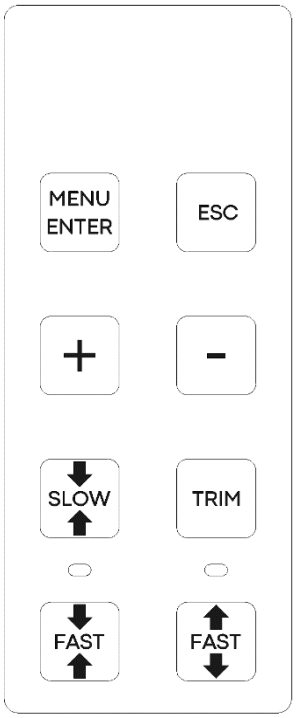
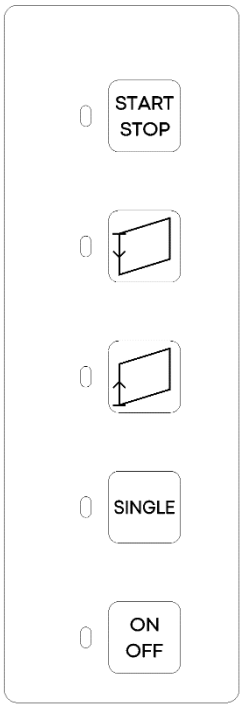
Figure MNT control panel for software and cutting thickness motor top left side of device.	**Button**	**Button name**
	MENU ENTER	**MENU ENTER**
	ESC	**ESC**
	+	**+**
	-	**-**
	SLOW	**>SLOW<**
	TRIM	**TRIM**
	FAST	**>FAST<**
	FAST	**<FAST>**

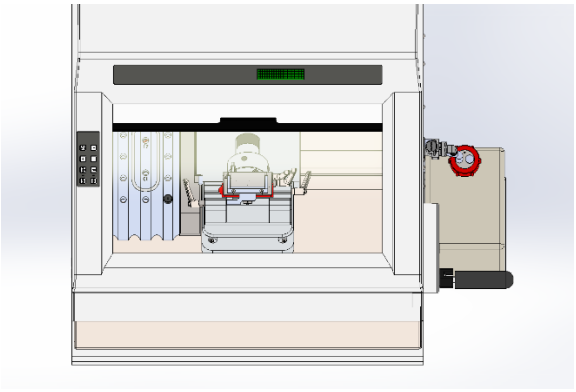
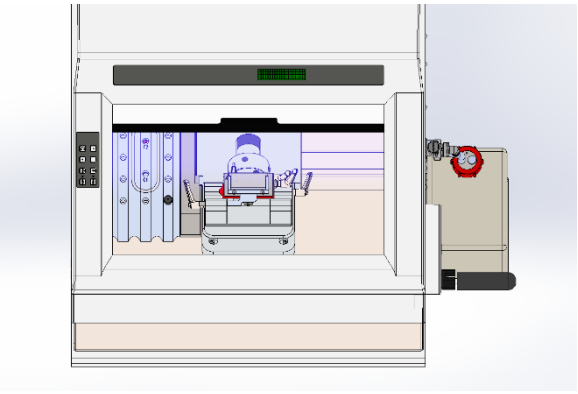
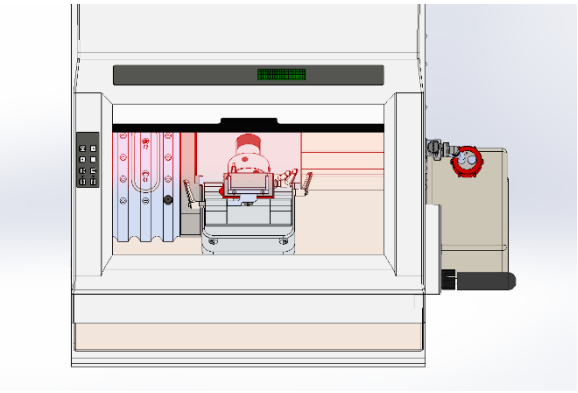
Figure MNT control panel for cutting motor top right-hand side of device.	**Button**	**Button name**
	START STOP	**START STOP**
		WIN DOWN
		WIN UP
	SINGLE	**SINGLE**
	ON OFF	**ON OFF**

8.3 LED-display OSEI-system

Slee cryostats are equipped with the Slee OSEI-system as standard:

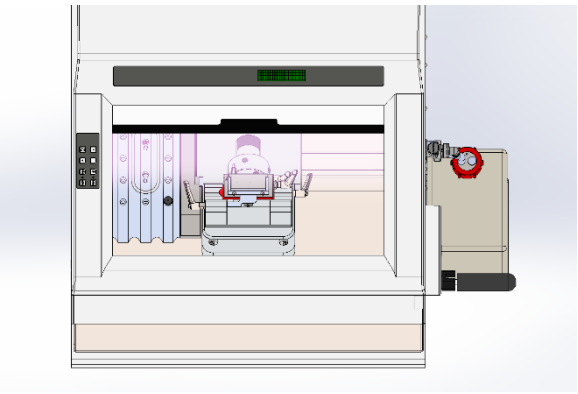
Optical **S**tatus and **E**rror **I**ndication.

LEDs of different colors in the operating chamber enable quick and easy detection of the current status of the cryostat. Possible application or system errors are promptly indicated by colored light and thus increase operating safety.

White LED, continuous: • Lights up for 3 minutes in normal operation, then changes to blue or red or off. • Turning the handwheel or pressing a button on the control panel resets the timer. The 3 min re-start.	 White light.
Blue LED, continuous: • When chamber cooling is activated and the window is closed, the blue LED lights up after 3 minutes of inactivity.	 Blue light.
Red LED, continuous: • During defrosting process. **Red LED, flashing** (1 sec. on, 1 sec. off): • When chamber cooling is activated and the window is open, the red LED flashes after 3 minutes of inactivity. In addition, a message is shown on the display that the window should be closed. • For error messages, e.g.: o Window is open after inactivity o End position of feed is reached o UV-C disinfection [only applicable for devices equipped with this feature]:	 Red light.

▪ The disinfection process has been aborted. ▪ The UV-C lamp is defective.	

	Error messages: Error messages can be acknowledged by pressing the **ESC** button.

UV-C light for surface disinfection, continuous [only applicable for devices equipped with this feature]: • During UV-C surface disinfection, all LEDs are switched off and the UV-C lamp becomes active.	 UV-C light for surface disinfection.

	UV-C sensor: If no radiation input is detected from the UV-C lamp after 30 seconds, the red LED flashes and the display shows a message indicating that the UV-C lamp is defective.

8.4 Software settings

Software settings and feed:

MENU ENTER	Press **MENU ENTER**, to open the settings menu.	>	Chamber temp.	-20 °C
			Quickfreeze	Off
			UV disinfection	
			Light	Auto

FAST	To move down in the main menu list, press **>FAST<**.		Retraction	5 µm
			Start defrost	
			Contrast	
		>	TIME	TUE 13:05:05

FAST	To move up in the main menu list, press **<FAST>**.	>	Light	Auto
			Light duration	10 m
			Chamber incr	-15 °C
			Retraction	5 µm

MENU ENTER + − MENU ENTER	To change values, select a setting. Press **MENU ENTER**. to open the setting. Change entries by pressing **+** or **-**. Store new settings by pressing **MENU ENTER**.		Light duration	10 m
		>	Chamber incr	-15 °C
			Retraction	5 µm
			Start defrost	

ESC	Press **ESC**, to return to the main menu.	Time	TUE 13:05:05	
			CUT: 7 µm	Trim: 19µm
			Cha: 22 °C (25)	QF: 0
			Status:OK	0000

ESC	**Please note the LOCK function:** The LOCK function can be activated in the basic settings by pressing **ESC** for 2 sec. You end the LOCK function by pressing **ESC** again for a longer time.		
			LOCKED

i	**LOCK function**: All functions and operation are blocked. Exceptions to this are the regulation of the chamber temperature, edge heating, automatic defrosting and automatic disinfection. During disinfection, any pending query is held back until the LOCK function is ended.

8.5 Automatic defrost, disinfection and power saving settings

Software settings and motor:

MENU ENTER	Press **MENU ENTER**, to open the settings menu.	>	Chamber temp	-20 °C
			Quickfreeze	Off
			UV disinfection	
			Light	Auto

MENU ENTER	Select program settings and press **MENU ENTER**, to open the menu for setting automatic defrost and power saving times.		TIME	TUE 13:05:05
			Language	English
			Display version	
		>	Program settings	5 µm

+ –	Enter PIN code 5792. PIN code is usually restricted to service technicians or device administrators.			
			Enter PIN	
			0000	
		>		

+ –	Select defrosting program 1 to 3 and set a time for the automatic defrosting program using the **+** and **–** buttons (e.g., each day at 12:00 h and at 23:00 h).	>	Defr. Start 1	12:00
			Defr. Start 2	23:00
			Defr. Start 3	__:__
			Disinf. Start	__:__

+ –	Set a starting time for the automatic power saving mode using the **+** and **–** buttons (e.g., start at 21:00 h).		Disinf. day	_ _ _ _ _ _ _
		>	Incr. start	21:00
			Incr. end	04:00
			Incr. days	

+ –	Select temperature increase end and set an end time for the automatic power saving mode using the **+** and **–** buttons (e.g., end at 04:00 h).		Disinf. day	_ _ _ _ _ _ _
			Incr. start	21:00
		>	Incr. end	04:00
			Incr. days	_ _ _ _ _ 6 7

+ –	On non-working days, the energy-saving mode can be executed for the whole day (for 24 hours). Use the **+** and **–** buttons to select the non-working days on which the energy-saving mode is to be executed (e.g. Saturday, Sunday).		Disinf. day	_ _ _ _ _ _ _
			Incr. start	21:00
			Incr. end	04:00
		>	Incr. days	_ _ _ _ _ 6 7

1-Monday 2-Tuesday 3-Wednesday 4-Thursday 5-Friday 6-Saturday 7-Sunday

Quick freeze (optional):

MENU ENTER	Press **MENU ENTER** for 2 Sec, to start the quick freeze (optional) function. After 10 min it stops automatically.	>	TIME THU	13:05:05
			Language	English
			Display version	
			Program settings	5 µm

Settings for disinfection parameters:

+ / −	The disinfection cycle works in a semi-automated way. When the system asks for a disinfection, select a time pressing the **+** and **–** buttons (e.g., at 12:00 h the device will ask for a disinfection cycle).		Defr. Start 3	__:__
		>	Disinf. Start	12:00
			Disin. Days	_ _ _ _ _ _ _
			Incr. start	21:00

+ / −	Then select the days on which a disinfection cycle can be activated by pressing the **+** and **–** buttons (e.g., Monday and Tuesday).		Defr. Start 3	__:__
			Disinf. Start	12:00
		>	Disin. Days	1 2 _ _ _ _ _
			Incr. start	21:00

1-Monday 2-Tuesday 3-Wednesday 4-Thursday 5-Friday 6-Saturday 7-Sunday

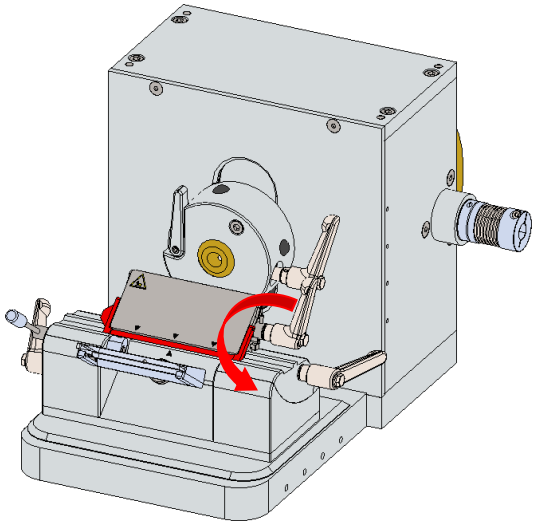
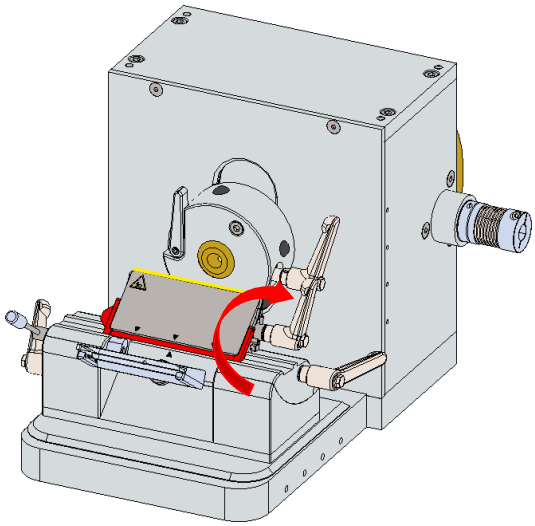
8.6 List of available software settings

Chamber temperature	-35 °C bis 0 °C. The recommended working temperature is -15 °C to -25 °C.
Object cooling (optional)	ON / OFF The compressor-operated object cooling system can be switched on and off via this parameter.
Object temperature (optional)	-45 °C ± 3k The compressor-operated object cooling system can be set via this parameter.
Quick Freeze (optional)	ON / OFF If the device is equipped with the optional fast cooling system, its function can be activated or deactivated. The default setting for automatic deactivation of the quick freeze is set to 30 minutes. The timer for automatic deactivation can be set by an authorized service technician.
UV disinfection (optional)	ON / OFF If the device is equipped with the optional UV-C disinfection system, its function can be activated or deactivated. The default setting for automatic deactivation is set to 30 minutes. The timer can be set by an authorized service technician.
Counter	Number / Total The counter shows the number of sections or the value traveled in µm (total).
Light	ON / OFF / AUTO The white operating light can be switched on or off. If OFF is selected, the white operating light is deactivated, status messages (red or blue light) are still being displayed.

	If AUTO is selected, the white operating light switches off automatically after the time specified under light duration and switches to the respective status indication (red or blue).
Light duration	0 - 99 minutes
Chamber increase	The default setting for the chamber temperature increase is set to -15 °C.
Energy saving mode	For power saving, a higher temperature can be set for defined times and / or days. The selected temperature should be below 0 °C to avoid damage to the microtome by freezing moisture.
Retraction	0 - 200 µm
Defrosting	Activate A manual defrost procedure is activated.
Trim Rast TRIM	ON / OFF If Trim latching mode is activated, trimming function is activated and deactivated by pressing **TRIM** once. If Trim latching mode is deactivated, the trimming function is activated by continuously pressing **TRIM**.
Contrast	Settings for display contrast
Time	Day and time
Language	A language for the menu navigation can be selected from a drop-down list.
Display version	Display of software version.
Program settings	Upon selecting Program settings, the automatic defrost and power saving settings can be changed.

9 OPERATION OF MICROTOME

9.1 Insertion of disposable blades

Activate the handwheel lock. Fold down the finger protection. Release the blade lock by turning the right-hand lever on the blade holder anticlockwise. Remove the blade if necessary.	 Release the blade lock to remove the blade.
Insert the new blade from the side. Secure the blade evenly by turning the right-hand lever on the blade holder clockwise. Fold the finger protection back up. Release the handwheel lock.	 Fixing the blade in the blade holder.

9.2 Orientation of disposable blades

Activate the handwheel lock.

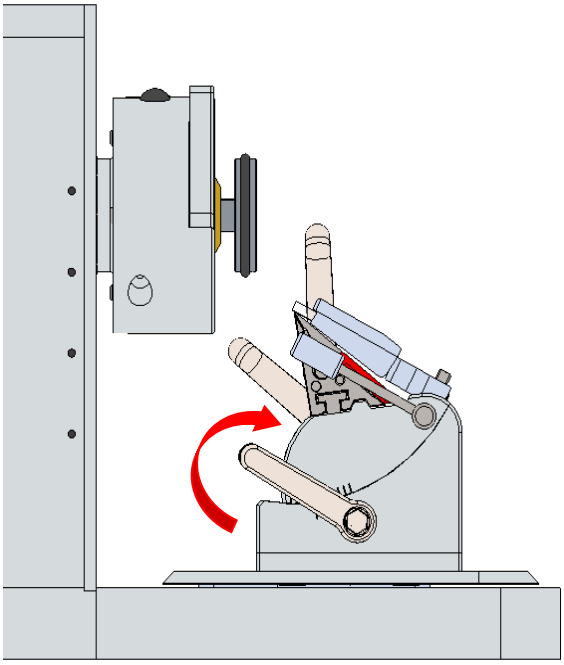
Fold down the finger protection.

For adjusting the cutting angle of the blade, loosen the blade holder fixation by turning the right lever on the blade holder base counter clockwise.

Tilting the blade holder towards the sample increases the cutting angle, tilting the blade holder away from the sample reduces the cutting angle.

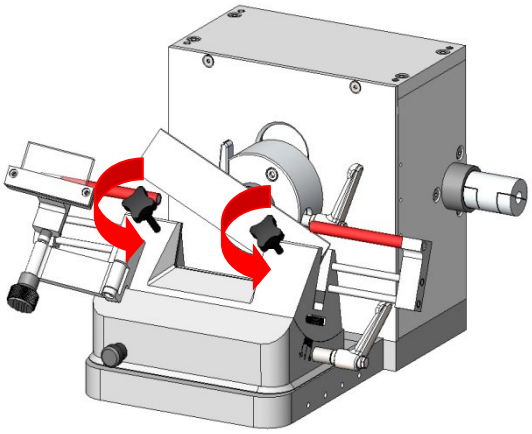
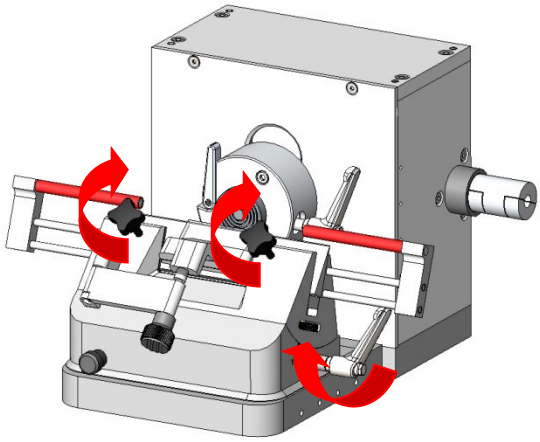
To fix the blade holder, turn the lever counterclockwise.

Release the handwheel lock.



Loosening the blade holder and setting a new cutting angle.

9.3 Insertion and orientation of microtome knives

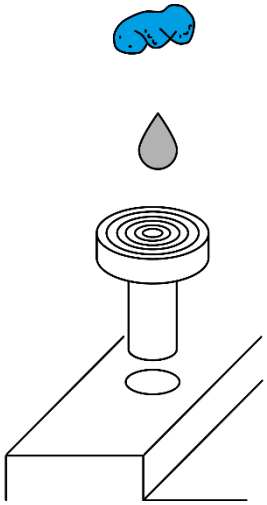
Activate the handwheel lock. Loosen the blade holder by turning the fixing screws counter clockwise.	 Loosening the knife holder and inserting a microtome knife.
Remove / insert the microtome knife. Adjust the height of the knife by turning the adjusting wheels on the right and left side of the knife holder. Fix the knife in the blade holder by turning the fixing screws clockwise. Release the handwheel lock to cut the samples.	 Fixation and height adjustment of the microtome knife.

9.4 Specimen mounting

The device is equipped with 24 freezing positions max. (24 standard resp. 21 + 2 [version incl. quick freezing positions]). The temperature of the quick freezing positions is approx. 10 °C lower than the actual cryo chamber temperature.

In order to prepare a specimen for sectioning, place the specimen holder* on a freezing position, add some drops of embedding medium on the holder and carefully press the object on top

Wait until the object is frozen (mat surface or pressure-resistant).



* The specimen holders with Ø 22 mm, 28 mm, 35 mm come in 5 different colors for each size. The specimen holders with Ø 50 mm are only available in black. The colors make it easier to identify the samples.

9.5 Insertion of object holder

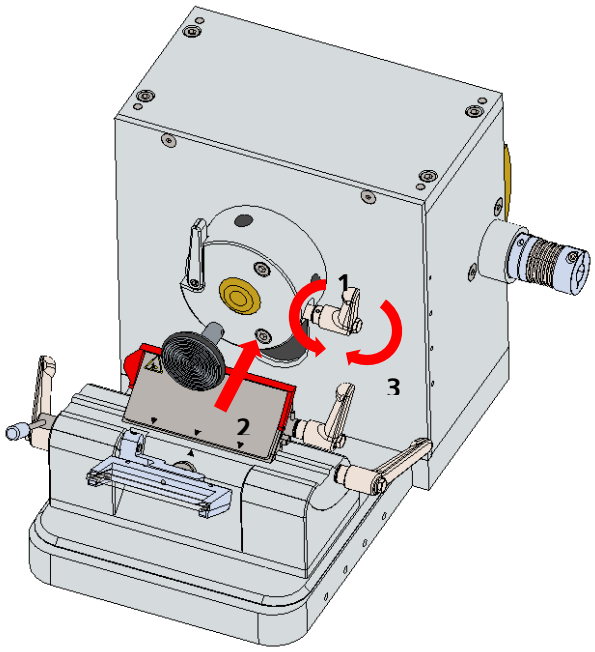
Turn hand wheel to its highest position and activate the hand wheel stop.

Release the object holder fixation by turning the fixation lever counter clockwise (1).

Insert object holder (2).

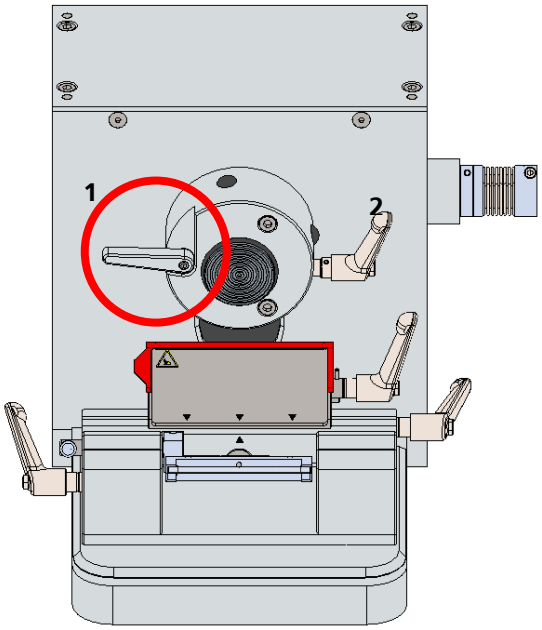
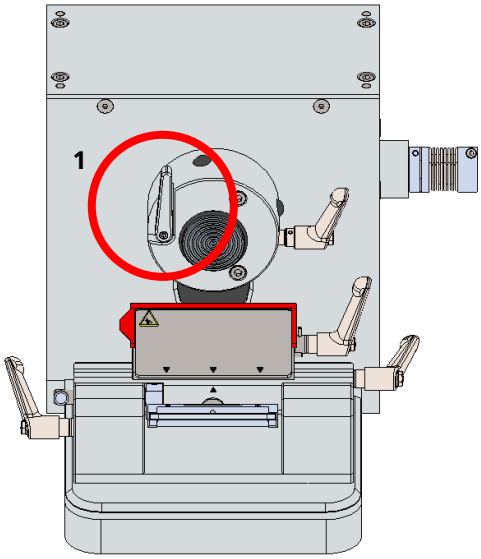
Tighten the object holder by turning the fixation lever clockwise (3).

Please note: The rotation range of the fixing lever is limited to prevent contact with the microtome base plate when the handwheel is being turned.



Release of object holder fixation; removal and / or insertion of object holder.

9.6 Specimen orientation adjustment

Turn the hand wheel to its highest position and activate the hand wheel stop. For orientation of the specimen, open the fixing lever at the left side of the object holder counterclockwise (1). To adjust the orientation, turn the right-hand orientation screw (2).	 Opening of orientation fixation lever and orientation of object holder.
Fix the sample orientation by turning the fixing lever on the left side of the sample holder clockwise (1). Release the hand wheel lock to cut the samples. The object orientation has a zero-point lock and automatically engages the sample holder parallel to the microtome.	 Fixing of sample orientation.

9.7 Fast approach to specimen

FAST	Press **>FAST<**, to move the knife holder base towards the sample.
FAST	Press **<FAST>**, to move the knife holder away from the sample.

9.8 Slow approach to specimen

SLOW	Press **>SLOW<**, to move the knife holder base slowly towards the sample.

9.9 Thickness adjustment for trimming

TRIM + −	To change the trimming settings, press **TRIM** continuously and press + or - o increase or decrease the value.

9.10 Thickness adjustment for cut

TRIM + −	To change the cutting thickness, press **+** or **-**, o increase or decrease the value.

9.11 Trimming of specimen

1. Insert object holder.
2. Orientate specimen as desired.
3. Deactivate the hand wheel stop.
4. Release finger protection.

TRIM	If trim latching mode is activated, trimming function is activated and deactivated by pressing **TRIM** once. Activation of trim latching is displayed (see figure on the right).	Time	TUE 13:05:05
		--TRIM--	Trim: 19 µm
		Cha: -20 °C (-22)	QF: 0
		Status:OK	0000

TRIM	If trim latching mode is deactivated, trimming function is activated by continuously pressing **TRIM**. Activation of trimming function is displayed (see figure on the right). Turn hand wheel evenly clockwise.	Time	TUE 13:05:05
		--TRIM--	Trim: 19 µm
		Cha: -20 °C (-22)	QF: 0
		Status:OK	0000

9.12 Manual cutting

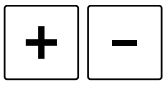
Release the hand wheel stop.

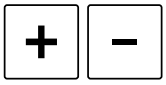
Release the finger protection.

Turn hand wheel evenly clockwise.

A counter clockwise movement of the hand wheel will also result in cutting and incremental advance of the specimen.

Approach specimen either by trimming or slow approach.

	To set the cutting thickness, press **+** or **-**, to change the setting.

	Set the required section thickness. Change entries by pressing **+** or **-**. The selected section thickness is indicated in the display (e.g., 7 µm in this example).	Time	TUE 13:05:05
		CUT: 7 µm	Trim: 19 µm
		Cha: -20 °C (-22)	QF: 0
		Status:OK	0000

Turn the hand wheel until even sections are being cut.

Clean the microtome knife or disposable blade (always away from the cutting edge) with a cold brush.

Position anti-roll plate onto the microtome knife or disposable blade. If necessary, readjust the height of the guide plate.

After successful cutting, activate the hand wheel lock in the lowest position and transfer the section onto a microscope slide.

	To keep it cool, always store the brush in the chamber.

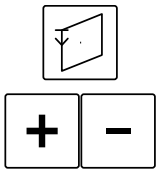
9.13 Motor settings

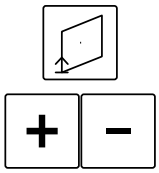
Release the hand wheel stop.

Remove the finger protection.

ON OFF	To set the speeds for the cutting mode, press **ON OFF** to activate the cutting mode.	Time	TUE 13:05:05
		CUT: 7 µm	Trim: 19µm
		Cham: -20 °C (-22)	QF: 0
		Status:OK	0000

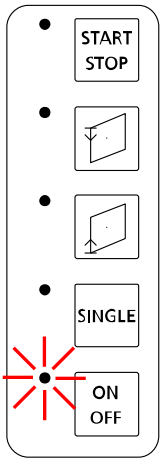
ON OFF	The display will show the speeds for the downward movement (↓) and the upward movement (↑) of the specimen head.	Time	TUE 13:05:05
		Trim: 19µm	Trim: 19µm
		QF: 0	QF: 0
		↓ 40 mm/s	↑ 125 mm/s

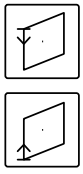
	To change the settings for the downward movement, press **WIN DOWN** and **+** or **-** at the same time to increase or decrease the speed.	Time	TUE 13:05:05
		Trim: 19µm	Trim: 19µm
		QF: 0	QF: 0
		↓ 35 mm/s	↑ 125 mm/s

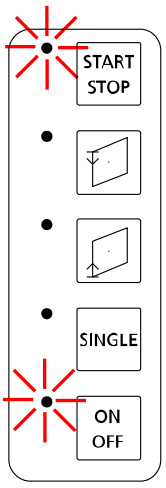
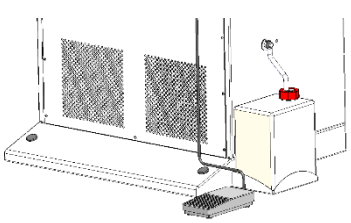
	To change the settings for the upward movement, press **WIN UP** and **+** or **-** at the same time to increase or decrease the speed.	Time	TUE 13:05:05
		Trim: 19µm	Trim: 19µm
		QF: 0	QF: 0
		↓ 40 mm/s	↑ 140 mm/s

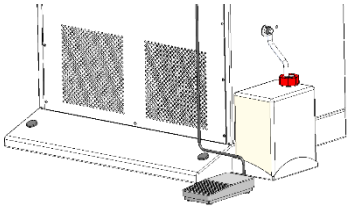
9.14 Continuous cutting

Release hand wheel stop.

ON OFF	Release the handwheel lock. Press **ON OFF** to activate the cutting mode. The LED lamp on the left-hand side of the switch lights up when the motor is activated.	 Activation of the cutting mode is indicated by the LED lamp lighting up.

	Select the end position of the specimen head after cutting. **WIN DOWN**: The specimen head will stop at the highest position. **WIN UP:** The specimen head will stop at the lowest position.

START STOP	Now press **START STOP** to start the motor. You can also use the installed foot switch for this (see illustration below). The LED lamp on the left-hand side of the switch lights up when the motor is running.	 The activation and running of the cutting motor is indicated by the LEDs lighting up.
START STOP	Press **START STOP** to stop the motor. You can also use the installed foot switch for this.	 Foot switch for the cutting motor control.

START STOP	Switching whether the cutting motor should be activated by pressing the start button once or twice is done in the settings menu. If double actuation (2 x) is activated, the button must be pressed twice with a maximum interval of 1 s to start the cutting operation. You can also use the installed foot switch to start cutting mode.	 Foot switch for the cutting motor control.

	Manual cutting is not possible as long as the cutting mode is activated.
	Do not start the motor with the handwheel lock activated. Failure to do so will result in damage to the appliance!

To trim the sample, select the trim level as described in chapter 8.9 (SETTING THE TRIMMING).

TRIM	If the Trim latching mode is activated, the trim function is activated and deactivated by pressing **TRIM** once. The activation of the trim function is shown in the display. Display with activated trim function.	Time	TUE 13:05:05
		--TRIM--	Trim: 19µm
		Cha: -20 °C (-22)	QF: 0
		↓ 40 mm/s	↑ 125 mm/s

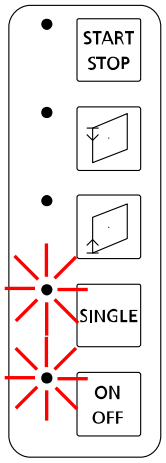
Activation of the Trim latching mode is described in chapter 8.9.

TRIM	If the Trim latching mode is deactivated, the trim function is activated by continuously pressing **TRIM**. Display with deactivated trim function.	Time	TUE 13:05:05
		CUT: 7 µm	--TRIM--
		Cha: -20 °C (-22)	Cha: -20 °C (-22)
		↓ 40 mm/s	↓ 40 mm/s

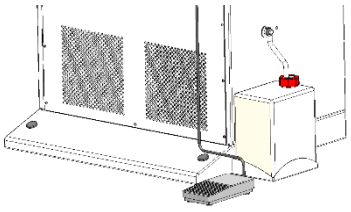
	Alternatively, **WIN UP** can also be pressed continuously for accelerated trimming in Trim Rast mode in order to increase the cutting speed briefly while pressing. The cutting motor speed selected for the upward movement is kept constant and is also used for the downward movement, see also chapter 9.12. If **WIN UP** is no longer pressed, the cutting motor will return to the selected cutting motor speeds for the upward and downward movements.

9.15 Single cutting

Release hand wheel stop.

ON OFF SINGLE	For single cuts, press **ON OFF** to activate the cut mode and **SINGLE** to activate the single cut mode. The LEDs on the left-hand side of the switches light up when cut mode and single cut mode are activated.	 Activation of cut mode and single cut mode is indicated by the LEDs on the left-hand side of the control panel lighting up.

 	Select the stop position of the specimen head after cutting. **WIN DOWN**: The specimen head will stop at the highest position. **WIN UP:** The specimen head will stop at the lowest position.

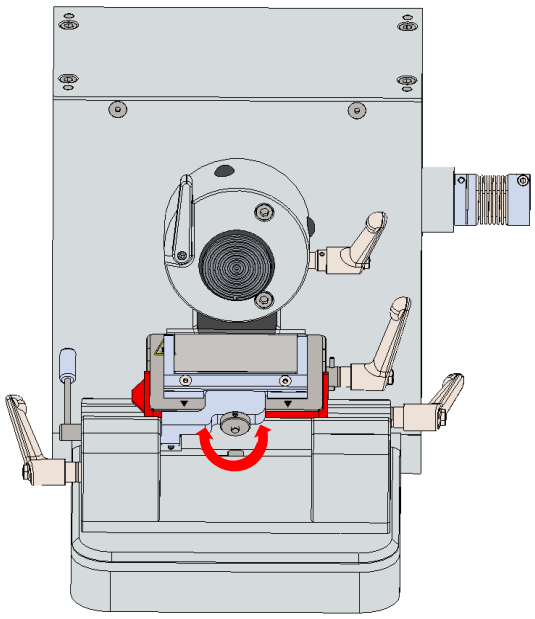
START STOP	Press **START STOP** to start the motor. You can also use the installed foot switch to do this. The motor will stop automatically after one cut in the selected end position.	 Foot switch for the cutting motor control.

	Manual cutting is not possible as long as the cutting mode is activated.
	Do not start the engine with the handwheel lock activated. Failure to do so will result in damage to the appliance.

9.16 Anti-roll plate

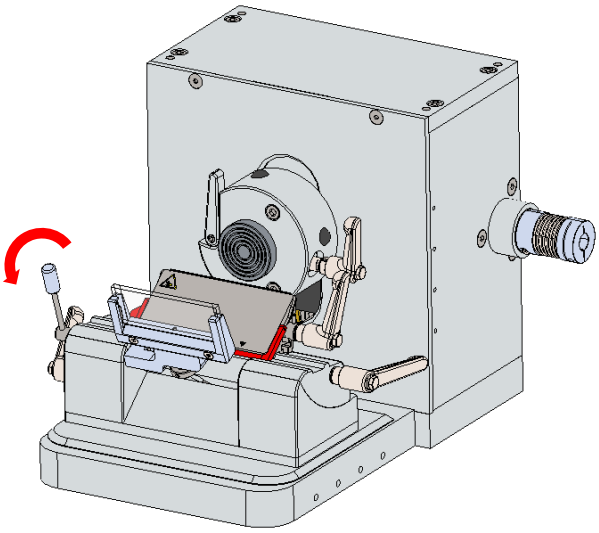
Each device is equipped with an anti-roll plate.

To adjust the vertical position of the anti-roll plate, turn the small wheel on the basis of the anti-roll plate to the left (towards blade) or to the right (away from blade).

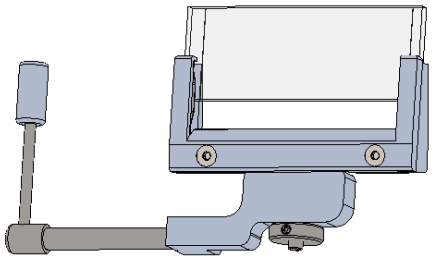


Vertical adjustment of anti-roll plate.

To pick-up the sections turn the anti-roll plate sidewards and put a slide onto the cut section. The section will stick to the slide.



Fold the anti-roll plate out.

To replace the anti-roll plate, loosen the two screws with the 2 mm Allen key. Then swivel the anti-roll plate forwards and carefully pull it upwards out of the holder. Insert the new anti-roll plate. Make sure that the outer raised sides are facing away from you. Then tighten the two screws again.	 Exchange of the anti-roll plate

	It is recommended to adjust the setting of the height of the anti-roll plate during the cutting process.

9.17 Tips and tricks – tissue sectioning

The temperature of the cryostat plays an important role in the quality of the tissue sections obtained. Each type of tissue requires a different temperature. The following list provides an indication. Please note that the temperature ranges indicated in the table below are approximate values and may require adjustments for individual tissues.

Type of tissue	**Recommended temperature range at the knife or blade edge (°C)**
Bone marrow	-16 down to -25
Brain	-7 down to -10
Breast with fat	-25 down to -30
Breast without fat	-16 down to -20
Cartilage	-13 down to -20
Fat	-30 down to -40
Heart	-20 down to -25
Intestinal	-13 down to -20
Kidney	-13 down to -20
Larynx	-13 down to -16
Lip	-10 down to -20
Liver	-7 down to -13
Lung	-13 down to -20
Lymph-node	-13 down to -20
Lymphatic	-13 down to -20
Lymphoid	-13 down to -20
Muscle	-13 down to -20
Nose	-13 down to -20
Rectal	-13 down to -20
Scrapings	-16 down to -25
Skin with fat	-16 down to -25
Skin without fat	-10 down to -16
Spleen	-7 down to -10
Testicle	-10 down to -13
Tongue	-13 down to -20
Uterine-curettage	-7 down to -10

9.18 Tips and tricks – cutting artifacts

Cutting artifact	Cause	Remediation
Alternating thin and thick cuts	wrong temperature of the cutting edge / blade	select temperature according to the tissue type
	wrong temperature of the cryo chamber	adjust temperature
	sample is not optimally fixed on specimen holder	remove sample and freeze again
Squeaking sound when cutting, cuts show chattering	sample is not optimally fixed on specimen holder, vibrates during cutting	remove sample and freeze again
Formation of fractures in frozen tissue	freezing was too fast	freeze new sample, if possible
	sample is too big	
Feed takes place but no sections emerge	loose blade	check clamping
	sample is not optimally fixed on specimen holder	remove sample and freeze again
	wrong blade angle	correct angle
	anti-roll plate is too far in the front	adjust anti-roll plate with the adjusting screw
	specimen is not frozen yet	let tissue freeze longer
Sections distort or roll up	gap of the anti-roll plate is too small	set up / adjust
	thickness of sections is too thin	increase thickness of sections
	blunt blade	change blade and / or move laterally
Section cracks up	sample is over frozen	freeze new sample, if possible
	destroyed or dirty blade / edge	change anti-roll blade
Cuts thaw during cutting	cryostat or cutting temperature is too high	correct temperature
Frost on the blade	cryostat was open too long	close the cryo chamber
Section sticks to the anti-roll blade	gap of the anti-roll plate is too small	set up / adjust
	tissue or fat covers the anti-roll plate	clean anti-roll plate
	inappropriate cryostat or blade temperature	correct temperature
Section twists to one side	deposits on cutting edge	clean blade / cutting edge
	gash in the blade, blunt blade	change blade and / or move laterally
	anti-roll plate is broken	change anti-roll blade
Section detaches from slide	cut fixed tissue without adhesive	use adhesive
	no adhesive used	
	fat tissue	
	cartilaginous tissue	

	handling too rough	work more cautiously, more carefully
Section shows horizontal columns	specimen is too cold	correct temperature
		warm up specimen

9.19 Tips and tricks – cutting angle

Problem	Cause	Remediation
Hard tissue does not cut well	cutting angle is too small	tilting the blade away from the specimen increases the clearance angle
Soft tissue does not cut well	cutting angle is too big	tilting the blade towards the specimen reduces the clearance angle

10 OPERATION OF CRYOSTAT

10.1 UV-C disinfection

[only for devices with this optional feature]

UV-C radiation at 254 nm has an intense germicidal effect. Microorganisms, such as viruses, bacteria, fungi and yeasts are effectively destroyed in the area accessible to UV-C light without the addition of chemicals.

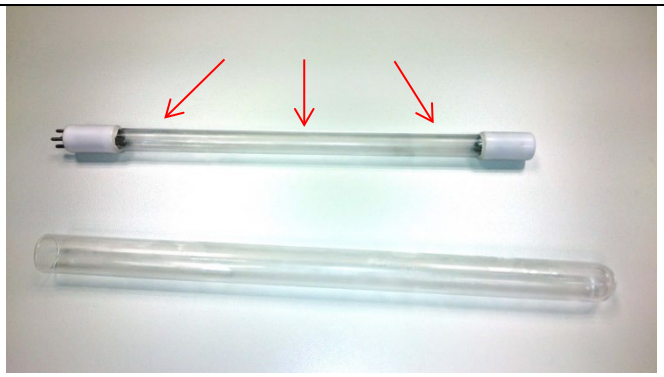
The cryostat MNT can be optionally equipped with an UV-C light source that can either be automatically activated (see chapter 8.5) or manually activated.

The default setting for the UV-C light duration and the automatic deactivation is set to 30 minutes. The timer can be set by an authorized service technician.

i	For safety reasons the UV-C light will be deactivated automatically when opening of the lid of the cryo chamber. The UV-C disinfection of the surfaces will be aborted and has to be activated again. The OSEI-system of the cryostat flashes red (see chapter 8.3 LED display OSEI-system). The default setting for automatic deactivation is set to 30 minutes. The timer can be set by an authorized service technician.

10.2 Installation instructions for UV-C lamp

Please follow the respective steps and pay attention to the relevant instructions.

Never touch the UV-C lamp directly on the glass, since this may reduce the durability.	 Picture 1
Slide the UV-C lamp as shown into the glass bulb. Keep 2 cm space before the end position will be reached. This place will be needed to connect the UV-C lamp with the connecting plug (picture 2 and 3).	 Picture 2
	 Picture 3
The connector can be plugged into two directions of polarity. A switch is excluded.	 Picture 4

	 Picture 5
Once the plug is connected to the UV-C lamp, the UV-C lamp unit can finally be clipped into the retaining clips.	 Picture 6
Done.	 Picture 7

10.3 Quick freeze position

[only for devices with this optional feature]

The MNT floor-standing cryostat can be optionally equipped with a quick freeze position (2 positions). Upon activation, the installed element will cool the two quick freeze positions down to approximately -55 °C.

The quick freeze position can be activated in the settings menu (see chapter 8.4).

	The default setting for automatic deactivation of the quick freeze is set to 40 minutes. The timer for automatic deactivation can be set by an authorized service technician.

10.4 Object cooling

[only for devices with this optional feature]

The MNT floor-standing cryostat can be optionally equipped with object cooling.

The object cooling can be activated in the settings menu (see chapter 8.4).

	To prevent the object head / sample holder from icing up, the object cooling switches off after 10 minutes of inactivity. Object cooling is reactivated when the window is opened, the hand-wheel is turned or the keypad is operated. Once the set temperature has been reached, the timer restarts.

10.5 Extraction system

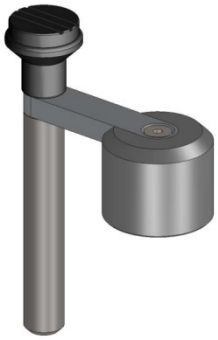
[only for devices with this optional feature]

The MNT floor-standing cryostat can be optionally equipped with an extraction system for cutting waste / debris.

The suction is activated via the foot switch on the left-hand side of the appliance (see chapter 3 Overview device).

When the foot switch is being pressed, the suction starts. The cutting waste can be extracted via a hose in the cryo chamber. The debris is being collected in a container which then can be easily emptied. When you release the foot switch, the suction stops.

10.6 Heat extractor

For an even more rapid freezing process with improved structural preservation of tissues, the device is equipped with a heat extractor. Apply the heat extractor on top of the specimen during the freezing process.	 Illustration similar

	The application of the heat extractor can lead to a change of orientation of the specimen in the frozen block, especially when it comes to smaller samples. If precise orientation of the specimen is required, the freezing procedure should be performed without the heat extractor.

10.7 Automatic / manual defrost

For an optimal effect of the cooling machine, a low thermal resistance at the cooling ribs is crucial. Frequent use of the cooling machine condenses moisture on the cooling ribs and increases the thermal resistance. Therefore, the device, in particular the cooling ribs, is automatically defrosted.

During an automatic or manual activated defrost hot gas from the cooling system is pressed through the evaporator. The ice melts, and the water drops into the condensate water collecting container.

The defrosting process ends at a temperature of 20 °C on the evaporator. The chamber temperature remains in the minus range, so that samples which are stored there do not thaw.

	The default setting for automatic defrost is set to 00:00 o'clock (midnight) each day. To adjust the settings, please refer to chapter 8.5. Always keep the front cover closed during the process.

10.8 Complete defrosting of the device

It is highly recommended to defrost the device at least every 6 months. If the device is used regularly in warm tropical climate, a more frequent complete defrost might be necessary. The device should be defrosted for a minimum period of 48 h, better over the weekend.

- Turn the hand wheel to its highest position and activate the hand wheel stop.
- Remove samples and tools from the cryo chamber.
- Switch off the device.
- Be sure to open the window and leave it open until it is switched back on.

Before restarting:

- Make sure that the microtome and the cooling chamber are completely dry in order to avoid a decision.
- Close the window.
- Switch the device back on.

	Before starting a complete defrost of the device, make sure that all samples have been removed from the cryo chamber. Before switching the device on again, the microtome and the cooling chamber must be completely dry to prevent damage.

10.9 Emptying the defrosting water collecting container

The unit is equipped with a container for defrosting water. The filling level of the collecting container is checked with a fill level sensor. As soon as "full container" is displayed in the display, the collecting container must be emptied in order to avoid overfilling.

	The contents of the defrosting water collecting container should be disposed of according to laboratory regulations. To reduce the risk of contamination and infection after emptying, it is recommended to fill a disinfectant concentrate into the container.

11 CLEANING AND MAINTENANCE

11.1 Cleaning

The recommended frequency of cleaning of the cryostat chamber depends on how frequently the device is used.

	Wear protective clothing and disposable gloves according to Good Laboratory Practices. Please take note of the safety aspects of the device. Only use aqueous and alcohol-based cleaning agents, no Acetone or Xylene. Never spray or use cleaning medium directly onto the touch panels.

11.2 Disinfection

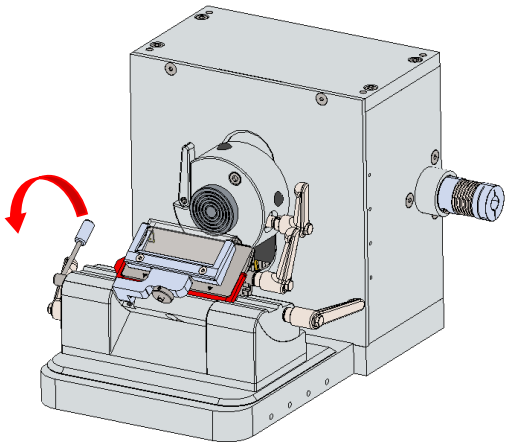
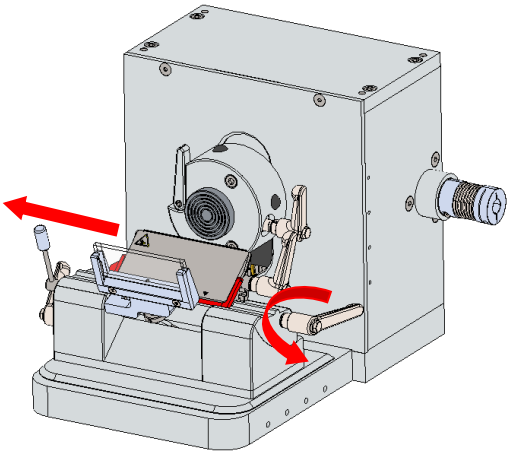
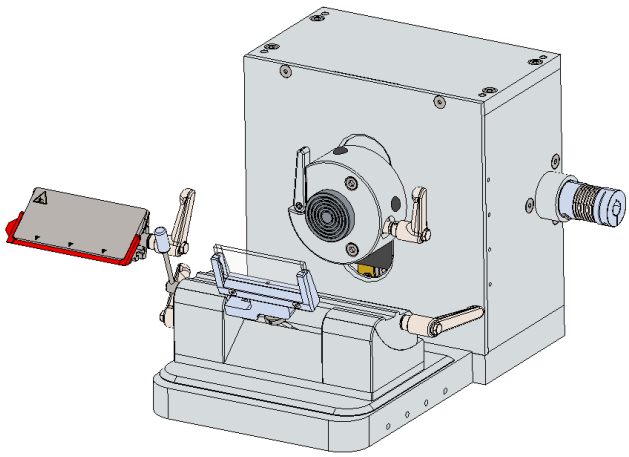
Spray disinfection with alcohol-based disinfectants is applicable without removing the microtome from the cryo chamber. When disinfecting the device, take appropriate protective measures (gloves, mask, protective clothing, etc.).

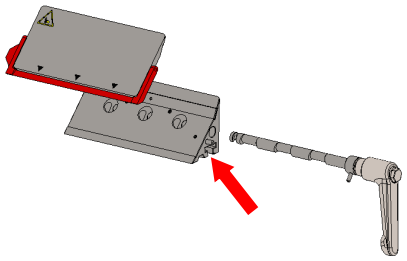
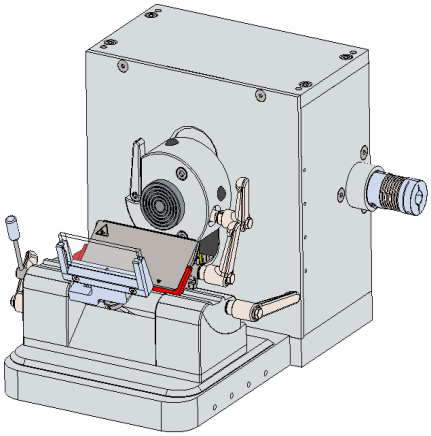
	Wear protective clothing and disposable gloves according to Good Laboratory Practices. When using detergents and disinfectants please comply with the safety precautions of the disinfectant manufacturer! The integrated anti-roll plate of the blade holder can be cleaned with alcohol. Dispose of waste liquid according to the waste disposal regulations! Do not turn the device on before the cryo chamber and the microtome are completely dry. Otherwise, built-up of ice can damage mechanical parts. All components removed from the cryostat must be carefully dried before returning them to the cryo chamber!

11.3 Recommended maintenance and service schedule

Daily	Remove frozen section waste from the cryostat chamber after every day of usage. Disinfect if necessary.
Weekly	Cleaning of blade holder (see chapter 11.4). Cleaning of window.
Monthly	Check of temperature sensor in cryo chamber. Cleaning of cryostat ventilation (see chapter 11.5).
Yearly	Complete service (performed by authorized Slee service technician) • check of all functions • complete defrost • maintenance of microtome • oiling of movable parts • check of cooling system • check of driving system • complete disinfection / cleaning / drying

11.4 Cleaning of disposable blade holder

Turn the handwheel to the highest position and activate the handwheel lock. Fold the pressure plate forwards using the lever.	
Remove the blade from the blade holder. Loosen the upper part of the blade holder by turning the right-hand lever counterclock-wise. Slide the upper part of the blade holder to the right …	
… until you can remove the lateral carriage.	

Separate the lateral slide from the eccentric shaft by simultaneously turning and pulling out the shaft. To pull out the eccentric shaft, it must be rotated over the small pin in the carriage. To do this, push the pin into the carriage and turn the shaft over it. Make sure that all other parts remain in place when disassembling, especially the two pressure springs inside the carriage. After removing the clamping plate, both parts can be cleaned.	
After cleaning, the lateral carriage can be reassembled and mounted on the blade holder.	

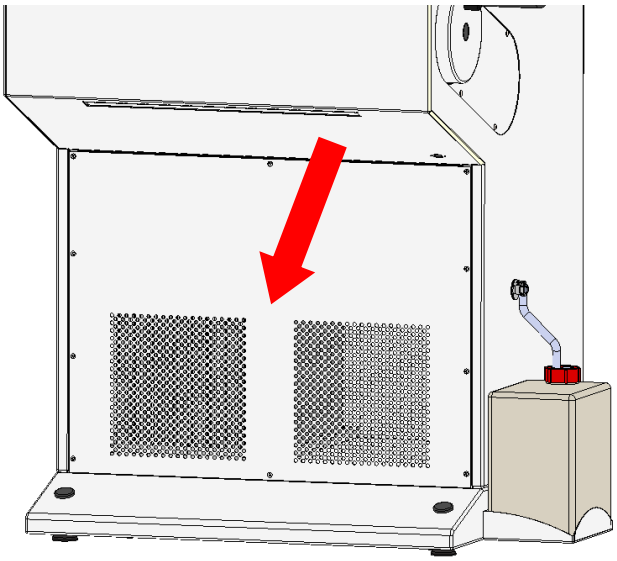
11.5 Cleaning of cryostat ventilation

During daily use, dust settles on the fins of the condenser. This can affect the cooling capacity of the appliance.

Monthly cleaning of the cryostat ventilation is recommended.

MNT: 2 ventilation grilles at the front

We recommend to use a vacuum cleaner for cleaning.



Picture MNT (cleaning from the front)

12 OPTIONAL ACCESSORIES

	MNT
Blade remover, magnetic	34004113
Standard knife holder	10156010
Microtome knife (16 cm C-cut, 1 pcs.)	28000026
Disposable blade holder (low and high profile)	10157004
Object holder rack (stainless steel)	31000769
Heat extractor block	31000253
Object holder (Ø 22 mm; 5 pcs., 5 different colors)	30000002
Object holder (Ø 28 mm; 5 pcs, 5 different colors)	30000017
Object holder (Ø 35 mm; 5 pcs., 5 different colors)	30000000
Object holder (Ø 50 mm; 5 pcs., black)	30000003
Section removal brush	30001030
Pressure plate (glass, 40 x 26 x 3 mm)	32203206
Pressure plate (glass, 70 x 26 x 3 mm)	32203307
Footrest, height adjustable	10157009
Ergosit laboratory chair, low, with castors	10157011
Ergosit laboratory chair, high, with foot ring and sit-stop castors	10157010
Cork plates (Ø 20 mm, 100 pcs.)	30001001
CryoGlue embedding medium (4 x 125 ml)	30001100
Anti-roll plate (standard knife holder, plastic)	32001049
Disposable blades (plasma coated), low profile plasma LPS; for soft specimens, 50 pcs. / box	28407005
Disposable blades (plasma coated), low profile plasma LPH; for hard specimens, 50 pcs. / box	28407004
Disposable blades (plasma coated), high profile plasma HPS; for soft specimens, 50 pcs. / box	28407007
Cryostat low temperature oil (50 ml)	30001011
Filter for extraction system, 5 pcs.	33000417
Foot switch	34001500
Cooling bar cover	32000497
Waste tray (devices without extraction system)	32000604
Waste tray (devices with extraction system)	32000606
Brush tray (only for devices without extraction system)	32000605

13 Service

Internal components should only be serviced by technicians authorized by SLEE medical GmbH.

If technical service or spare parts are necessary, please contact your local SLEE medical GmbH distributor. Please have the following information available:

- complete contact details,
- type of device and serial number,
- location of device and name of user,
- purpose of service call,
- delivery date of the device.

If it is necessary to return the device, it must be cleaned and disinfected before delivery. It must be returned in its original packing.

If the device or parts thereof are sent back in a dirty or non-disinfected condition, we reserve the right to not accept the delivery of the device.

	Please ask for our decontamination protocol before returning the cryostat.

14 WARRANTY

SLEE medical GmbH guarantees that the product delivered has been subjected to a comprehensive quality control procedure, and that the product is faultless and complies with all technical specifications and / or agreed characteristics warranted.

SLEE medical GmbH guarantees that the device is manufactured under an ISO 9001:2015 and ISO 13485:2016 quality management system.

Unauthorized modification or repair by third party persons will void the warranty.

Only original SLEE medical GmbH spare parts must be used.

Guarantee claims can be put forward only if the device is used according to this manual and for the purpose described.

Mistakes and errors which occur because of improper use cannot be accepted.

15 DISPOSAL

The device or parts of the device must be disposed of according to existing local applicable regulations.

Notes

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