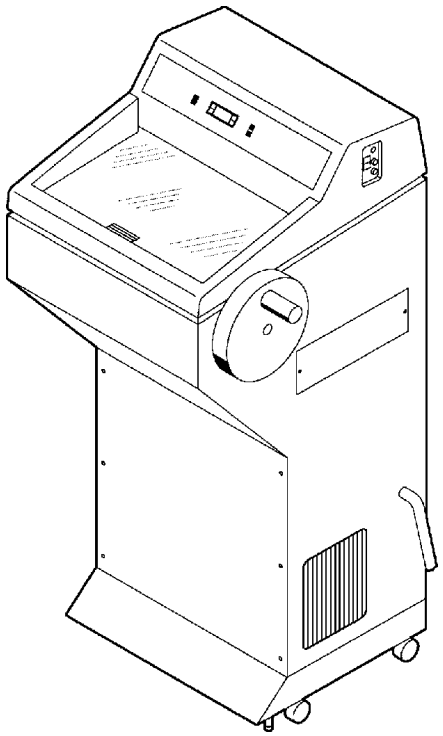

Leica CM 1510

Cryostat

Instruction Manual

Leica CM 1510 V2.1 English – 12/2001

Always keep this manual near the instrument!
Read carefully prior to operating the instrument!

Leica
MICROSYSTEMS

Serial No. .....

Year of manufacture: .....

Manufactured: ..... Federal Republic of Germany

Until the ratification of the guideline for in-vitro diagnostic instruments this product is categorized according to the MedGV (National Regulations for Medical Appliances) as a Class 3 equipment.

The information, numerical data, notes and value judgments contained in this manual represent the current state of scientific knowledge and state-of-the-art technology as we understand it following thorough investigation in this field. We are under no obligation to update the present manual periodically and on an ongoing basis according to the latest technical developments, nor to provide our customers with additional copies, updates etc. of this manual.

For erroneous statements, drawings, technical illustrations etc. contained in this manual we exclude liability as far as permissible according to the national legal system applicable in each individual case. In particular, no liability whatsoever is accepted for any financial loss or consequential damage caused by or related to compliance with statements or other information in this manual.

Statements, drawings, illustrations and other information as regards contents or technical details of the present manual are not to be considered as warranted characteristics of our products. These are determined only by the contract provisions agreed between ourselves and our customers.

Leica reserves the right to change technical specifications as well as manufacturing processes without prior notice. Only in this way is it possible to continuously improve the technology and manufacturing techniques used in our products.

For the instrument serial number and year of manufacture, please refer to the name plate at the back of the instrument.

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2. Table of contents

3.1 Safety features

The instrument design incorporates the following safety features: handwheel lock, a knife guard on the knife holder CN and the anti-roll guide of the knife holder CE that has the protective function of a knife guard.
These safety devices have always to be used by the operator. In addition, all safety precautions in this manual have to be observed by the operator.

3.1.1 Handwheel lock

Always lock the handwheel when manipulating in the cryochamber or when changing the specimen!

The handwheel can be locked in the upper turning point.

- Rotate the handwheel until the handle **(1)** is positioned in the upper turning point.
- To lock, push the lever **(2)** to the right.
- To unlock, push the lever **(2)** to the left.

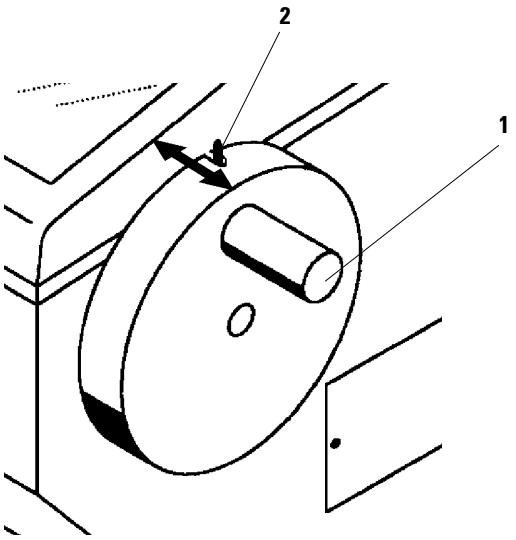


Fig. 5

3.1.2 Knife guard

Prior to manipulating the knife and specimen, or during breaks, always cover the knife edge with the knife guard!

The knife holder has a knife guard which is positioned over the knife edge to prevent injury.

3.2 General hazards

Despite the safety features provided for operator safety, the use of the instrument and the applications for which is designed involve certain risks that cannot be totally eliminated:

- The handling of microtome knives involves a risk of injury.
- The handling of cold parts can cause frostbite.
- The sectioning of infectious and/or radioactive materials represents a hazard.

Operating conditions

Transport and installation

- The instrument must be transported in an upright position only, or at an angle of max. 30 °!
- Do not operate in rooms with explosion hazard!
- To ensure an adequate cooling capacity, the instrument must be set up with at least 10 cm distance from walls and furniture!
- Do not place anything next to the compressor ventilation grid (right side of the cabinet) to ensure adequate ventilation!
- Remove the protective foam parts for the microtome and for the evaporator prior to operating the instrument (see Fig. 13.2)!

Connection to mains power

- Please refer to the 'Technical data'!
- The instrument must be connected to a grounded mains power outlet socket.
- During the start-up of the compressor the nominal voltage must not drop below the values specified in the 'Technical data'.

  Please note that the compressor requires a start-up current between 45 and 50 A. Therefore, the electric circuit at the installation site must be inspected by an electrical engineer to ensure that it meets the requirements for a smooth operation of the instrument. A constant adequate power supply to the instrument must be ensured at all times. Failure to comply with the above will cause severe damage to the instrument.
- After transporting, wait at least 4 hours before turning the instrument on.

  This waiting period is necessary to allow the compressor oil, which may have been displaced during transport, to return to its original position.
  Failure to comply with this can cause severe damage to the instrument.

Sectioning

- Take care when handling microtome knives and disposable blades.
  The cutting edge is extremely sharp and can cause severe injury!
- Never leave knives/blades or knife holders with a knife/blade mounted lying around!
  Always keep the knife in the knife box when it is not used!
- Do not place a knife on a table with the cutting edge facing upward!
- Never try to catch a falling knife!
- Always clamp the specimen before the knife!
- Take care when removing the section - the cutting edge is exposed!
- Prior to manipulating the knife and specimen, or changing the specimen or knife, and during breaks, always lock the handwheel and cover the cutting edge with the knife guard!
- Avoid skin contact with cold parts of the instrument as this can cause frostbite!

Cleaning and disinfection

- Do not use organic solvents or any other aggressive substances for cleaning and disinfection!
  We strongly recommend the use of Leica Cryofect disinfectant spray! Only use alcohol or common disinfectants based on alcohol!
- For spray disinfection follow the instructions for use supplied with the disinfectant!
- Do not use external heaters for drying the cryochamber. This can cause severe damage to the cooling system!

Removal of the microtome

- Before removing the microtome, turn the instrument off with the mains switch and disconnect it from mains!
- Before taking the microtome out of the cryochamber, place the handle of the handwheel in the lowest position.
  When removing the microtome, the specimen head will rapidly fall down and might injure the operator's hands!
- Wear appropriate protective gloves to remove the cold microtome from the cryochamber. Risk of frost bite!
- The microtome must be completely dry before reinstallation. Humidity inside will condense and freeze in the cold cryostat and thus may cause malfunctions or damage.

Maintenance

- Only qualified and authorized service personnel may access the internal components of the instrument for service and repair.
- Clean the compressor ventilation grid at least once a year or more often if required!

Fuse replacement (Chapter 11)

- Turn the instrument off with the mains switch and pull the mains plug, before replacing the fuses.
- Only use fuses of the same specification! For the required values, please refer to Chapter 4 'Technical data'.

Lamp replacement (Chapter 11)

- Turn the instrument off with the mains switch and pull the mains plug, before replacing the lamp.
- If the lamp is broken, it must be replaced by the technical service, as the replacement involves a high risk of injury.
- Do not use lamp type other than specified by the manufacturer!

4. Technical data

Operating temperature range: 18 °C to 40 °C.
All specifications related to temperature are valid only for an ambient temperature up to 22 °C and for an air humidity lower than 60%!

Type	CM 1510	CM 1510
Nominal voltage	120 V AC ±10%	230 V AC ±10%
Nominal frequency	60 Hz	50 Hz
Power draw	1500 VA	1500 VA
Protective class	I	I
Mains fuses	2 x T 15 A Type MDA (UL-listed) or automatic circuit breaker T 15 A	2 x T10A Type MDA (DIN-IEC 127-II) or automatic circuit breaker T 10 A
Pollution degree	2	2
Overvoltage installation category	II	II

Refrigeration - Cryochamber

Temperature range	0 °C to -30 °C ±10% at an ambient temperature of 22 °C and air humidity ≤ 60% when sliding window is closed; adjustable in 1-degree increments	
Temperature of quick-freeze shelf	max. -44 °C at a chamber temperature between -20 °C and -30 °C	
Defrosting	automatic hot gas defrosting, defrost time freely programmable, manual defrosting duration: 8 min.	
Power draw	850 W	495 W
Refrigerating output at an evaporation temperature of -25 °C	780 W	585 W
Nominal pressure	25 bar (maximum value)	
Safety factor	3	
Refrigerant	240 g ± 5 g R404A *	
Compressor oil	0.6 l EMKARATE RL244b, ICI *	

*** Refrigerant and compressor oil must be replaced by authorized service personnel!**

Microtome

Type	Rotary microtome
Section thickness setting	1 - 50 µm in 1 µm increments from 1 to 10 µm in 2 µm increments from 10 to 20 µm in 5 µm increments from 20 to 50 µm
Specimen orientation	± 8°
Specimen feed	25 mm
Vertical stroke	59 mm
Coarse feed speed	0.8 mm/s

Cryocabinet

Dimensions		
	Width (excluding handwheel)	580 mm
	Width (including handwheel)	680 mm
	Depth	680 mm
	Height (arm rest)	1010 mm
	Overall height	1175 mm
Weight including microtome	105 kg	

5.1 Leica CM 1510 and components

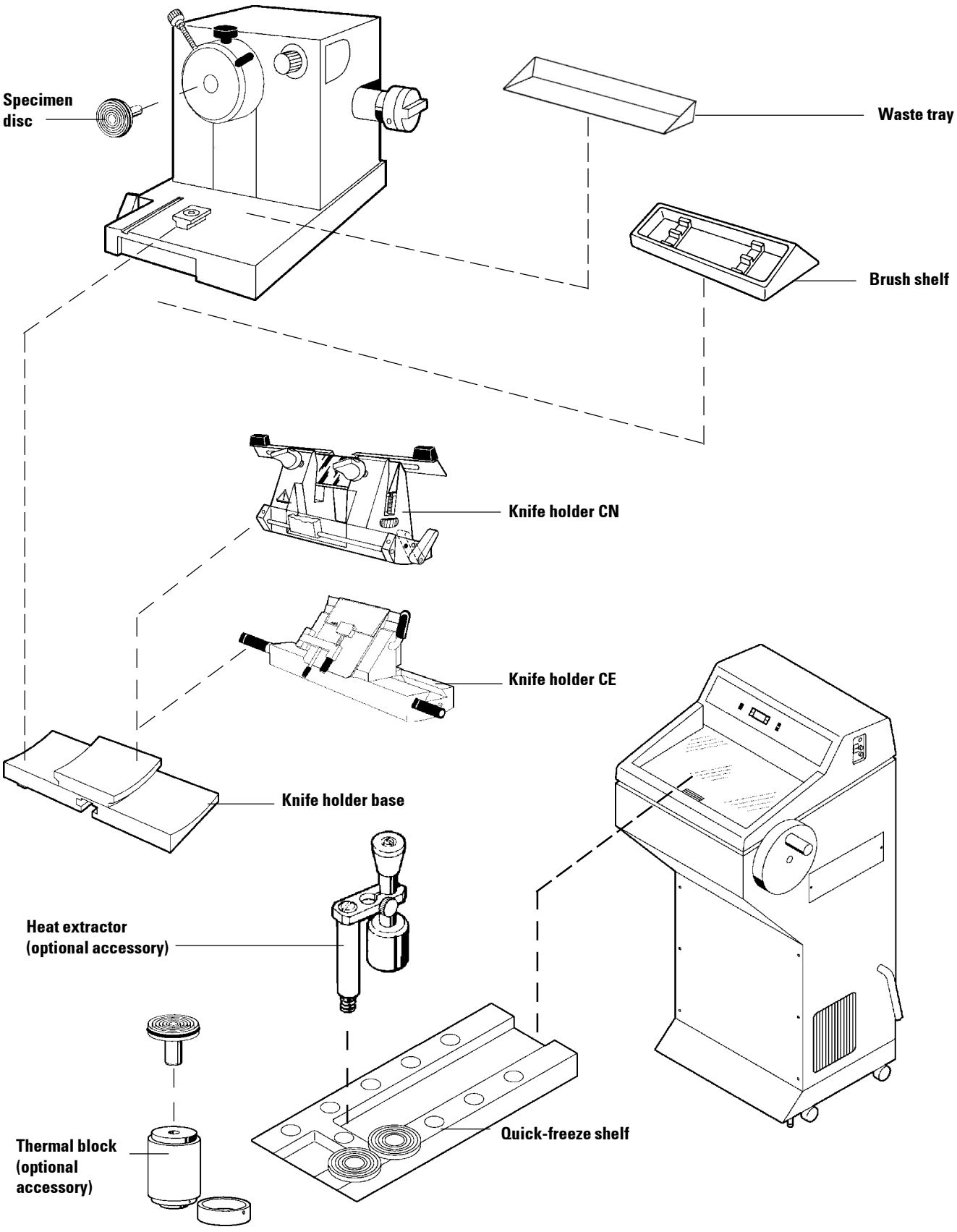


Fig. 9

5.2 Product description

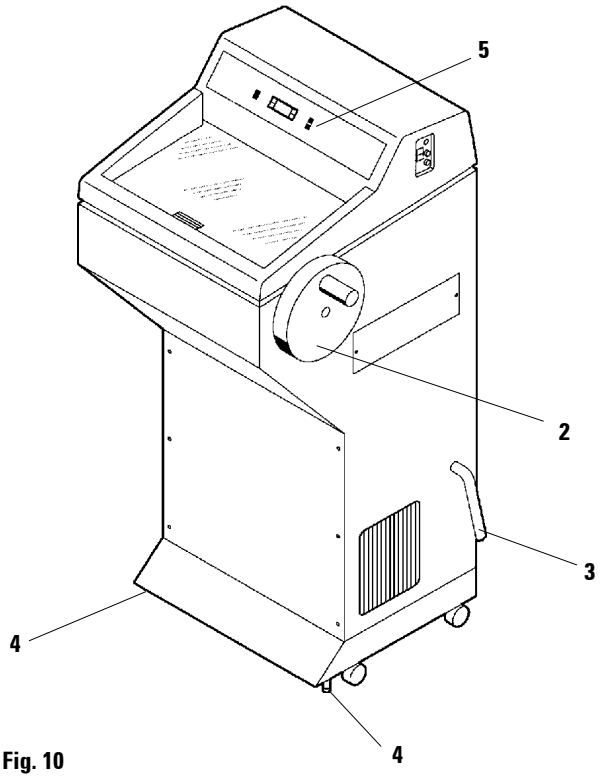


Fig. 10

The Leica CM 1510 is a compact open-top cryostat in a space-saving design for rapid freezing and manual sectioning of tissue specimens.
The cabinet is movable on rollers. Two adjustable feet **(4)** at the front ensure a safe stand. The counterbalanced handwheel **(2)** is lockable in the top position.
The corrosion-proof cryochamber is well illuminated and easily accessible through the heated sliding window. The cryochamber temperature is selectable between 0 °C and -30 °C. An actively cooled quick-freeze shelf for up to 10 specimen discs ensures rapid freezing of specimens at a maximum temperature of -44 °C (+3 Kelvin) depending on the selected cryochamber temperature (-20 °C to -30 °C).
Waste liquid from the chamber is drained through a tube **(3)** and collected outside.
The stainless steel rotary microtome is virtually maintenance-free and provides an 8° X/Y/Z specimen orientation. The section thickness is adjustable in a range of 1 to 50 µm.
All controls and displays are integrated in the control panel **(5)**.
An 8-minute automatic defrost cycle can be activated manually and programmed.

5.3 Standard delivery range

Leica CM 1510 basic instrument with orienting specimen holder:

1 Knife holder base,
1 Knife holder CN or CE with anti-roll guide depending on the selected configuration,
2 Replacement anti-roll plates for CN configuration or:
1 Replacement glass anti-roll plate for CE configuration,
5 Specimen discs, 25 mm ø,
1 Cover for quick-freeze shelf,
1 Brush shelf,
2 Brushes,
1 Waste tray,
1 Storage shelf, left,
1 Storage shelf, right,
1 Handwheel including fitting material,
1 Tool set (3 tools),
1 OCT cryocompound, 125 ml ,
1 Cryostat oil no. 407, 50 ml,
1 Set of replacement fuses,
1 Instruction manual.

5.4 Optional accessories

For information about optional accessories, please contact your local sales representative.

6.1 Site requirements

Do not operate in rooms with explosion hazard!
To ensure an adequate cooling capacity, the instrument has to be set up with at least 10 cm distance from walls and furniture.
Do not place anything next to the compressor ventilation grid (right side of the cabinet) to ensure adequate ventilation!

The place of installation must meet the following requirements:

- No direct sunlight
- Mains power socket at a distance no greater than the length of the power cord (length approximately 2.5 meters) - do not use an extension cord
- No drafts (air condition outlets, etc.) directly over the instrument
- Even floor
- Mainly vibration-free floor
- Obstruction-free access to the handwheel
- Room temperature always below 22 °C
- Air humidity must not exceed 60%

High room temperatures and excessive air humidity affect the cooling capacity of the cryostat.

6.2 Transport and relocation

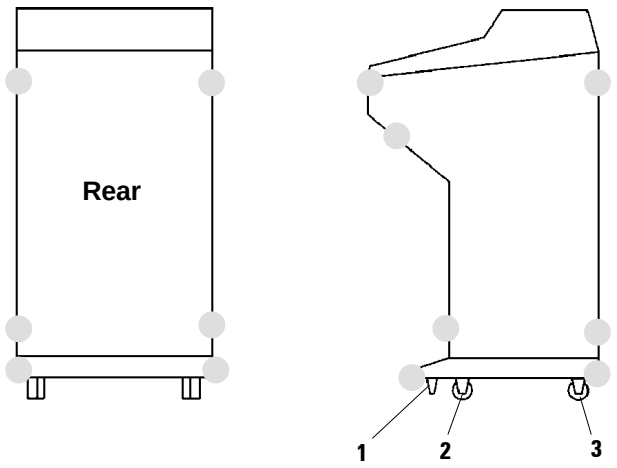


Fig. 11

The instrument must be transported in an upright position, or at an angle of max. 30°!
Do not grip the cabinet at the lid. Grip the cabinet only at the marked areas (◯), which are reinforced for transporting (Fig. 11).

- Screw the adjustable feet **(1)** to the highest position by means of a fork wrench (size 16).
- Move the instrument to the installation site on its rollers **(2 and 3)**.
- The adjustable feet **(1)** can support the weight of the instrument when tipping at a **slight** angle (max. 30°).
- To lift the instrument, please use the handle straps provided, which can be attached to the front rollers **(2)** and rear rollers **(3)**.
- At the installation site unscrew the adjustable feet **(1)** with a fork wrench (size 16) to ensure stability.
- Align the adjustable feet to level the instrument.

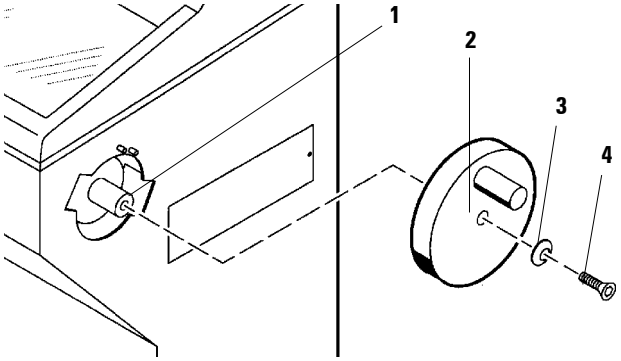


Fig. 12.1

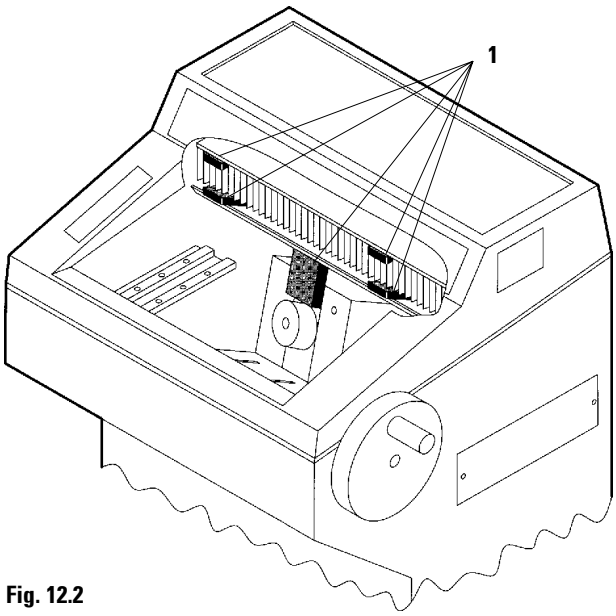


Fig. 12.2

6.3 Assembly of the handwheel

The handwheel including the fixing components are packed in the cardboard box for the accessories.

- Insert the pin **(1)** of the handwheel shaft in to the hole **(2)** of the handwheel.
- Mount the spring washer **(3)** on the screw **(4)** as shown in **Fig. 12.1**.
- Tighten the screw **(4)** with an Allen key (5 mm).

To disassemble, proceed in reverse order.

Remove the protective foam parts for the microtome and for the evaporator (1) prior to operating the instrument (see Fig 12.2)!

7.1 Connection to mains power

During the start-up of the compressor the nominal voltage must not drop below the values specified in the 'Technical data'.
Please note that the compressor requires a start-up current between 45 and 50 A.
Therefore, the electric circuit at the installation site must be inspected by an electrical engineer to ensure that it meets the requirements for a smooth operation of the instrument. A constant adequate power supply to the instrument must be ensured at all times.
Failure to comply with the above will cause severe damage to the instrument.
The instrument must be connected to a grounded mains power outlet socket.

- The electric circuit at the place of installation has to be protected separately.
- Do not connect any other consumers to this electric circuit.

7.2 Prior to operation

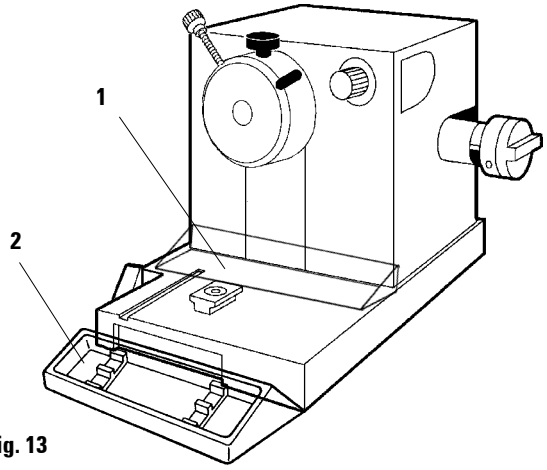


Fig. 13

- Before connecting the instrument to the mains power, please check if the local mains voltage complies with the power rating indicated on the name plate of the instrument.
- Place the storage shelves in the cryochamber.
- Place the waste tray (1) and brush shelf (2) in the cryochamber.
- Place the knife holder base on the microtome base plate.
- Place the knife holder on the knife holder base and clamp.
- Open the knife box with the knife and place it in the cryochamber for precooling.
- Place all tools needed for specimen preparation in the cryochamber.
- Close the sliding window.

After transporting, wait at least 4 hours before turning the instrument on. This waiting period is necessary to allow the compressor oil, which may have been displaced during transport, to return to its original position.
Failure to comply with this can cause severe damage to the instrument.

- Connect the mains plug to the mains power outlet at the wall.

For installation of the knife holder base and knife holder, please refer to the instruction manual of the knife holder.

7.3 Switches and controls

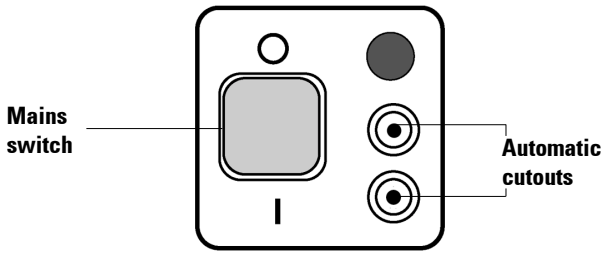


Fig. 14.1

7.3.1 Mains switch

The mains switch (green) is located in a recess on the right side of the cryocabinet. In the OFF position it is on 'O'; in the ON position it is on 'I' and illuminated.

- Turn the instrument on with the mains switch.

The display of the temperature control unit will read the actual temperature of the cryochamber.

After turning on, it will take approximately 5 seconds until the compressor starts operating.

7.3.2 Control panel

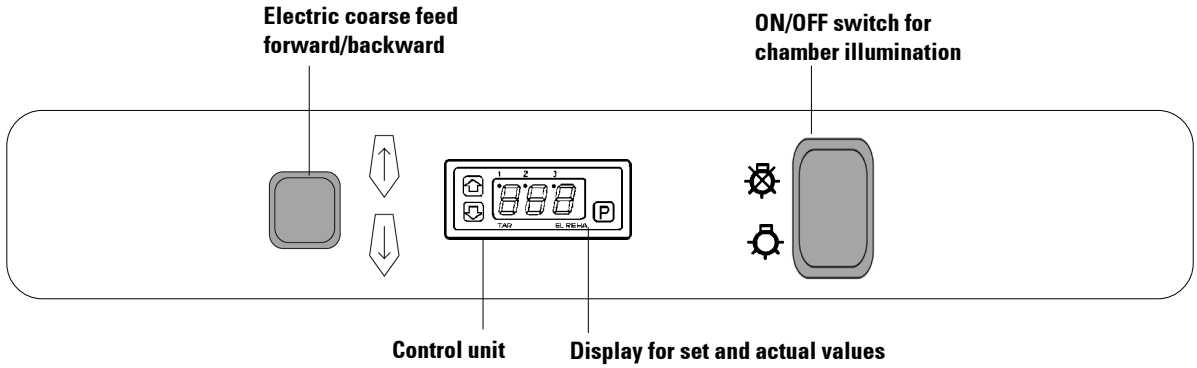
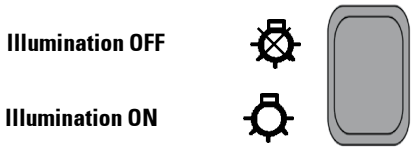
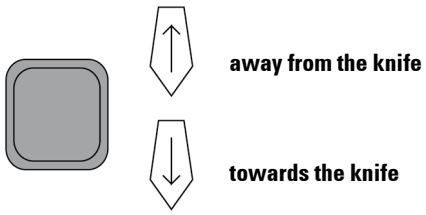


Fig. 14.2

Chamber illumination





Electric coarse feed

The electric coarse feed provides a rapid movement of the specimen towards or away from the knife.
The specimen movement towards the cutting edge must be observed carefully to avoid that the specimen collides with the cutting edge which can cause severe damage both to the knife and specimen!

7.3.3 Control unit

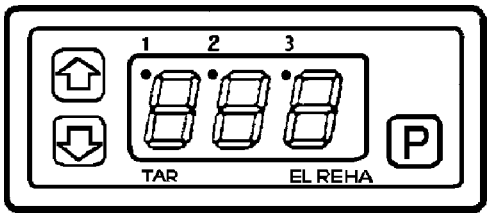


Fig. 15.1

Fig. 15.2

The control unit has a 3-digit display, with additional LEDs and three function keys.

LEDs

LED 1	indicates activation of cooling mode
LED 2	indicates activation of defrosting mode
LED 3	idle

Function keys

To program parameters

To increase the indicated value

To decrease the indicated value

During normal operation, the display indicates the actual temperature of the cryochamber.

Setting user definable parameters

User definable parameters can be accessed by pressing the P-button. Any programming field can be accessed for 30 seconds. After that time the display automatically resets to actual temperature indication. Parameters can be modified via the arrow keys:

- To adjust the set temperature, press 'P' and modify the value via arrow key.
- To set the defrost time, press 'P' again and modify the value via arrow key. The first two digits are used for hour indication, the last digit is used for minute indication. Since there is just one digit for the minute indication, the shown value has to be multiplied by ten. The defrost time can be adjusted in 10 minute steps. **Fig. 15.2** shows defrosting time set at 23:50 hours.
- To set the real time, press 'P' for hour indication and modify the value via arrow key. Press 'P' again for minute indication and modify the value via arrow key.
- When pressing 'P' once more the display shows '00'. In this mode the entry of a code number is required. Since coded parameters are reserved for service personnel only, press 'P' again to return to set temperature indication, or wait 30 seconds until the display resets to actual temperature indication.
- To activate manual defrosting, press 'P' and the 'Arrow-up' key simultaneously. Indication switches from LED 1 to LED 2.
- To deactivate manual defrosting before time, press 'P' and the 'Arrow-up' key simultaneously. Indication switches from LED 2 to LED 1.

The duration of the defrost cycles is set to 8 minutes in the factory.
Illuminated LED 1 indicates that the unit is in the cooling mode. Illuminated LED 2 indicates that the unit is running a defrost cycle.

7.4 Temperature selection chart (in minus °C)

Tissue	10 - 15	15 - 25	25 - 30
Adrenals	❄	❄	
Bone marrow		❄	
Brain	❄		
Bladder		❄	
Breast- fatty			❄
Breast - little fat		❄	
Cartilage	❄	❄	
Cervix		❄	
Fat			❄
Heart and vessel		❄	
Intestine		❄	
Kidney		❄	
Laryngeal		❄	
Lip	❄	❄	
Liver		❄	
Lung		❄	
Lymphoid		❄	
Muscular		❄	
Nose		❄	
Pancreas		❄	
Prostate		❄	
Ovary		❄	
Rectal		❄	
Skin with fat			❄
Skin without fat		❄	
Spleen or bloody tissue	❄	❄	
Testicular	❄	❄	
Thyroid		❄	
Tongue		❄	
Uterus curettings	❄		

- **Above temperature values are based on long-term experience but are only approximate values.**

8.1 Specimen freezing

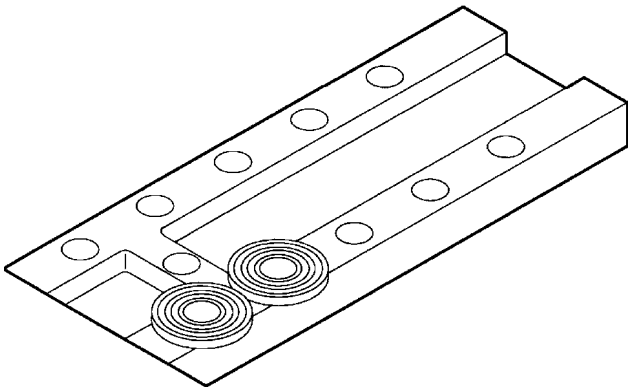


Fig. 17

8.1.1 Quick-freeze shelf with cover

The cryochamber has a quick-freeze shelf **(Fig. 17)** for up to 10 specimen discs.

The supplied cover prevents excessive frost formation on the quick-freeze shelf as the temperature of the shelf is always lower than the cryochamber temperature.

The cover should only be removed when the quick-freeze shelf is used for specimen freezing and replaced when not used to minimize frost formation, especially during defrosting.

Specimen freezing

- Cut the specimen to size.
  The specimen should be no greater than 2 cm x 2 cm x 2 cm.
- Use a specimen disc at room temperature.
- Apply enough cryocompound to the specimen disc.
- Place the specimen on the disc and orient.
- Remove the cover from the quick-freeze shelf.
- Place the specimen disc with the specimen in one of the holes of the quick-freeze shelf and freeze the specimen.

Specimen freezing can be accelerated by additionally using a mobile or stationary heat extractor, which are available as optional accessories (see Chapter 12. 'Optional accessories').

- Once the specimen is frozen, insert the specimen disc in the specimen head **(see Fig. 18.2)** and start sectioning.

8.2 Mounting of specimen discs

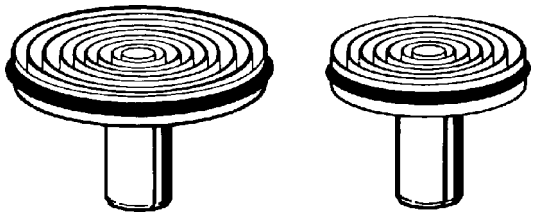


Fig. 18.1

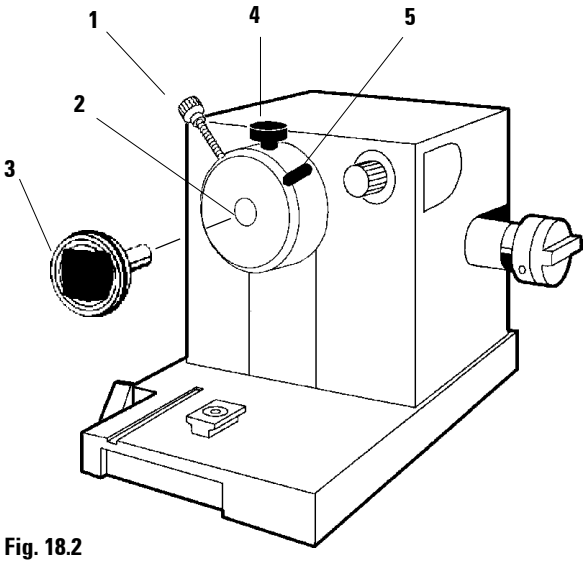


Fig. 18.2

8.2.1 Specimen discs

Specimen discs are available in three sizes of 20, 25 and 30 mm in diameter. The design of the surface ensures firm contact with the specimen.

8.2.2 Fixing the specimen disc in the specimen head

- Lock the handle of the handwheel in the upper position.
- If the knife holder and a knife are in place, cover the knife edge with the knife guard.
- Loosen the screw **(1)** on the specimen head.
- Insert the shaft of the specimen disc **(3)** with the frozen specimen in the location hole **(2)** of the specimen head.

Make sure that the shaft of the specimen disc is fully inserted. The entire rear surface must have a good contact with the specimen head.

- Retighten screw **(1)**.

8.2.3 Specimen orientation

- To release, loosen screw **(4)**.
- Orient the specimen by means of the lever **(5)** and the screw **(1)**.
- Retighten screw **(4)** to fix the orientation.
- To continue sectioning, remove the knife guard and unlock the handwheel.

8.3 Inserting the knife or blade in the knife holder

All components of the cryostat as well as the knife or blade and the tools for specimen preparation should be precooled in the cryostat before starting sectioning!

- Insert the precooled knife or blade in the knife holder and clamp.

For further details, please refer to the separate instruction manual for your knife holder.

Take care when handling microtome knives and disposable blades. The cutting edge is extremely sharp and can cause severe injury!
Never leave knives/blades or knife holders with a knife/blade mounted lying around!
Do not place a knife on a table with the cutting edge facing upward!
Never try to catch a falling knife!
Always clamp the specimen before the knife!
Prior to manipulating the knife and specimen, or changing the specimen or knife, and during breaks, always lock the handwheel and cover the cutting edge with the knife guard!
Avoid skin contact with cold parts of the instrument as this can cause frostbite!

8.4 Moving the specimen towards or away from the knife/blade via the coarse feed

Always observe the specimen during the rapid forward movement towards the knife/blade, to avoid that the specimen collides with the cutting edge. A collision can cause severe damage both to the knife or blade and the specimen!

- Push the coarse feed button to approach the specimen to the cutting edge.

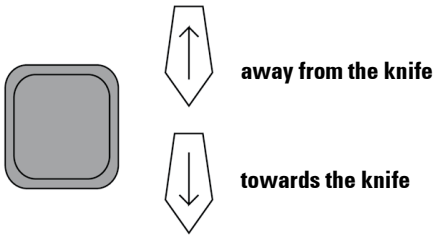


Fig. 19

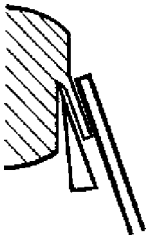
8.5 Trimming

- Remove the knife guard from the cutting edge.
- Remove the anti-roll guide from the knife.
- Unlock the handwheel.
- Rotate the handwheel cautiously and check if the specimen comes in contact with the cutting edge of the knife.
- To trim the specimen, select a section thickness of approximately 30 µm with the section thickness selection knob on the front of the microtome.
- Trim the specimen to the desired sectioning plane by gradually decreasing the section thickness.

8.6 Adjusting the anti-roll guide

- Place the anti-roll guide on the knife holder during trimming.

The anti-roll guide is correctly adjusted when the section smoothly slides down between the anti-roll plate and the knife (see illustration below)!



Correct adjustment of the anti-roll guide

Fig. 20

- Readjust the anti-roll guide if necessary.
- Decrease the section thickness continually to the required value.

8.7 Sectioning and section transfer

- Decrease the section thickness continually to the required value.

After changing from one section thickness to another, the first two or three sections should be rejected!

- Make sure the section smoothly slides down between the anti-roll plate and the knife.
- Remove the anti-roll guide from the knife for applying a section to a microscope slide.

Take care when removing the section - the cutting edge is exposed!

The section can be transferred either to a precooled microscope slide or to a microscope slide at room temperature.

Section transfer to a slide at room temperature

- Carefully approach the slide to the cut section.

The frozen section 'flies' to the slide, rapidly thaws and thus adheres to the slide surface making subsequent orientation impossible.

Section transfer to a precooled slide

- Carefully apply the section to the slide by gentle brushing.
- Orient and flatten the section on the slide surface by means of the brush.
- To ensure the section tightly adheres to the slide surface, warm the cold slide placing a finger against the underside of the slide directly underneath the section.

8.8 Defrosting

The Leica CM 1510 provides both programmable automatic and manual defrosting.

During a defrost cycle, whether automatic or manual, the evaporator is flushed with hot gas to remove frost that inevitably builds up during routine operation of a cryostat. Such frost formation on the evaporator can lead to a reduced cooling performance of the cryostat.

Therefore, the **automatic defrost cycle** should be programmed to take place during the night hours to ensure that the operator has the required low temperature and thus good working conditions in the morning.

At installation sites with high air humidity increased frost formation may occur, and it may become necessary to start a **manual defrost cycle** in addition, which can be operated any time when required.

The duration of the automatic and manual defrost cycles is 8 minutes each. The manual defrost cycle can however be terminated earlier.

The duration of the defrost cycles is set to 8 minutes in the factory.

After defrosting, cooling is resumed automatically. The cryochamber will then be cooled to the previously selected set temperature.

During defrosting, the actual chamber temperature is displayed and LED 2 is illuminated to indicate that a defrost cycle takes place.
The temperature of the quick-freeze shelf is always lower than that of the cryochamber, which may result in increased frost formation that cannot be removed during automatic and/ or manual defrosting.
In this case, we recommend to remove the cover from the shelf, turn the cryostat off overnight, and turn it on again the next morning.

8.8.1 Programming an automatic defrost cycle

An automatic defrost cycle is programmed via the control unit.

For programming an automatic defrost cycle, please refer to 7.3.3 Control unit -'Setting user definable parameters'.

8.8.2 Starting a manual defrost cycle

- To activate manual defrosting, press the 'P'-button and the 'Arrow-up' key on the control unit simultaneously. Indication changes from LED 1 to LED 2.
- To deactivate manual defrosting earlier, press the 'P'-button and the 'Arrow-up' key on the control unit simultaneously. Indication changes from LED 2 to LED 1.

9. Trouble shooting

Problem	Causes	Remedies
Frost on chamber walls and microtome	- Cryostat is exposed to air currents (open windows and doors, air conditioning). - Sliding window was open and exposed to air currents too long. - Frost built up by breathing into the cryochamber.	Change place of installation for the cryostat. - Wear mouth protection.
Sections smear	- Specimen not cold enough. - Knife/blade and/or anti-roll plate not yet cold enough and thus warm the sections.	- Select lower temperature. - Wait until knife/blade and/or anti-roll plate have reached chamber temperature.
Sections splinter	- Specimen too cold	- Select higher temperature.
Sections not properly flattened	- Static electricity/air currents. - Specimen not cold enough. - Large area specimen. - Anti-roll plate poorly positioned. - Anti-roll plate poorly aligned with cutting edge. - Incorrect clearance angle. - Cutting edge blunt or damaged.	- Remove cause. - Select lower temperature. - Trim the specimen parallel, increase section thickness. - Reposition anti-roll plate. - Align correctly. - Set correct angle. - Use different part of the cutting edge or replace the knife/blade.
Sections not properly flattened despite correct temperature and correctly aligned anti-roll plate	- Knife/blade and/or anti-roll plate dirty. - Edge of anti-roll plate damaged. - Blunt cutting edge.	- Clean with dry cloth or brush. - Replace plate. - Use different part of the cutting edge or replace the knife/blade.
Sections curl on the anti-roll plate	- Anti-roll plate does not protrude far enough beyond the cutting edge.	- Readjust correctly.
Scraping noise during sectioning and specimen return movement	- Anti-roll plate protrudes too far beyond the knife edge and is scraping against the specimen.	- Readjust correctly.
Ridged sections	- Cutting edge damaged. - Edge of anti-roll plate damaged.	- Use different part of the cutting edge or replace the knife/blade. - Replace the plate.

Problem	Causes	Remedies
Chatter during sectioning	- Specimen insufficiently frozen onto the specimen disc. - Specimen disc not clamped tightly. - Specimen holder ball joint not clamped. - Knife/blade not clamped tightly enough. - Specimen has been sectioned too thickly and has detached from the disc. - Very hard, inhomogeneous specimen. - Blunt cutting edge. - Knife profile inappropriate for the specimen to be cut. - Incorrect clearance angle.	- Refreeze specimen onto the disc. - Check disc clamping. - Check ball joint clamping. - Check clamping. - Refreeze specimen onto the disc. - Increase section thickness; reduce specimen surface area if necessary. - Use different part of the cutting edge or replace the knife/blade. - Use knife with different profile. - Set correct angle.
Condensation on anti-roll plate and knife/blade during cleaning	- Brush, forceps and/or cloth are too warm.	- Store all tools in the cryochamber.
Anti-roll plate damaged after adjustment	- Plate too high above the cutting edge. The adjustment was carried out in the direction of the cutting edge.	- Raise plate when aligning. - Be more careful next time.
Thick-thin sections	- Temperature incorrect for the tissue cut. - Knife profile inappropriate for the specimen cut. - Ice buildup on the knife back. - Handwheel speed not uniform. - Knife/blade not clamped tightly enough. - Specimen holder not clamped tightly. - Cryocompound applied to cold specimen disc; specimen detached from the disc after freezing. - Blunt cutting edge. - Incorrect clearance angle. - Microtome not properly dried before reinstallation.	- Select correct temperature. - Wait until the correct temperature is reached. - Use knife with different profile (c or d). - Remove ice. - Adapt speed. - Check clamping. - Check clamping. - Apply cryocompound on warm disc; mount specimen and freeze. - Use different part of the cutting edge or replace the knife/blade. - Set correct angle. - Dry microtome thoroughly.

9. Trouble shooting

Problem	Causes	Remedies
Tissue sticks or crumbles on the anti-roll plate	- Anti-roll plate is too warm or incorrectly positioned. - Static electricity. - Fat on the corner or edge of the anti-roll plate. - Rusty knife/blade.	- Cool down anti-roll plate or reposition plate. - Remove static electricity. - Remove fat with alcohol/ acetone. - Remove rust.
Flattened sections curl up when anti-roll plate is picked up	- Static electricity or air currents. - Anti-roll plate too warm.	- Remove static electricity. - Cool down the anti-roll plate.
Sections tear	- Temperature too low for the tissue cut. - Blunt part, dirt, dust, frost or rust on the knife/blade. - Leading edge of anti-roll plate damaged. - Hard particles in the tissue. - Knife/blade back dirty.	- Increase temperature and wait. - Remove cause. - Replace the plate. - Try different knife profile. - Clean.
Inconsistent or insufficient specimen feed	- Microtome was not entirely dry when switching on refrigeration; consequently ice built up in the micrometer feed system. - Defective microtome.	- Remove the microtome and dry it thoroughly before reinstallation. - Call technical service.
Specimen disc cannot be removed	- Moisture on the underside caused the disc to freeze to the quick-freeze shelf or specimen head.	- Apply concentrated alcohol to the contact point.
Cryostat inoperational	- Mains plug not properly connected. - Defective fuses.	- Check the mains plug is properly connected. - Replace the fuses.
No or insufficient refrigeration	- Stopper not inserted in the drain hole of the chamber. - Room temperature too high. - Compressor defective.	- Replace the stopper. - Comply with the installation site requirements. - Call technical service.
Sliding window collects condensation	- Air humidity and room temperature too high	- Comply with the installation site requirements.

10.1 Cleaning

- Remove frozen section waste from the cold cryostat.
- Remove the waste tray and empty it.
- Remove the storage shelves and brush shelf for cleaning.
- Switch off the cryochamber illumination and wait until the lamp has reached room temperature.

Do not use organic solvents or any other aggressive substances for cleaning and disinfection!
We strongly recommend the use of Leica Cryofect disinfectant spray!
Only use alcohol or common disinfectants based on alcohol!

10.2 Spray disinfection with Leica Cryofect

Keep only in original container and up to 25 °C!

Highly flammable (VbF: B)!
Flash-point: 18 °C (DIN 51755)
Keep away from sources of ignition!
Do not spray into flames!
Attention with alcohol-sensitive surfaces!

Wear appropriate protective clothing when cleaning and disinfecting!
Disinfect the instrument and accessories every day!
Effectiveness of the disinfectant down to -20 °C experimentally tested.

1. Select a cryochamber temperature value down to -20 °C.
2. Remove the knife or blade from the knife holder.
3. Remove all samples, microscope slides and tools from the cryochamber.
4. Remove debris from the cryochamber.

Allow the cryochamber to reach the previously selected temperature.

Once the selected temperature is reached, either

5a. spray the disinfectant evenly on the contaminated surfaces- the surfaces should be covered with an even layer - or

5b. soak a cloth with disinfectant and apply it on the contaminated surfaces.

6. Allow a reaction time of no less than 15 minutes.
7. Wipe it off with a tissue.
8. Dispose of tissue in compliance with the ruling waste disposal regulations of your institution.
9. Set the cryochamber temperature to the originally selected value.

If increased frost buildup occurs, start a manual defrost cycle.

- Place an appropriate vessel under the drain tube on the right side of the cabinet.

- Pull the stopper at the bottom of the cryochamber to drain any condensate, waste or cleaning liquid that may have collected in the cryochamber.
- Replace the stopper.
- Dispose of the waste liquid according to the local waste disposal regulations.

All components removed from the cold environment will collect condensation. Therefore all components should be dried thoroughly before placing them back into the cryochamber.

Do not use external heaters for drying the cryochamber. This can cause severe damage to the cooling system!

10.3 Removal of the microtome

For extensive cleaning and disinfection, or for thorough drying of the microtome after a long mains power failure, it may be necessary to remove the microtome from the cryochamber.

Before removing the microtome, turn the instrument off with the mains switch and disconnect it from mains!

- Remove the sliding window (see *11.3 Replacement of the lamp*).
- Take out the knife holder, waste tray, brush shelf, storage shelves and cover of the quick-freeze shelf.

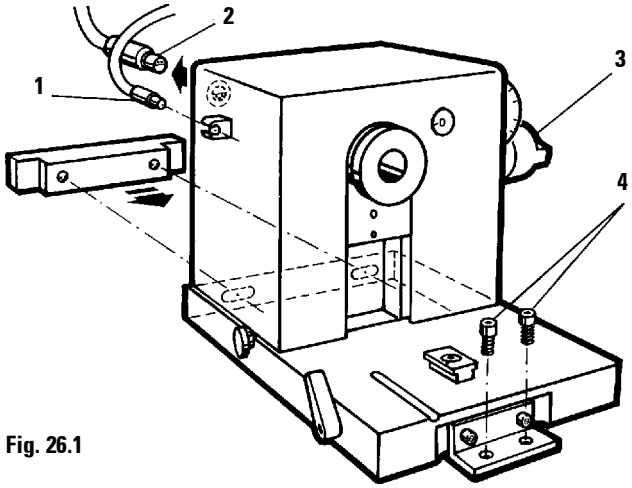


Fig. 26.1

- Disconnect the coarse feed motor plug **(2)** and the temperature sensor **(1)**.
- Upon removing the brush shelf, two screws **(4)** become visible which should be loosened with a 5 mm Allen key.

Before taking the microtome out of the cryochamber, place the handle of the handwheel in the lowest position. When removing the microtome, the specimen head will rapidly fall down and might injure the operator's hands!

- Place the handle of the handwheel in the lowest position so that the specimen clamping head is at its lowest position.

Wear appropriate protective gloves to remove the cold microtome from the cryochamber! Risk of frost bite!
Or wait until the microtome has reached room temperature.

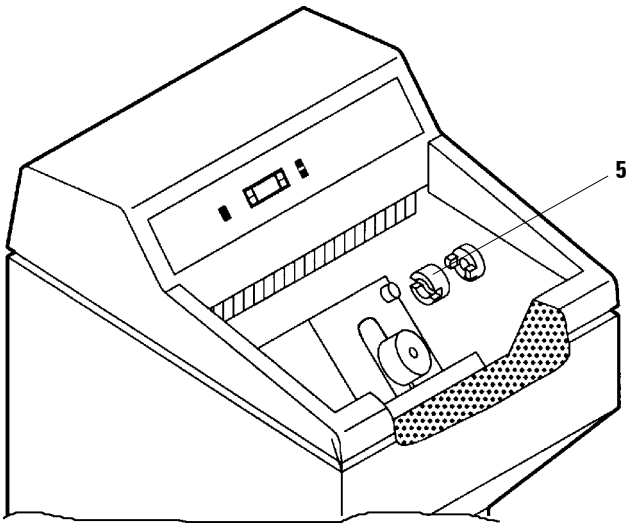


Fig. 27.2

- Slightly lift the microtome, pull it to the left.

Thus the plastic coupling (5) connecting the two axles will disengage and the handle of the handwheel will swing to the top.

- Take the microtome out of the cryochamber.

10.4 Reassembly of the microtome

The microtome must be completely dry before reinstallation. Humidity inside will condense and freeze in the cold cryostat and thus may cause malfunctions or damage.

- Replace the microtome in the cryochamber.
- Mount the plastic coupling **(5)** on the handwheel shaft.
- Rotate the handle of the handwheel to the lowest position and hold it (specimen clamping head is at its lowest position).
- Slightly push the microtome to the right until the shaft **(3)** engages in the coupling.
- Slightly move the handwheel forwards and backwards to ensure proper alignment of the parts.
- Tighten the screws **(4)**.
- Reconnect the coarse feed motor plug **(2)** and temperature sensor **(1)**.
- Replace the storage shelves, waste tray, brush shelf, knife holder and cover of the quick-freeze shelf.

The cryochamber and all accessories must be completely dry when turning on the instrument.
Remaining humidity will cause frost formation during cooling.

11. Maintenance

11.1 General maintenance

Only qualified and authorized service personnel may access the internal components of the instrument for service and repair.

The microtome is maintenance-free in operation to a great extent!

To ensure reliable and trouble-free operation over several years, we recommend the following:

- Have the instrument inspected by a qualified service engineer authorized by Leica at least once a year;
- Enter into a service contract after the warranty period; for further details, please contact your Leica sales office.
- Clean the instrument every day.
- From time to time: Apply a **drop of cryostat oil** - from time to time - especially after repeated drying in a heating oven, to the following components:
  - Clamping piece (T piece) and clamping lever of the microtome base plate
  - Guide of the knife holder base
  - Clamping lever of the knife holder base
  - Press the coarse feed button to move the specimen cylinder out to the front limit. Apply some drops of cryostat oil to the cylinder. Press the coarse feed button again to move it back to the home posi tion (rear limit).
- Clean the ventilation grid of the compressor at the bottom of the right cabinet side wall with a brush or vacuum cleaner in the direction of the fins to remove dust and dirt.

11.2 Replacement of the fuses

The automatic cutouts are located next to the mains switch on a panel on the right side wall of the cryocabinet - see illustration below.

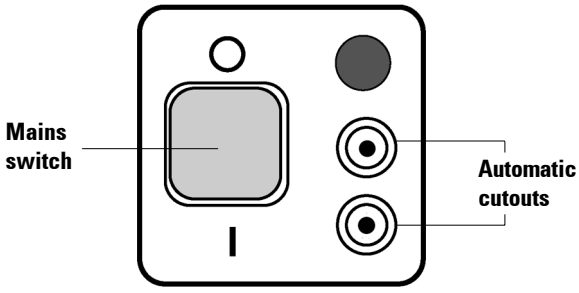


Fig. 28.1

- After an automatic cutout has operated, the fuse pin will protrude more than 20 mm from the housing.

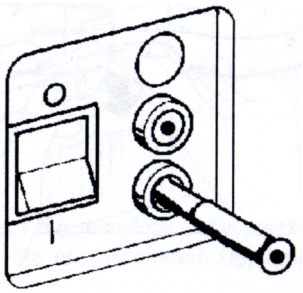


Fig. 28.2

To reconect the automatic cutout procced as follow:

- Switch of the instrument mains switch.
- Wait approx. 5 minutes (the safety cutout has to cool before it can be reinserted).
- Connect the automatic cutout by pressing it into the housing.
- Switch the mains switch back on.

If an automatic cutout cannot be reinserted or if it operates several times, call the Leica Technical Service!

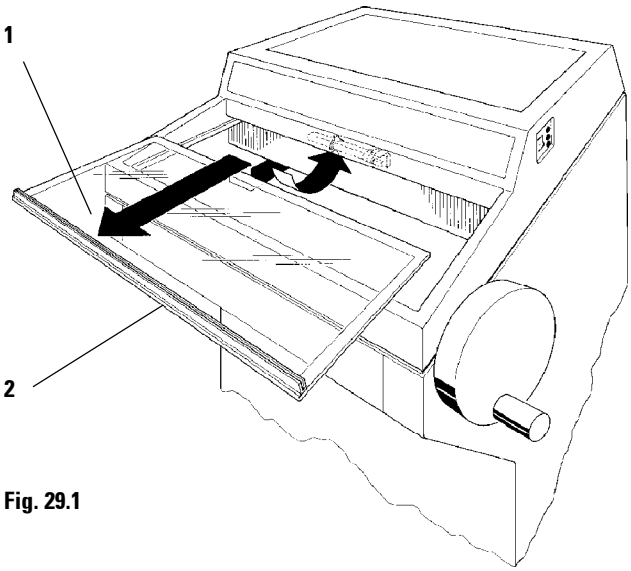


Fig. 29.1

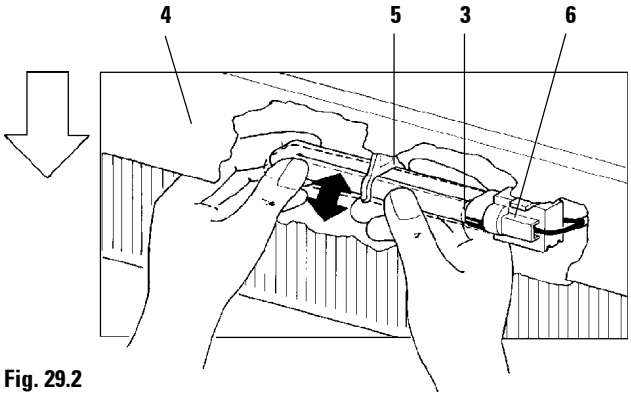


Fig. 29.2

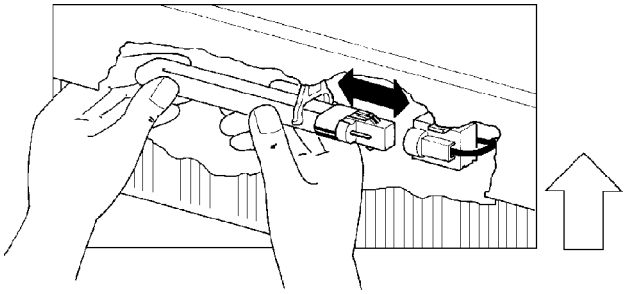


Fig. 29.3

11.3 Replacement of the lamp

Turn the instrument off with the mains switch and pull the mains plug before placing the lamp!

- Slightly lift the closed sliding window **(1)** holding it by the grip **(2)** and pull it out to the front.

If the lamp is broken it must be replaced by the technical service, as the replacement involves a high risk of injury!

Removal of the lamp

- The lamp **(3)** is mounted behind the cover **(4)** and therefore not visible.
- Touch the lamp for better orientation.
- **Slightly** tilt the fluorescent tube down to the left and pull it out of the clip **(5)**.
- Hold the lamp with both hands and pull it **to the left** out of the lamp holder **(6)**.

Do not use lamp type other than specified by the manufacturer!

Assembly of the new lamp

Lamp type:	
(230 V/50 Hz)	**OSRAM DULUX S - 11 W**
(115 V/60 Hz)	**OSRAM DULUX S - 13 W**

- Hold the lamp in the correct mounting position as shown **(Fig. 29.3)** and push it to the right until it engages in the lamp holder.
- Lightly push the fluorescent tube upward to engage in the clip.
- Replace the sliding window.
- Reconnect the instrument to mains and turn it on.

12. Optional accessories

12.1 Heat extractors

Specimen freezing on the quick-freeze shelf can be accelerated by the additional use of a heat extractor.

12.1.1 Mobile heat extractor

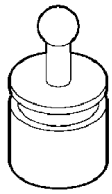


Fig. 30.1

- Store the heat extractor in the cryochamber.
- Place it on the specimen surface to accelerate freezing.
- Remove it once the specimen is entirely frozen.

12.1.2 Stat ionary heat extractor

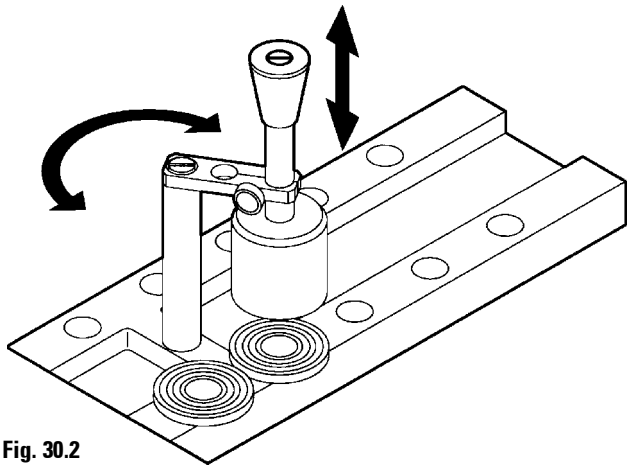


Fig. 30.2

- Screw the heat extractor into the hole on the quick-freeze shelf. It can reach three specimen discs.
- Lower the heat extractor cylinder on the tissue surface. After approximately 30 seconds, the specimen will be entirely frozen.

To prevent unnecessary distortion of the specimen during contact freezing, the weight of the heat extractor can be balanced.

- To balance the weight of the cylinder, loosen screw **(2)** and move the knob **(1)** up or down as required.
- Retighten screw **(2)** to fix the knob **(1)** in the appropriate position.

12.2 Thermal block

The thermal block (8) facilitates the removal of the frozen specimen from the specimen disc.

Keep the thermal block outside the cryochamber at room temperature.

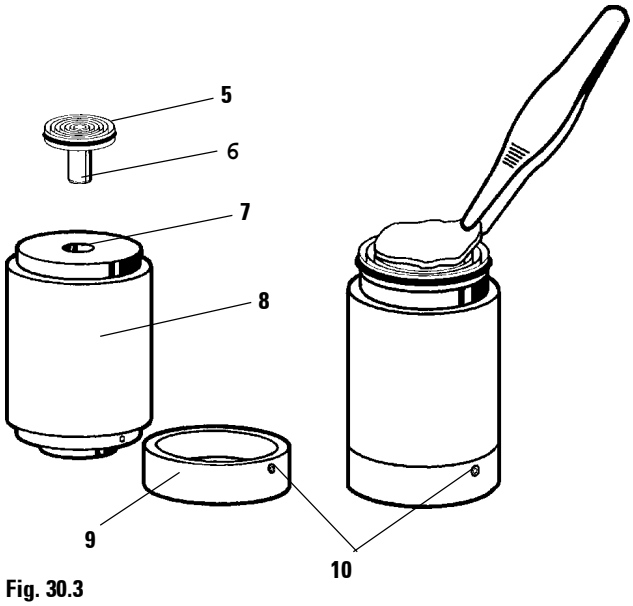


Fig. 30.3

- Place the cap **(9)** on the required side, so that the appropriate location hole for the specimen disc is visible.
- Insert the shaft **(6)** of the specimen disc **(5)** in the appropriate location hole **(7)** at the top or bottom of the thermal block.
- After about 20 seconds, the frozen specimen can be removed from the specimen disc with forceps.
- If the cap is too loose, readjust it with the small screw **(10)**. Do not overtighten the screw.
- Once the specimen is removed, take the thermal block out of the cold cryochamber.

13.1 Product changes

Due to a policy of continuous improvement of our products, Leica Microsystems Nussloch GmbH reserves the right to change specifications without notice.

13.2 Warranty

Leica Microsystems Nussloch GmbH guarantees that the contractual product delivered has been subjected to a comprehensive quality control procedure based on the Leica in-house testing standards, and that the product is faultless and complies with all technical specifications and/or characteristics warranted.

The warranty conditions depend on the contents of the individual contract concluded, supplemented by the warranty conditions of your local Leica sales unit.

The warranty period starts on the day of passing of risk or on the day of delivering the product.

Excluded are warranties for defects or damage attributable to, for example, operational and normal wear and tear, improper use, faulty operation, installation and/or use of non-original spare parts, installation and/or use of non-original accessories, negligent handling of the product by the customer, connection to unsuitable power supply sources, operation at incorrect voltage, force majeure such as fire, lightning, earthquakes, humidity etc.

We will not assume any liability for damages due to improper handling of the product.

Any repairs and/or exchange of parts of the product must be carried out by technical service engineers authorized by Leica. Otherwise warranty claims can no longer be made.

The local Leica sales unit, the Leica representative responsible or the factory in Nussloch must be consulted prior to any changes to the instrument, to any modifications as well as prior to any use of the instrument in combination with non-Leica components not expressly authorized by Leica.

Spare parts and accessories not supplied by Leica can under no circumstances be considered as inspected and/or approved by Leica.

Installation or use of any such parts may impair the technical design features and thus the properties of the instrument.

Warranty claims can only be made as long as the product or system has been operated according to its designated use and according to the instructions given in this manual.

In case of justified claims the manufacturer is entitled to repair or replace the goods. Rescission of the sales contract can only be demanded after two unsuccessful attempts at repairing the instrument on the part of the manufacturer.

13.3 Disposal

The instrument or parts of the instrument must be disposed of in compliance with the local laws.

13.4 Technical service information

If you require technical service or replacement parts under warranty, please contact your Leica Sales Representative or Dealer from whom the instrument was purchased.

Be sure to state the model type, serial number and date of delivery. Leica Microsystems Nussloch GmbH (Germany) cannot accept goods returned without official authorization.

If an instrument or any part of it is to be returned to Leica, please note the following:

a. If the instrument or any part of it has been exposed to or been in contact with potentially pathogenic or radioactive materials, it is essential to decontaminate the instrument or part.
   Decontamination must explicitly be confirmed by the customer. Our service engineers have to enquire about this.

b. Ensure that there is no radioactivity or hazardous bacteria present and advise Leica of any decontamination procedure that may have been carried out.

Should the instrument or any part of it be received in a condition that Leica considers to be a potential biological hazard, the instrument or part will be returned unrepaired at the expense of the customer.

When requesting a service call, please provide the following information:

a. Model type and serial number of the instrument;

b. Location of the instrument and the person to contact;

c. The reason for the service call.