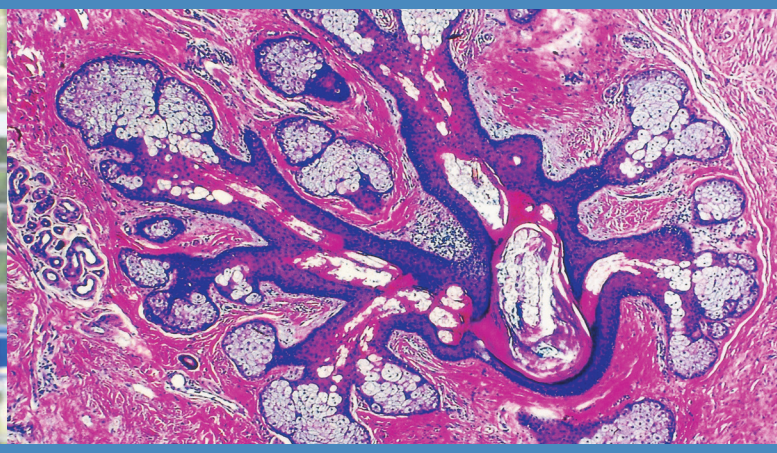

Part of Thermo Fisher Scientific

Thermo SCIENTIFIC

Microm HM550

Thermo Scientific
CRYOSTAT MICROTOM
incl. options O M V P D

Operation manual – English

ex Ser. No 46320

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The Thermo Scientific Microm HM550 meets the following CE Mark requirements:
In Vitro Diagnostic Directive 98/79/EC

CE

02/11

Figure 1. Cryostat Thermo Scientific Microm HM550.

Certification

Thermo Fisher Scientific Microm International GmbH certifies that this instrument has been tested and checked carefully. Its technical data was verified before shipment to be in accordance with the published specifications.

The instrument complies with applicable international safety regulations.

Warranty

This Thermo Fisher Scientific product is warranted against defects in material and workmanship for a period of 1 year. Parts which prove to be defective during the warranty period will be repaired or replaced free of charge by the manufacturer. No other warranty is expressed or implied. Unauthorized modification or repair by third party persons will void the warranty.

The warranty will expire in case of improper or wrong use of the instrument and in case the warning and precautionary messages are not observed. Thermo Fisher Scientific is not liable for any occurring damage.

Errors and omissions excepted. Subject to amendment and improvement without further notice.

This operation manual will be supplied together with each instrument. Further copies can be ordered at the nearest Thermo Fisher Scienitific sales office by giving the serial number of the instrument, the number of the operation manual and the date of issue.

This operation manual is available in the following languages:
German, English, French, Spanish, Italian
Cat. No: 388092

Intended use

Dear valued Customer,

Thank you for buying this Thermo Fisher Scientific instrument.

Before putting the instrument into operation, please read these operating instructions carefully to familiarize you with its proper operation and functions.

The Cryostat series Microm HM550 are highly efficient cryostats for sectioning techniques in routine and research.
Only skilled or specially trained personnel must operate the microtome cryostat, i.e. placing the specimen onto a chuck, sectioning and transferring sections onto a slide. The listed and marked safety measures as well as the regulations and hygiene measures of your respective lab must strictly be observed.

Serial No.:.....

Please check the Serial No. on the type plate, which is placed on the rear side of your instrument and enter this number here. This way, questions and service can be handled faster.

Issued on February 01st, 2011

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Chapter 1
Safety precautions

Warning signals and symbols

The installation and routine use of the HM550 Series is easy and safe if the instructions in this manual are being observed.

Note:
Special instructions regarding operation of the instrument.

WARNING
Special precautionary measures to prevent damage to equipment. For a long lifetime of the equipment, please observe these instructions carefully.

CAUTION – general danger spot
The operation manual must strictly be observed whenever this symbol is visible on the instrument.

Biohazard
Warning of biological danger.

Radioactivity
Warning of radioactive danger.

Chemicals
Warning of unhealthy or irritating substances.

Separate taking back of electrical and electronic instruments in the countries of the European Union:
This is to be applied in the countries of the European Union and other European countries with a separate collecting system within the waste management. This product, being an electro and/or electronic instrument, must be treated separately within the waste management process (WEEE).

CAUTION!
The operator's safety is affected, when the instrument is not operated in accordance with this operation manual. Please observe the following general precautions during operation of this instrument. Failure to comply with these precautions violates safety standards and the intended use of the instrument. Thermo Fisher Scientific is not liable for misuse of the instruments and failure to comply with basic safety requirements.

Instrument Grounding

To avoid injury from electrical current, the instrument must be connected with the protective earth. The instrument is equipped with a three wire ground plug. The power outlet must be connected to the protective earth and must meet the International Electrotechnical Commission (IEC) regulations.

Caution: Mains Voltage

Never remove instrument covers during operation. Component replacements as well as adjustments must only be made by trained service personnel. Unplug the unit before removing or opening the covers.

Danger in explosive Environment

The instrument must not be operated in the presence of flammable gases.

Hazard of frostbite

Avoid permanent touching of metal parts inside the cryostat microtome chamber as frostbite may occur at unprotected hands and arms.

Hazard of radioactive radiation

When working with radioactive specimens observe all applicable radiation safety procedures. When working with radioactive contaminated material, appropriate safety and disinfection measures must be carried out. According to the rules and regulations concerning the handling of radioactive contaminated material of the respective laboratory, safety clothing (e.g. particle mask, gloves, protective shoe covers) must be worn. Radioactive contaminated waste must be disposed of according to the respective regulations.

Hazard of infection

Use the appropriate safety and disinfection measures when working with infectious specimens. According to the rules and regulations concerning the handling of infectious/radioactive contaminated material of the respective laboratory, safety clothing (e.g. particle mask, gloves, protective shoe covers) must be worn.

Biohazard

Specimens used during the intended operation of the instrument might potentially be infectious. For this reason, it is recommended to observe the general laboratory regulations concerning protection against danger of infection. Information on decontamination media, their use, dilution and effective range of application can be read in the Laboratory Biosafety Manual: 1984 of the World Health Organization.

Hazard of malfunction

To avoid the hazard of malfunction of an instrument, it must only be operated in a controlled electromagnetic environment. This means, that transmitters such as mobile phones must not be operated in their close vicinity.

In case of malfunctions and/or service work, please turn off the instrument and contact your local dealer.

Warning of unhealthy or irritating substances

During the intended use of the option D, smallest amounts of irritating aerosols, consisting of activated oxygen, might occur. For this reason, please care for sufficient ventilation. To avoid negative effects on your health while in direct contact with the disinfection medium or its residues, always wear respective safety clothing (e.g. protective glasses, laboratory gloves).

Care in using microtome knife

To diminish the danger of being injured by the knife or blade, use the knife guard when adjusting specimen and knife. If possible, the specimen should be clamped in before the knife is inserted into the knife holder. Before changing the knife holder, always remove blade or knife! Unused knives should always be kept in a knife case. Never place the knife with the cutting edge upwards. Never try to catch a dropping knife!! Never check the sharpness of the cutting edge with your fingers. The cutting edge is extremely sharp!

Waste disposal

All debris, waste, defrosting liquid as well as infectious and radioactive contaminated material from operation must be disposed of in accordance with the respective regulations of the lab. Disinfection and cleaning liquids as well as section waste must be disposed of according to the respective regulations for special waste!

Chapter 2
Introduction

Description of the HM550 Series

Open top cryostat. Modular design. Stainless steel cooling chamber. Chamber temperature regulation variable from -10°C down to -35°C. When the instrument is equipped with the option O, the specimen temperature can be controlled from +10°C down to -50°C.

Graphic LC-display of set and actual temperatures, electronic control with user-oriented touchpad keyboard, battery-buffered memory and self-diagnostic system. Standby and sleep status for noise reduction and energy savings. Automatic defrosting and in addition a manual defrost cycle which can be activated when needed. Defrost interrupt on key-stroke request. Integrated fast freezing device with controlled cooling element down to -60°C (option P). Sliding window with heater and integrated fluorescent lamp for cryo-chamber. Brush shelf and storage space inside the cryo-chamber. Large, flat storage space on top of the housing with integrated storage space for marked slides.

Rotary Microtome with backlash and maintenance-free cross roller bearings in stainless steel. Electro-mechanical feed system.
Section thickness setting from 1 to 100 microns;
up to 10 µm in 1 µm-increments,
up to 20 µm in 2 µm-increments,
up to 70 µm in 5 µm-increments and
up to 100 µm in 10 µm-increments.

Trimming thickness setting from 5 to 500 microns;
up to 10 µm in 5 µm-increments,
up to 100 µm in 10 µm-increments,
up to 200 µm in 20 µm-increments and
up to 500 µm in 50 µm-increments.

Specimen retraction during the return stroke with optical indication. Horizontal feed range 28 mm. Vertical cutting stroke 60 mm. Max. specimen size 75 x 55 mm.

Motorized coarse feed in two directions with three speed selections. Limit indication and automated switch off at front and rear limits of horizontal travel. Automatic approach system for exact and safe approach of specimen towards the knife edge from -5°C to -35°C.

Section counter and indication of sum of section thicknesses with reset-button. Indication of remaining travel.

Hand wheel brake in any position. Fine orientation of specimen with zero device. Rotatable on Z-axis, 360°.

Basic outfit with three specimen chucks, 118 ml freezing medium, 100 ml cryostat oil, brush shelf and section waste tray, consisting of two parts.

Option M

Electric motor drive with electronic control of the cutting stroke. Cutting speed variable from 0 to 250 mm/s. Accelerated return travel. Freely selectable cutting zone.

Three modes of operation: interval, single and continuous stroke. Indication of hand wheel brake.

Manual control of motor drive via safety start procedure. Stop command selection via manual control, foot pedal or hand wheel brake. Emergency stop key and foot pedal emergency stop.

Option V

Vacutome system for stretching cryo-sections as well as for the disposal of sections when trimming.

The system consists of a duo filter system: The coarse filter collects the section waste. The micro filter with a 99.99% filtration efficiency for 0.1 µm particles filters the air. The coarse filter is actively cooled in its position in the cryostat.

A vacuum-generating unit with its controlling elements is also part of the system.

Stretching and disposing of is controlled by the cutting window that can be set on the microtome cryostat. The suction vacuum can be set via an turning knob on the microtome cryostat.

Cold D (Option DC)

The Cold D (Option DC) is a fumigation unit for the application of disinfection media (Sanosil®) onto the operation areas in the cryo chamber which are accessible for the user during the intended use. Please refer to the Recommended Disinfection Procedure in **Appendix A** at the end of this manual.

Warning

To guarantee the functionality and reliability of the fumigation unit, it is recommended to solely use Sanosil®. When using other disinfection media, Thermo Scientic assumes no liability concerning functionality and disinfection effectiveness.

Technical Data

HM550 Series

Specimen temperature control		+10°C to -50°C
Chamber temperature control		-10°C to -35°C
Fast freezing station depending on the chamber temperature		up to -35°C
Actively cooled fast freezing station with Peltier element		max. up to -60°C
Defrosting	automatic defrosting, adjustable	with temperature control
	manual immediate defrosting	
Microtome	Section thickness range	1 to 500 µm
	Fine section thickness range	1 to 100 µm
	Resolution	1 µm from 1 to 10 µm 2 µm from 10 to 20 µm 5 µm from 20 to 70 µm 10 µm from 70 to 100 µm
	Trimming thickness range	5 to 500 µm
	Resolution	5 µm from 5 to 10 µm 10 µm from 10 to 100 µm 20 µm from 100 to 200 µm 50 µm from 200 to 500 µm
	Specimen retraction during return travel	40 µm
	Vertical specimen stroke	60 mm
	Horizontal specimen movement	28 mm
Read-outs	Graphical LC display: section thicknesses, section counter, sum of section thicknesses, remaining travel to front end position, size of the cutting window, chamber temperature, specimen temperature and graphic of temperatures, menu with submenus	
Specimen approach		automatic function alternatively manual with variable speed
Size of chucks		30 and 40 mm special sizes upon request

HM550 Series

Specimen orientation	X- and Y-axes	universal 8° with zero positioning
	Z-axis	up to 360°
Coarse feed		motorized, graduated, single and continuous
Cooling chamber illumination		with variable illumination position
Sliding window		heated

Option M		
Cutting drive		manual and motorized, electronically controlled
Cutting window		cutting window adjusted to specimen size manually
Operating modes		interval, single and continuous stroke
Cutting speed		0 to 250 mm/s
Handwheel brake		electromagnetic, in any position
Emergency stop		via handswitch or foot pedal

Option V		
	max. specimen size	28 mm
	max. section thickness to be disposed of	max. 40 µm
	max. section thickness to be stretched	20 µm
	min. section thickness to be stretched	1 µm
Clearance angle adjustment	Standard knife carrier	5 to 16°
	Disposable blade carrier	5 to 16°
	Magnetic disposable blade carrier	25 to 30°
Coarse filter	Glass fiber reinforced extraction thimble	
Micro filter	Borosilicate micro fiber	99.99% filtration efficiency for 0.1 µm particles

Cold D (Option DC)		
Max. filling amount	ultrasonic bath	125 ml
Max. filling amount	store reservoir disinfection medium	1000 ml
	(Recommended medium)	Sanosil®

HM550 Series

Frequency Ultrasonic-unit		1.63 MHz + 70 kHz
Transportation and storage conditions		
Storage temperature range		-20°C to +50°C
Operating conditions		+5°C up to +35°C (at a max. rel. humidity of 60%) altitude up to 2000 m M.S.L. for indoor use only Floor loading requirements: 300 kg/m2
Power requirements		100 V/50 Hz, 12 A, +/-10% 100 V/60 Hz, 12 A, +/-10%
		115 V/60 Hz, 12 A, +/-10% 220...230 V/50 Hz, 6 A, +/-10% 220 V/60 Hz, 6 A, +/-10% 240 V/50 Hz, 6 A, +/-10%
Internal protection		
Primary circuits		
Transformer		T8AH, 100...115 V T4AH, 220...240 V
Illumination		T0,8AH, 100...115 V T0,4AH, 220...240 V
Secondary circuits		
Window heating		T2.5AH
Vacutome valve (optional)		T2AH
Pollution degree		2
Protection category		I
Overvoltage category		II
Sound pressure		45 dB(A) measured with 1m distance to the instrument
Fluids and gases	cooling agent	R404a, filling amount: 230 g (230 V/50 Hz) R404a, filling amount: 250 g (115 V/60 Hz)
Dimensions	Wide (w/o hand wheel	640 mm, deep: 760 mm, high: 1200 mm
Weight		125 to 155 kg (depending on the model)

All temperatures refer to an ambient temperature of +20°C!

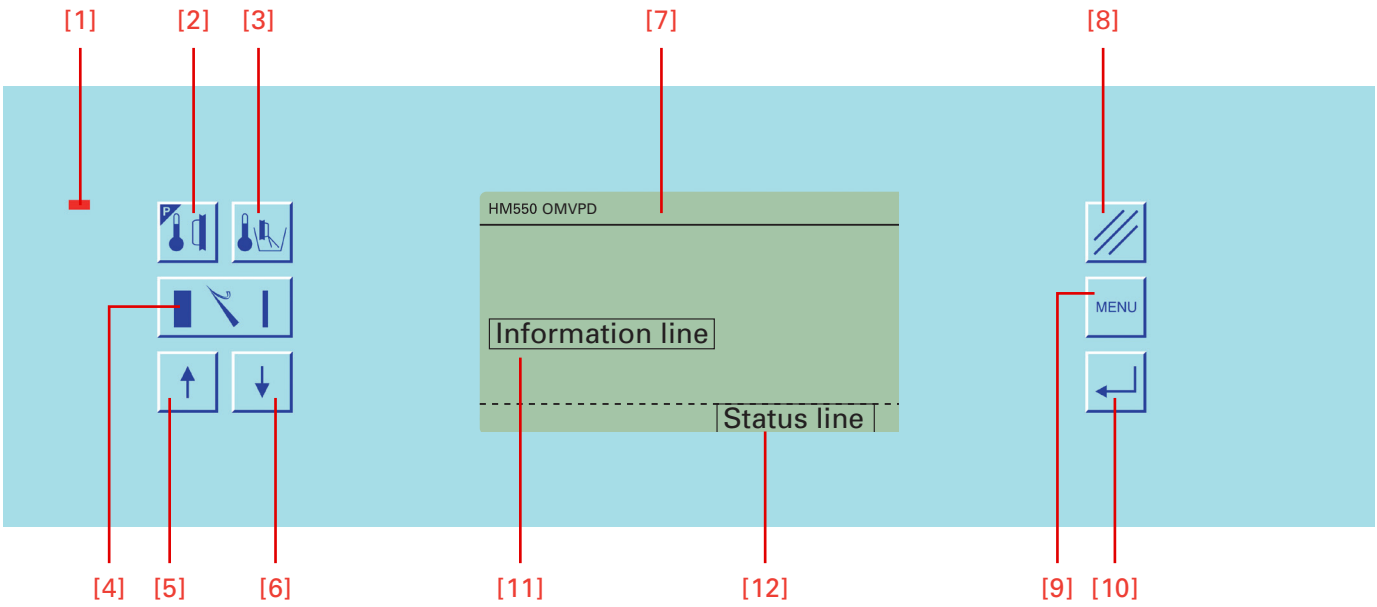

Figure 2. Touchpad Keyboard with buttons and LC-display.

[1] On indication (sleep status)
[2] Button specimen temperature
(Standard version not used, as there is no specimen cooling)
[3] Button chamber temperature
[4] Button TRIM/FEED
[5] Arrow button UP
[6] Arrow button DOWN
[7] LC display
[8] Reset button
[9] Menu button
[10] enter button (within the menu settings)
scroll button (outside the menu settings)
[11] Information line
[12] Status line

Note:
This operation manual includes all options. If your instrument is not equipped with all options, some of the buttons might be disabled.

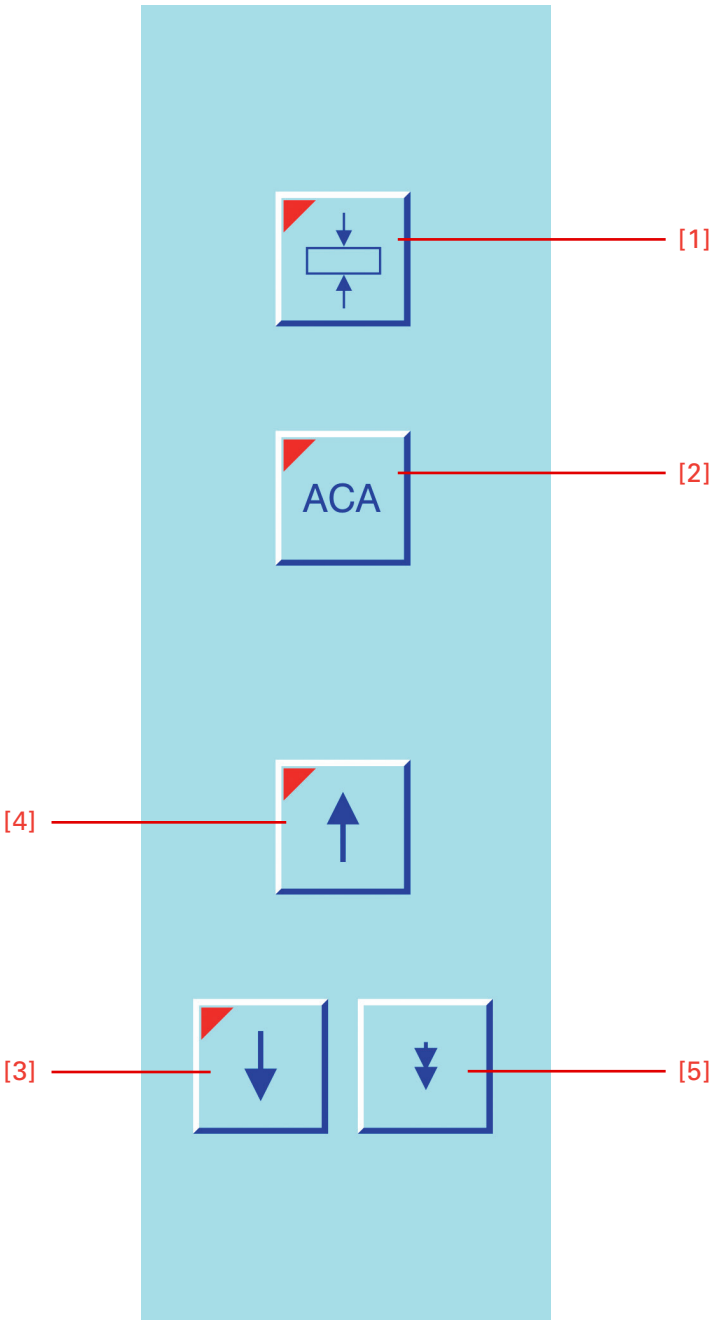

Figure 3. Keypad left.

[1] Button cutting window
[2] Button ACA
[3] Button coarse feed, forwards
[4] Button coarse feed, backwards
[5] Button TRIM

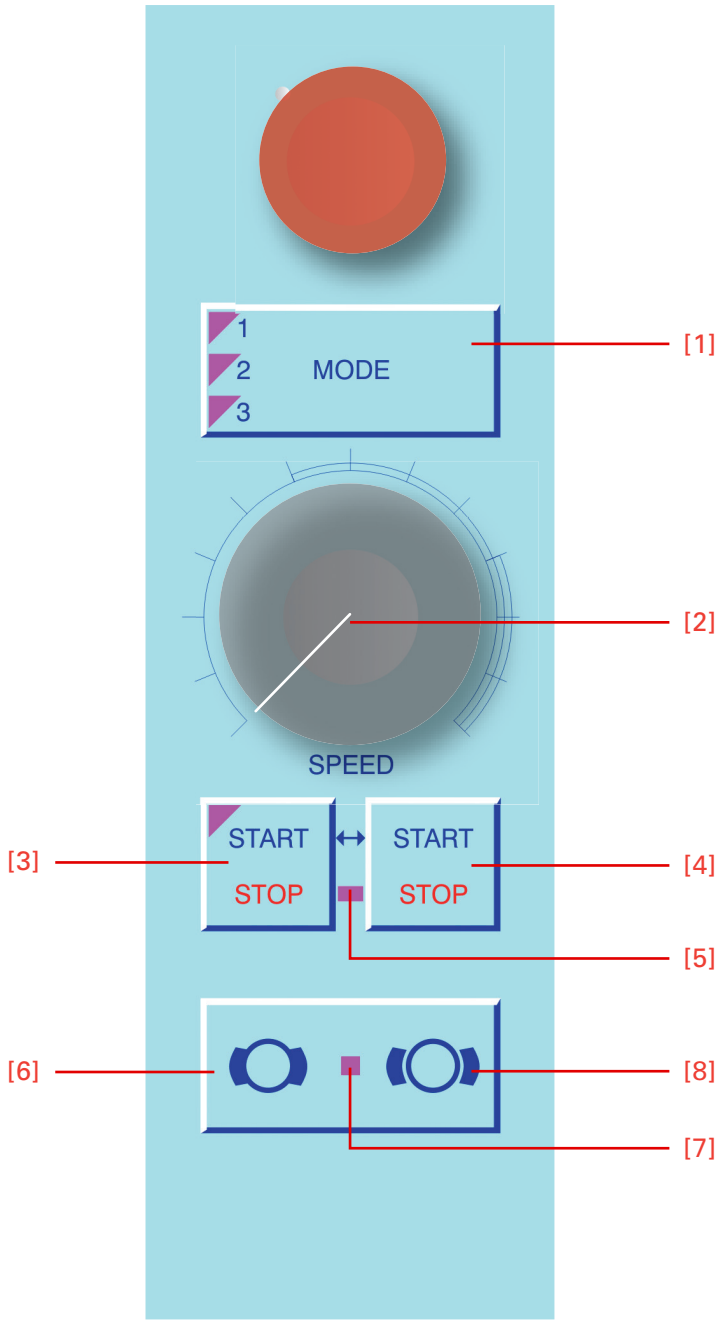

Figure 4. Keypad right.

[1] Button operating modes
[2] Operating knob
[3] Button START/STOP
[4] Button START/STOP
[5] Emergency stop LED
[6] Button to activate the hand wheel brake
[7] Brake LED
[8] Button to loosen the hand wheel brake

Frontal View

Rear View

Lateral View Left Side

Lateral View Right Side

Chapter 3
Operating Instructions

Setting up the cryostat

Unpacking the instrument:

- Cut through the three packing straps and remove the packing.
- Remove the upper wooden cover (fig. 5.1).
- The hinges of the upper wooden cover are secured with tape.
- Remove this tape.
- Lift the packing (fig. 5.2) over the instrument.
- Remove the upper and lower supporting foams (fig. 5.3, 5.4, 5.5, 5.6) from the cryostat.

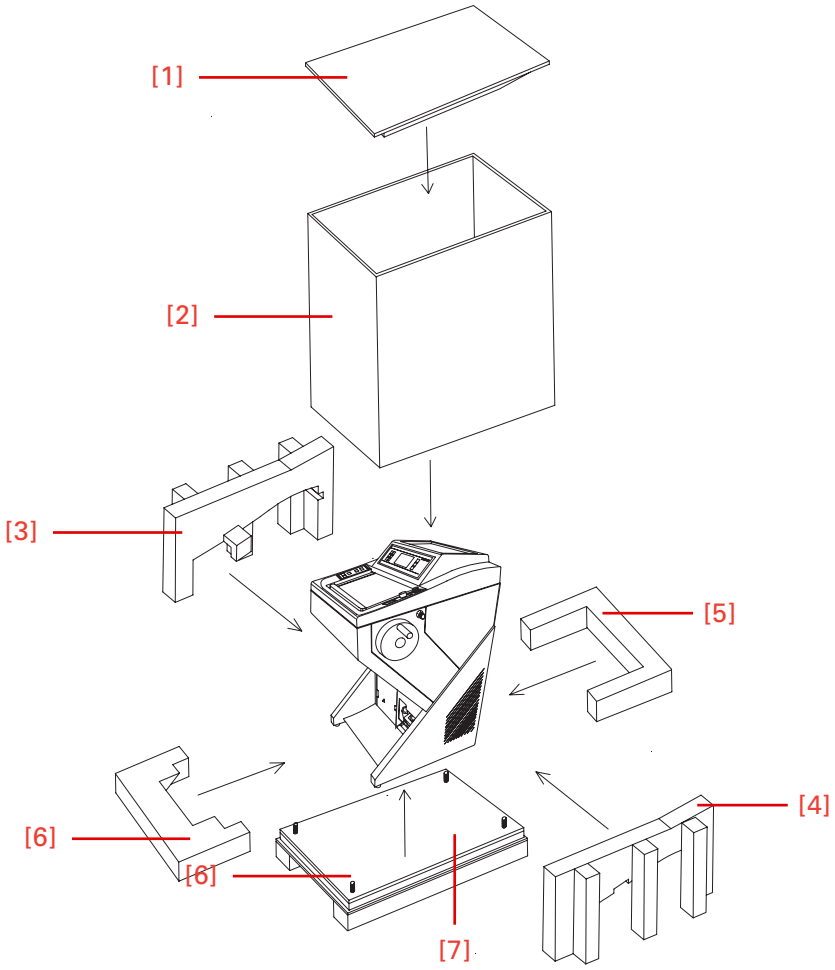

Figure 5. Unpacking the instrument.

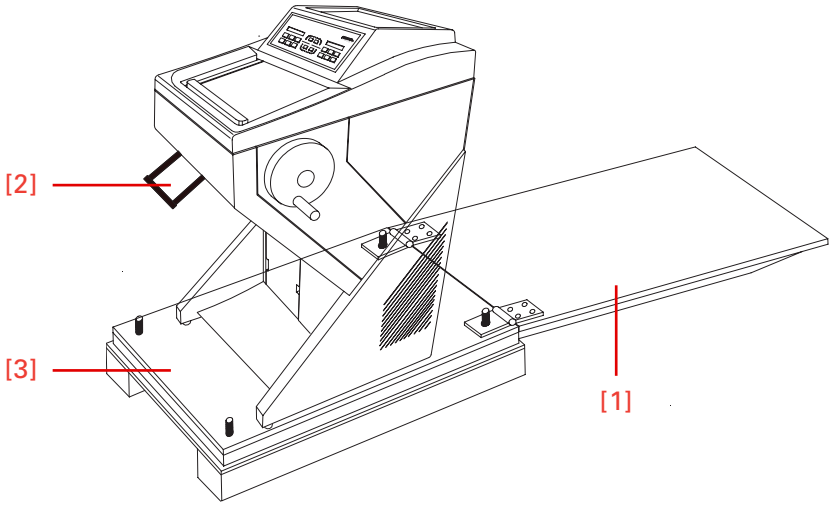

Figure 5a. Removing the bottom plate

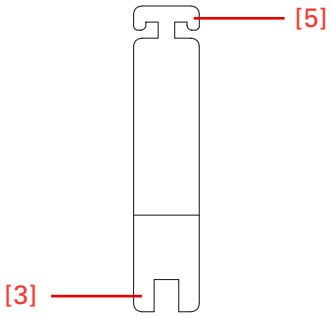

Figure 5b. Allan Key SW 6 for hight adjustment of the cryostat.

Note:
The upper wooden cover now serves as an incline (fig. 5a.1) on which the cryostat can be moved from the pallet to the floor by using the handle (fig. 5a.2)

- The hinges of the upper wooden cover (fig. 5.1) are inserted into the screws of the bottom plate (fig. 5a.3). The correct side for this is marked with arrows.

- The tool (fig. 5b.2, size 6) for the height adjustment of the setting feet of the cryostat is packed together with the accessories of the cryostat (separate carton on the foot rest of the cryostat).

- Turn the setting feet completely upwards via this tool so that the cryostat stands with its rollers on the bottom plate (fig. 5a.3).

- Via the handle (fig. 5a.2) roll the cryostat from the bottom plate (fig. 5a.3) over the wooden cover (fig. 5a.1). In doing so, the rear side of the instrument must show to the incline (fig. 5a.1).

CAUTION!
The instrument is very heavy. While the instrument rolls down on the incline, it must be guaranteed that the instrument does not move in an uncontrolled way.

- Now the cryostat can be rolled to its site of installation.
- For possible return shipments, please keep the packing.

WARNING
The instrument must only be moved in standing or slightly tilted (approx. 30°) position.

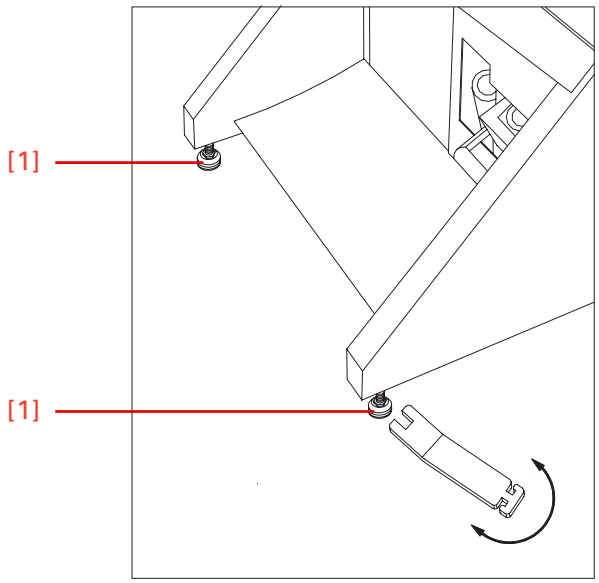

Figure 6. Balancing out the machine.

Choose installation site that

- enough ventilation for the cooling system is guaranteed.
- the distance between wall and rear panel is approx. 15 cm. For this, install the distance bolts (fig. 6a.1).
- the suction areas on either side are kept free (fig. 6a.2).
- the mains switch for separating the instrument from the power supply is accessible any time.

Moreover, the installation site must be free from:

- draught by open doors or by air conditioning systems.
- direct exposure to sunlight into the cooling chamber.

Note:
Both measures reduce the formation of frost and therefore result in more favorable work conditions. A high air moisture as well as high ambient temperatures reduce the maximum performance of the instrument.

- To fix the complete unit, tighten the screws (fig. 6.1) by using the attached tool.

Warning
Instead of the hand wheel handle, a transportation screw (fig. 6b.1) is inserted into the hand wheel. This way, the hand wheel is tightly and securely connected with the housing of the cryostat. I**t is absolutely necessary to remove this transportation screw before the initial turn-on!**

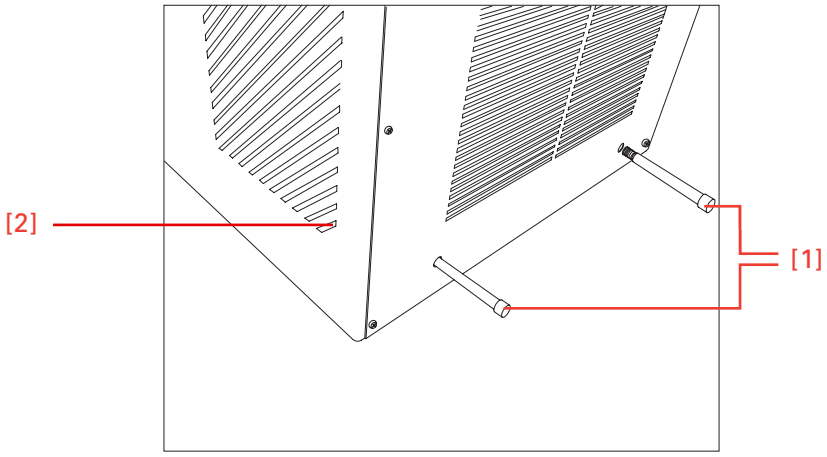

Figure 6a. Installing the distance bolts.

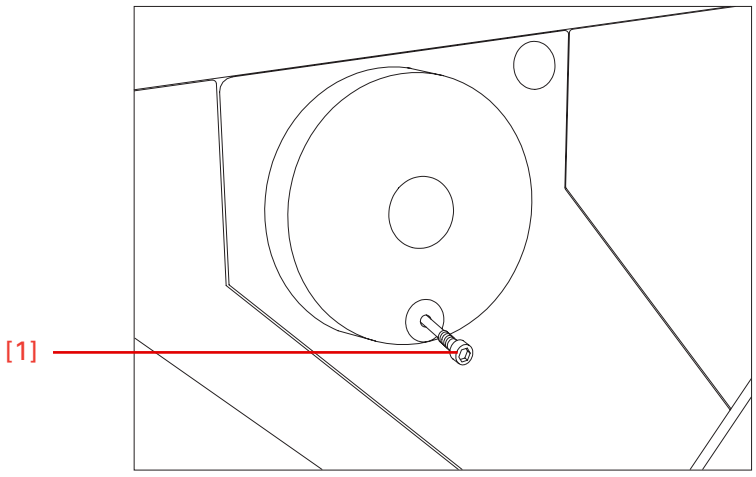

Figure 6b. Loosen the transportation screw.

- Loosen the transportation screw (fig. 6b.1) via the Allan key, size 6.
- Now fix the separately packed handwheel handle on the handwheel with the attached screw by means of the Allan key.

Afterwards:

- If the instrument is equipped with the option M, connect the attached foot pedal to the socket (fig. 7.3) on the rear panel of the instrument.

Note:
The enclosed foot pedal must be connected to the socket (fig. 7.3) only.

- If equipped with the option V, check that the micro filter is inserted in its proper position.
- Insert coarse filter into the filter unit.

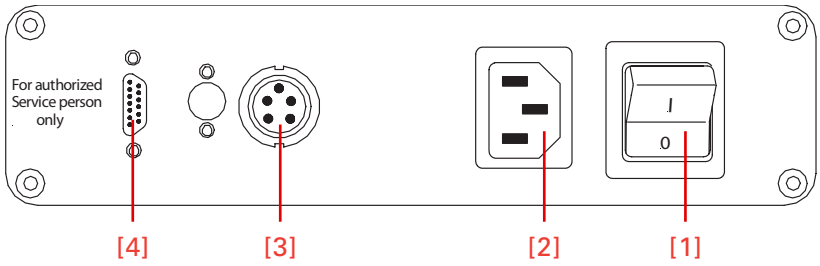

Figure 7. Connections at the rear site.
[1] Power switch
[2] Mains plug
[3] Socket for foot pedal
[4] Serial interface

CAUTION!
Section waste is collected in the coarse filter. It must be replaced at least once a week depending on the amount of debris and nature of the specimens. The **coarse filter** is to be understood as a disposable filter and must not be used again.

The **micro filter** must be replaced at regular intervals, at least semi-annually.

Section waste as well as coarse and **micro filters** are to be disposed of according to the respective lab regulations.

(For this, please see “Inserting and replacing the filter unit”, page 88).

Note:
The serial interface (fig 7.4) must only be used for service purposes and must not be used by the user for its intended use. Only Thermo Scientific specific programming instruments must be connected to this interface.

Initial commissioning

Note:
The kind of the used examination materials and all special conditions for their processing, pre-treatment and, if necessary, storage as well as instrument controls for correct and safe operation is in the responsibility of the operator.

The operator is also responsible for special equipment and materials and/or reagents for the operation of the instrument.

WARNING
Before turning on the instrument for the first time, please check if the power requirements indicated on the type plate (fig. 8) correspond to the power supply voltage being used.

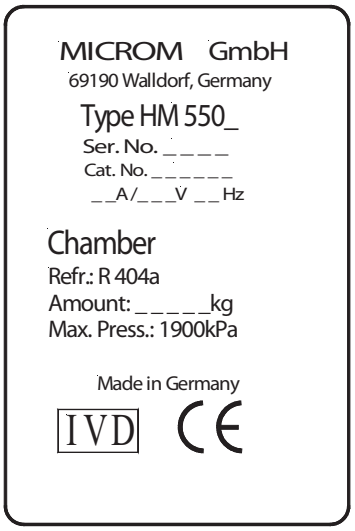

Figure 8. Type plate.

- No other instruments should be connected to the circuit used for the cryostat, as the compressor needs high surge currents when started.
- Do not use multi-socket power outlets with small wire sizes for the supply of the instrument.
- Connect the power line of the instrument to the power outlet.
- If the instrument is equipped with the option M, plug in the foot pedal into the respective socket (fig. 7.3).

Note: Only for option M!
If the foot pedal is not connected, there is the operating mode emergency stop (see page 84). This way, the hand wheel brake is activated and the cutting drive motor cannot be started. Always connect the foot pedal, if the instrument is equipped with option M!

- We recommend to immediately install all accessories belonging into the cryo chamber, e.g. blade carrier.
- The operation manual of the instrument can be found in the separate carton which is placed on the foot part of the cryostat.
- Close the heated sliding window (fig. 6.2).
- Turn on the mains switch (fig. 7.1) on the rear side of the instrument and cool down the instrument.

Note:
The chamber temperature of the cryostat is factory set to -25°C. In case the instrument is equipped with an optional specimen cooling, the specimen temperature is pre-set to -10°C.

The cooling phase will take approx. 2 to 3,5 h depending on the set chamber temperature between -15°C and -30°C.

The cooling phase will take approx. 2 to 3,5 h depending on the set chamber temperature between -15°C and -30°C.

Basic operational rules

When turning on the instrument, the display shows:

- the configuration of the instrument (e.g. the figures show HM550 MV)
- the section thickness selection
- the specimen and chamber temperatures with the corresponding set and actual values
- the symbol for the cutting window

The **WAKE** time is used to trigger the instrument back into the active state.

It should be set with sufficient time before work is started (approx. 1,5 h).

To save energy and extend the lifetime of some instrument components, the instrument has two more operative status:

- Standby status
- Sleep status

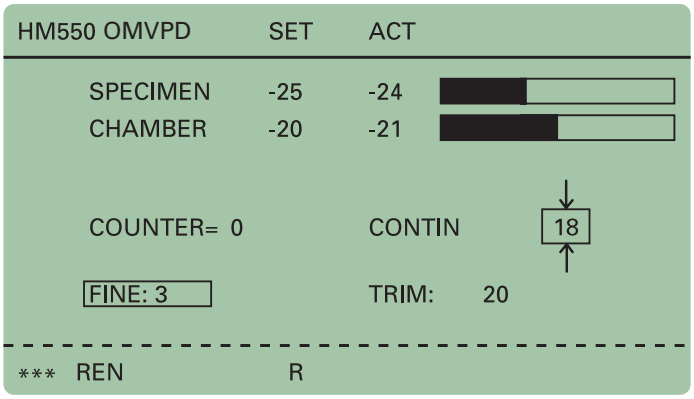

Figure 9. Display starting window.

The instrument switches to the **standby status** (fig. 10) when it is turned on, but not operated for more than a pre-selected active time (see "ACTIVE Time", page 51)) between 1 and 9 h. The chamber illumination goes off and the display switches to a large indication of the chamber actual temperature. This is the clear sign for the **standby status** and gives the operator information on the chamber temperature, also from a greater distance.

When the instrument is not operated for another hour, the cryostat switches to the **sleep status.** The display illumination goes off. However, the equipment-on indicator (fig. 2.1) then lights up and shows that the instrument is still on.

Note:
While in the sleep status, the temperature control of the chamber temperature features a reduced control accuracy.

The specimen temperature in the sleep status is always kept at -15°C. The set temperature of the chamber is kept on a temperature of -20°C.

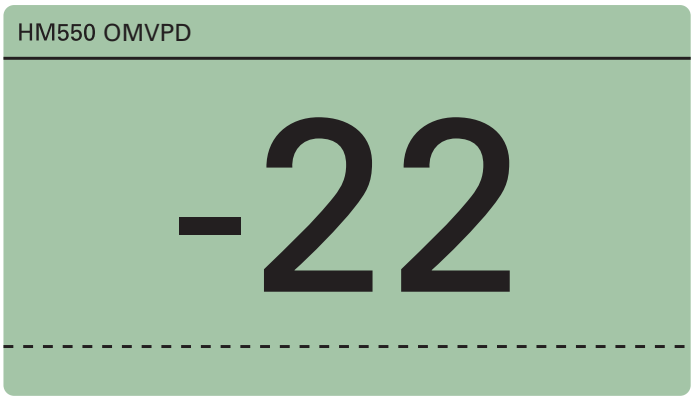

Figure 10. Display: Actual specimen temperature.

- To return to the active operating state, press any key on the control panels or move the hand wheel. Also when reaching the WAKE time (see page 53) the instrument is in the active state again.

UP/DOWN buttons

These two buttons (fig. 11.5 and 11.6) are used to change pre-selected values of different kinds in connection with the chosen function.

– section thickness
– trimming thickness
– specimen temperature
– chamber temperature
– time settings

Note:
To operate the instrument easily and comfortably with a few buttons only, please note the following:

After having chosen a function, its pre-selected values can be changed via the up or down buttons.

However, if no entry is made within five seconds, the operating control switches back into its basic status.

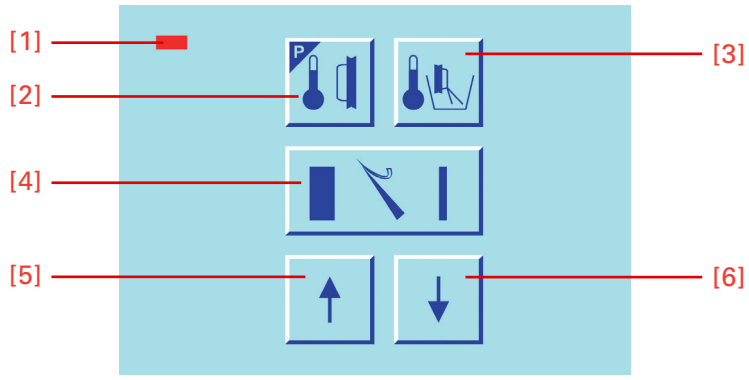

Figure 11. Center keyboard, left buttons.

Reset button

This button (fig. 12.8) is used to reset added values (e.g. number of sections, sum of section thicknesses) to zero.

Menu button

This button (fig. 12.9) is used to get into the submenus. Basic settings, times, service functions and options are set and/or called.

Enter/scroll button

Within the submenu, basic settings are carried out, further submenus are called and other functions are activated via this button (fig. 12.10).

During operation of the instrument, e.g. while cutting, this button is used to choose between the indication of the section thickness, section sum, real time and indication of the distance to the end position of the specimen.

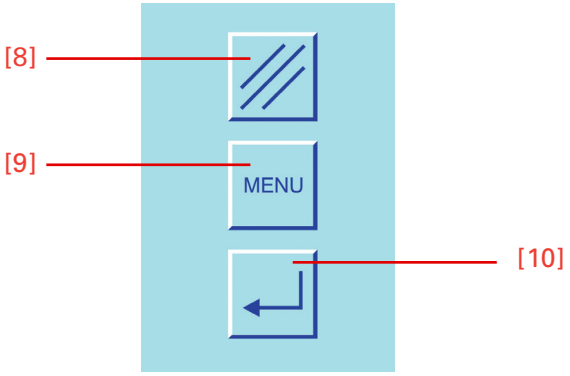

Figure 12. Center keyboard, right buttons.

Keyboard lock

To lock the keyboards and to block the feed movement, press the buttons (fig. 12.8 and 12.10) for approx. 2 sec. The display (fig. 13) shows LOCKED.

To unlock the keyboards press the buttons (fig. 12.8 and 12.10) again.

Note:
When the keyboards have been locked, this leads automatically after 5 sec. to the standby status and after another 5 sec. to the sleep status.

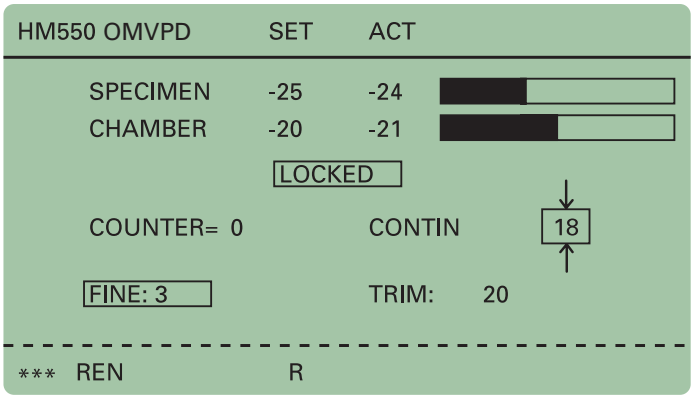

Figure 13. Display: Keypads locked.

Cutting process

Cutting movement and retraction

- Turn the hand wheel in a clockwise direction so the cutting movement is carried out.
- As the specimen moves down, sections are produced.
- Continue turning the hand wheel clockwise to bring the specimen back up.
- To protect the knife and specimen during return travel, the specimen clamping is retracted electro-mechanically.
- This is shown by the letter “R” in the status line on the display.

Warning
When the motor drive (option M) for the cutting movement has been turned on, the same run process as above-mentioned is carried out. Keep the rotating area of the hand wheel clear! Keep enough distance to the rotating hand wheel handle.

X Selected Section Thickness
a Specimen
b Cutting Movement
c Knife
d Return Travel
R Retraction

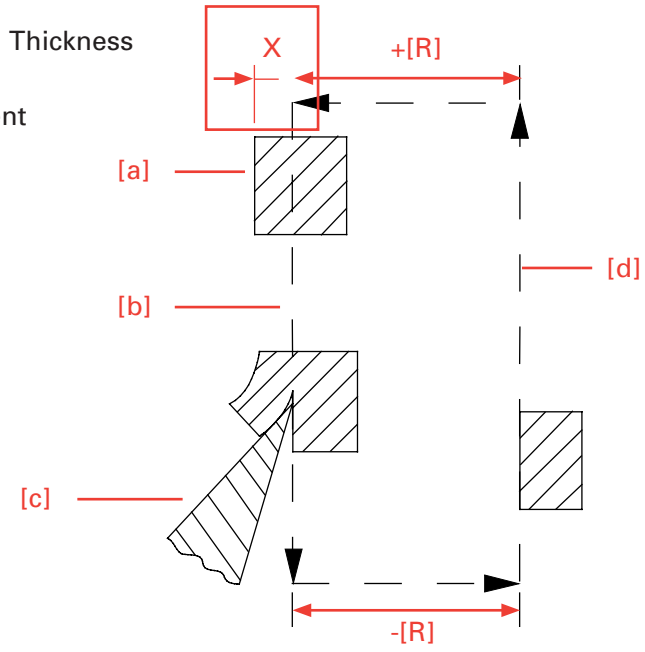

Figure 14. Cutting movement and retraction.

Setting section thickness and trimming thickness

Basic status of the operating control:

- To choose between section thickness and trimming thickness, press button (fig. 16.4).
- The selected setting is shown inverted on the display (fig. 15).
- Then enter the desired section or trimming thickness via button up (fig. 16.5) or down (fig. 16.6).
- The altered values are shown on the display.

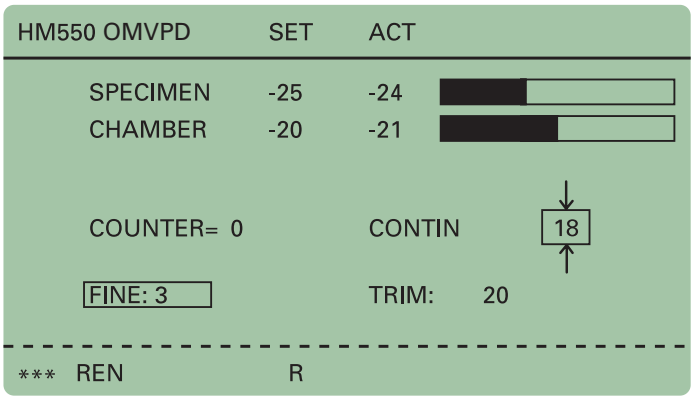

Figure 15. Setting section thickness and trimming thickness.

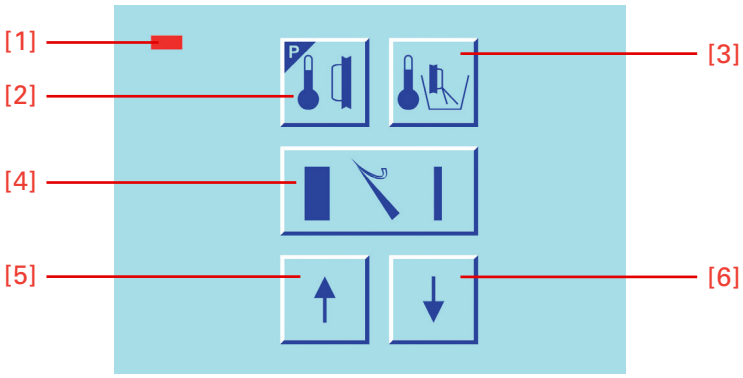

Figure 16. Center keyboard, left buttons.

The graduation of the section thicknesses (which can be pre-selected) is divided into 5 ranges:

Range	Graduation
from 1 µm to 10 µm	1 µm
from 10 µm to 20 µm	2 µm
from 20 µm to 70 µm	5 µm
from 70 µm to 100 µm	10 µm

The graduation of the trimming thicknesses (which can be pre-selected) is divided into 4 ranges:

Range	Graduation
from 5 µm to 10 µm	5 µm
from 10 µm to 100 µm	10 µm
from 100 µm to 200 µm	20 µm
from 200 µm to 500 µm	50 µm

Chamber cooling

Actual and set value of the chamber temperature

The actual and set values of the chamber cooling are shown in °C on the display (fig. 17). On the right side of the display, the actual value is also shown graphically.

- Press button (fig. 18.3) for chamber temperature.
- "CHAMBER" is then shown inverted.

The set value settings are made via the

- up button (fig. 18.5)
- down button (fig. 18.6)

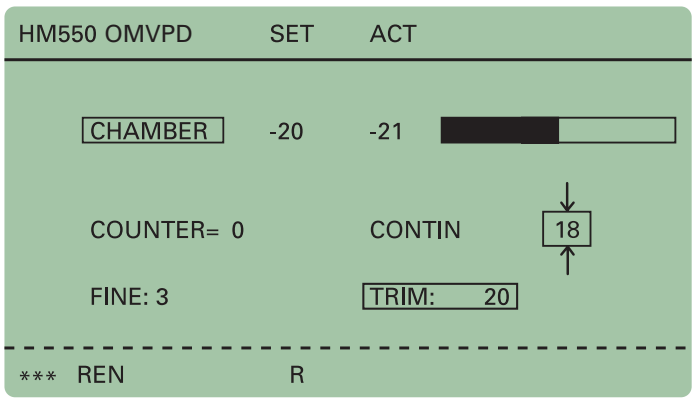

Figure 17. Display: Actual / Target chamber temperature.

Note:
The valid range of the set value goes from +10°C down to -35°C.

- The actual value of the chamber temperature is shown as actual temperature and as a graphic.
- After having chosen the requested values, the display automatically

returns to its basic indications after three seconds, i.e. fine section thickness is again shown inverted.

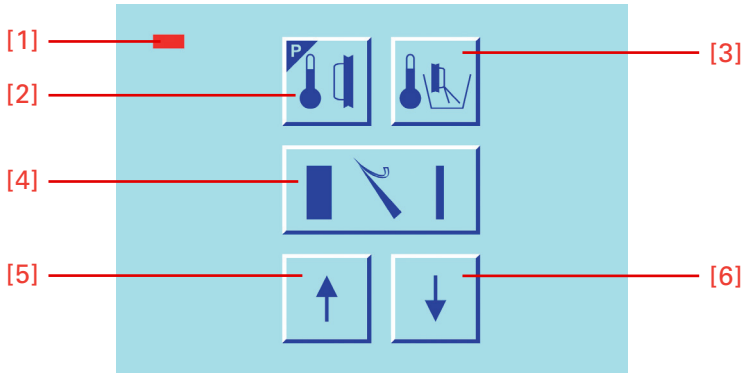

Figure 18. Center keyboard, left buttons.

Fastfreezing for standard instruments

There are several possibilities to freeze on specimens.

Various specimen chucks are available. Round specimen chucks can be supplied with a diameter of 30 mm and 40 mm and rectangular specimen chucks with a size of 50, 55, 60 and 70 mm. Special sizes on request.

- Put the warm chuck into the hole (fig. 19.1) of the fast freezing rail.
- Put freezing medium onto the chuck.
- Place fresh tissue onto the still liquid freezing medium.
- When the medium and tissue are frozen, the chuck can be inserted into the specimen clamping and can be fixed.
- The specimen can now be sectioned.

Figure 19. Fast freezing rail in the chamber.

Note:
The upper side of the freezing station must not be covered by frost or ice. To avoid this, use ethanol (absolute) or the like.

Note:
If the instrument is equipped with the option P (active deep freezing device with Peltier element), please also see page 100, Option P.

Heat extractors (optional accessoires)

When using a heat extractor in combination with the so-called cryo molds, the specimen is frozen faster and more evenly, as the specimen is frozen from above and below at the same time. Thus the freezing time can be reduced.

Moreover, the formation of artifacts can also be reduced considerably.

Two different heat extractors (fig. 20a and fig. 20b) are available:

Heat extractor (fig. 20a)

- Insert the chuck (fig. 20a.3) into the fast freezing rail (for standard version) or into the rail with Peltier element (for versions with option P).
- Then insert a cryo mold (fig. 20a.2) onto the chuck (30 or 40 mm).
- Fill freezing medium into the mold and place the specimen onto the freezing medium.
- The heat extractor (fig. 20a.4) is placed horizontally onto the specimen.

Note:
Use both a frozen cryo mold and a frozen heat extractor.

Heat extractor (fig. 20b)

- Insert the heat extractor (fig. 20b) into the fast freezing rail (fig. 20b.1).
- To pre-cool the heat extractor, turn the knob (fig. 20b.2) to lower the heat extractor onto the fast freezing plate (fig. 20b.4).
- Turn the knob (fig. 20b.2) to lower the heat extractor onto the specimen (fig. 20b.3).
- Further turn the knob (fig. 20b.2) to increase the pressure onto the specimen. Carefully observe this process to avoid a possible deformation of the specimen.
- To loosen the heat extractor, turn the knob (fig. 20b.2) in opposite direction.

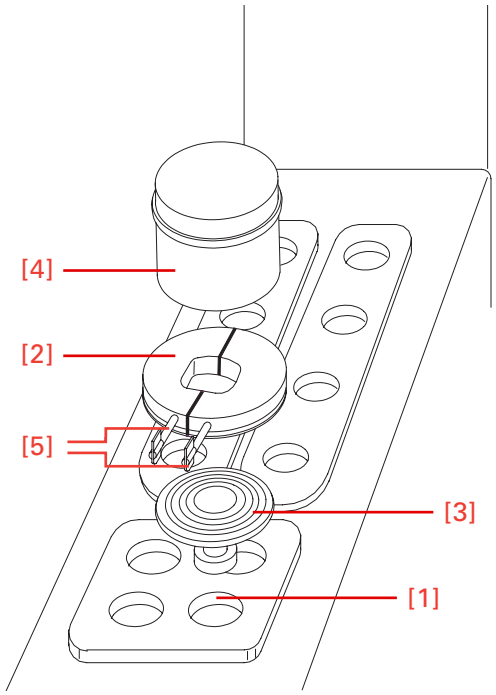

Figure 20a. Heat Extractor.

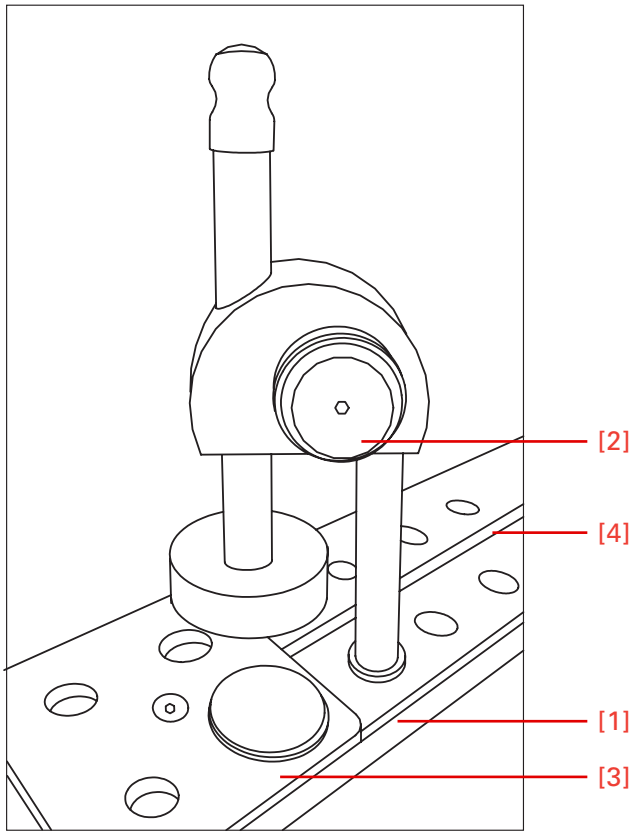

Figure 20b. Heat Extractor.

Feed

Specimen coarse feed

For the fast forward and backward travel between knife and specimen, the cryostat microtome has a motorized coarse feed system.

The approach between specimen and knife can also be carried out by means of an automatic function (see page 43).

Return travel of the specimen clamping

- Press button (fig. 21.4). Pressing the button briefly leads to short return travels only.
- Press the button (fig. 21.4) for more than approx. 2 seconds, the function is carried out continuously. The specimen clamping will entirely be moved backwards.

Note:
The rear end position is defined as that position which has the longest distance to the knife.

- To stop this function, briefly press button (fig. 21.4) once more.
- When the rear end position of the specimen clamping is reached, the coarse feed turns off.
- The LED in button (fig. 21.4) blinks, which means that the specimen clamping is in its rear end position.

Feed travel of the specimen clamping

- Press button (fig. 21.5). Briefly press this button, to carry out a forward travel of that trimming section thickness which was chosen via the control panel and shown on the display.
- The continuous forward travel is only carried out as long as the button (fig. 21.3) is being pressed.

Warning
With the function coarse feed forwards specimen and knife are adjusted very quickly. To avoid damage to specimen and knife, the following points are of utmost importance!

- Take note that the specimen and knife edge do not come in contact with each other.
- Carefully observe the narrowing gap between specimen and knife edge to stop the function coarse feed forwards in time before the specimen touches the knife.

When the instrument is just carrying out the retraction movement and the function coarse feed forwards is selected, the coarse feed movement is carried out and the retraction is annulled.

- When the front end position of the specimen clamping is reached, the coarse feed turns off.
- The LED in button (fig. 21.3) lights up and shows that the specimen clamping has reached its front end position.

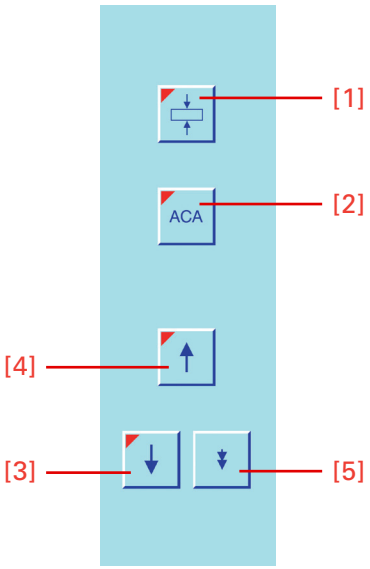

Figure 21. Keypad left.

Speed for specimen coarse feed

The speed for the specimen coarse feed can be selected in three different settings.

The selected setting is shown in the status line on the display by one, two or three little stars. Three stars means the fastest coarse feed setting.

Setting the speed

- Press the menu button (fig. 23.9). This way, you will get into the list with the submenus.
- Select “coarse feed” via the arrow buttons (fig. 22.5 and 22.6). The selected submenu is now shown inverted.
- Press the enter button (fig. 23.10) to confirm the submenu and open it.
- Via the arrow buttons (fig. 22.5 and 22.6) choose between *, ** or ***.

Note:
One star means a slow approach speed, two stars mean a medium speed and three stars stand for a fast approach speed.

- Press the enter button (fig. 23.10) to confirm the setting.

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

- To quit the submenu, press the menu button (fig. 23.9).
- Now continue working with the selected settings.

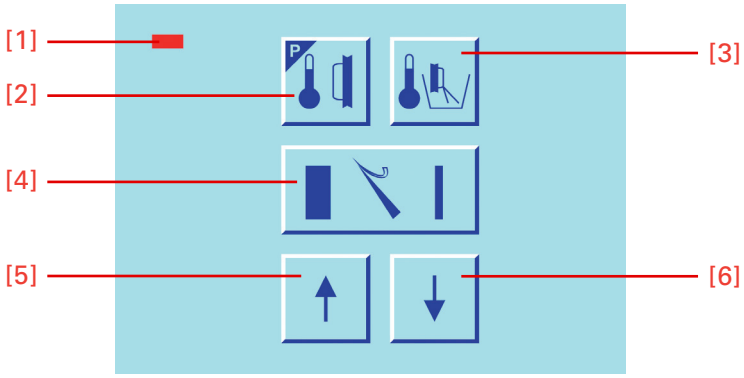

Figure 22. Center keyboard, left buttons.

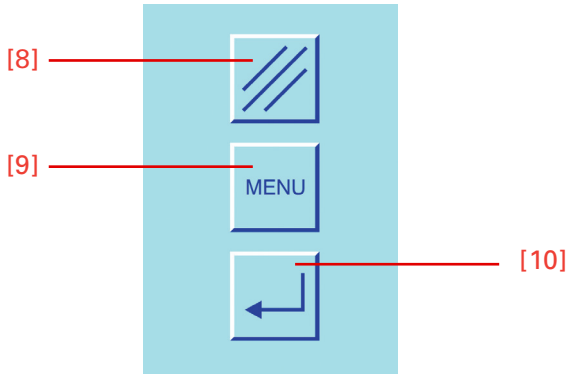

Figure 23. Center keyboard, right buttons.

Setting the cutting window

To activate an automatic approach process, it is necessary to set a cutting window first.

The size of this window is then shown in the symbol cutting window. When passing the cutting window this symbol is shown inverted on the display.

Manual setting

- The cutting window can be determined by manual entries.
- For this, press button (fig. 23.8) and while this button (fig. 23.8) is still being pressed, press button (fig. 25.1).
- Turn the hand wheel so that the lower edge of the specimen is positioned slightly above the knife edge.
- Press button (fig. 25.1) to set the upper limit of the cutting window.
- Continue turning the hand wheel clockwise to place the upper edge of the specimen just below the knife edge.
- Press button (fig. 25.1) to set the lower limit of the cutting window.
- The LED in button (fig. 25.1) lights up during each further passing through of the cutting window. The length of the cutting window is shown in mm within the cutting window symbol on the display.

Note:
A cutting window should only be set while the specimen is moved downwards. If, by mistake, a cutting window limit is set during return travel of the specimen, the set limits are applied to the cutting movement accordingly.

Note:
In case the cutting window limits are set incorrectly, please repeat abovementioned process again.

Note:
If no cutting window is needed, briefly press the button (fig. 25.1) twice. The automatic approach system can now be released in any position.

Automatic apporach system

The automatic approach system performs the fast and exact approach of the specimen towards the knife edge and can be applied between -5°C and -35°C with the Thermo Scientific freezing medium Neg -50.

Note:
Use automatic approach system with conventional freezing medium only down to -35°C chamber and/or specimen temperature

Caution
For your personal safety, before activating the automatic approach system, move the anti-roll plate onto the blade against possible splintering of the blade. This might be caused by an incorrect approach.

Caution
When using different freezing techniques, for example by means of the fast freezing stations, liquid nitrogen, CO2 and the like, which generate a freezing temperature of below -35°C, the automatic approach system

can only be applied after the specimen will have adjusted itself to the respective temperature of the specimen holder which must be between the temperature range.

Starting the automatic approach

- Use the hand wheel to make sure that the most protruding point of the specimen is opposite the knife edge. This position must be within the selected cutting window.

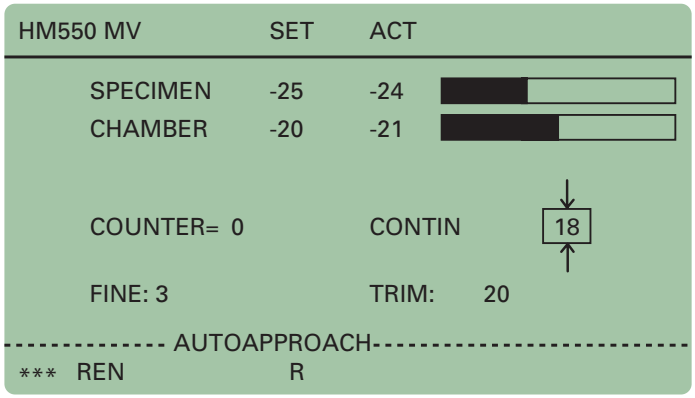

Figure 24. Display: Automatic approach process.

Note:
If the button (fig. 25.1) is pressed twice and the cutting window is inactive, the automatic approach can be released in any position.

- Press button (fig. 25.2) to start the automatic approach process.
- The red LED in this button (fig. 25.2) lights up and confirms the chosen function and AUT.APPROACH is shown in the status line on the display (fig. 24).

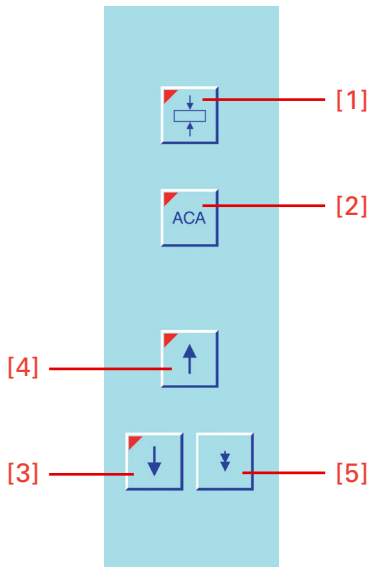

Figure 25. Keypad left

- The specimen clamping moves forwards until the knife edge touches the specimen.
- Immediately afterwards, this forward travel of the specimen clamping is stopped and moved backwards by a safety distance of 200 µm. AUT.APPROACH is still shown on the display as the process of the automatic approach has not yet been finished.
- When passing the next upper reversal point, the specimen clamping automatically moves forwards again by 200 µm.
- The red LED in button (fig. 25.2) goes off as well as the term AUT. APPROACH disappears.
- The specimen is now in position to start sectioning.

Interruption of the automatic approach

- Press button (fig. 25.2) or
- pass upper or lower reversal point via hand wheel.

When an automatic approach has been carried out, another approach can be started immediately, if needed.
This might become necessary, when the specimen has been oriented again.

Error codes during an automatic approach process

- **Error code ‚AMPLIFIER ERROR‘**
  is shown on the status line on the display, in case the activating signal for the automatic approach has already been recognized before the automatic approach movement has been started.
- Possible cause: the specimen has already been in contact with the knife edge, e.g. by protruding fibers or the Cold D cycle was interrupted.
- Press button (fig. 25.2), remove the cause for the error and press button (fig. 25.2) again, to start the automatic approach once more.
- However, if there is no obvious explanation for this error code, e.g. frost built-up, please call a service technician.
- **Error code ‚OUT OF TEMPERATURE‘**
  appears in the status line on the display, if the actual temperature of the knife or the specimen is outside the temperature range of -5°C and -35°C, which is valid for the automatic approach function only.
- Press button (fig. 25.2). The error message goes off.

Note:
In this case the function automatic approach cannot work. The approach between specimen and knife edge must be carried out via the coarse feed button (fig. 25.3).

Trimming and first cuts

After the specimen and the knife are adjusted, further gradual feed for trimming can be carried out using the function trimming.

For different sectioning series, deeper layers of the specimen can be reached with the function trimming.

- Make sure that the trimming thickness setting is selected via the button (fig. 26.4). Trimming thickness is shown inverted on the display.
- Press the arrow buttons (fig. 26.5 or 26.6) to select the desired trimming value.
- Turn the hand wheel in a clockwise direction to carry out the trimming feed in the upper reversal point of the cutting movement.

Note:
If the trimming function is carried out via the motorized drive (see Option M – Motorized Cutting Drive, page 80 and page 123).

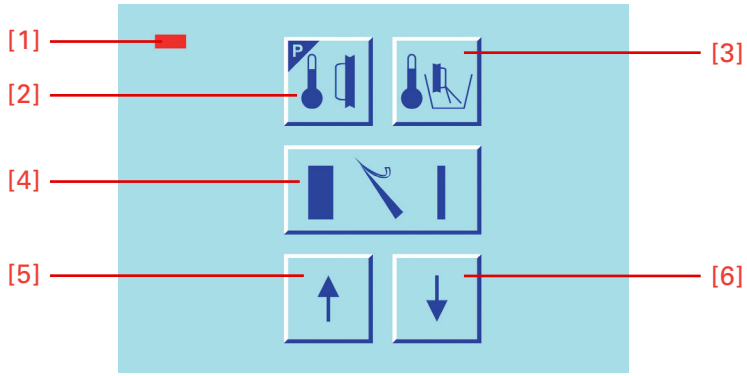

Figure 26. Center keyboard, left buttons.

Fine feed

After having adjusted knife and specimen as well as having trimmed the specimen, sectioning can be started.

- Make sure that the section thickness setting is selected via the button (fig. 26.4). Section thickness is shown inverted on the display.
- Press the arrow buttons (fig. 26.5 or 26.6) to select the desired value.

- Turn the hand wheel in a clockwise direction to feed the specimen at the selected section thickness.

Note:
If the fine feed is carried out via the motorized drive (see Option M – Motorized Cutting Drive, page 80 and page 123).

Turning ON/OFF the Function RETRACTION

If needed, the function retraction can be turned off.

- Press the menu button (fig. 29.9). This way, you get into the list of submenus.
- Via the arrow buttons (fig. 28.5 and 28.6) select the submenu "retraction ON/OFF". The selected submenu is now shown inverted.
- Via the enter button (fig. 29.10) confirm the submenu and simultaneously open it.
- Via the arrow buttons (fig. 28.5 or 28.6) select the desired setting (ON or OFF).
- Confirm the setting via the enter button (fig. 29.10).

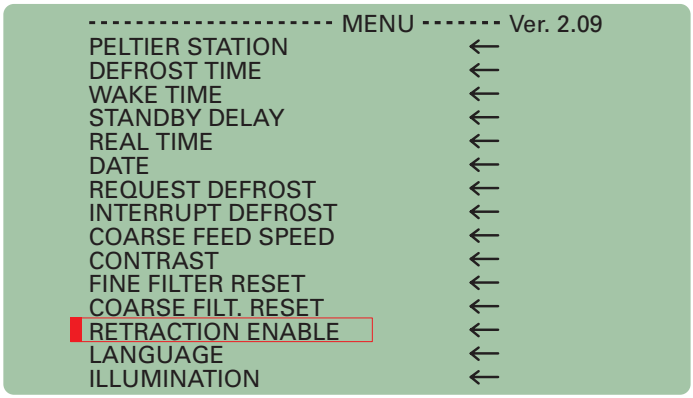

Figure 27. Display: Retraction.

Note:
You return immediately to the list of submenus (fig. 27). If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

- To quit the submenu, press the menu button (fig. 29.9).
- Now continue working with the selected settings.
- The letters "REN" in the status line on the display go off, if the retraction function has been turned off.

Note:
The letter "R", however, might still be on. This function goes off only after having passed from the return travel again to the cutting movements via the hand wheel.

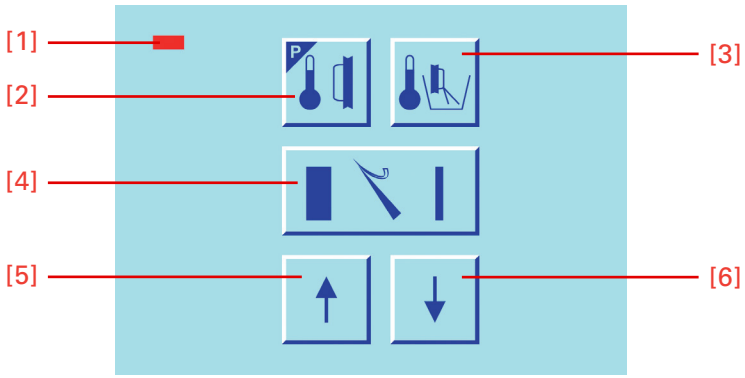

Figure 28. Center keyboard, left buttons.

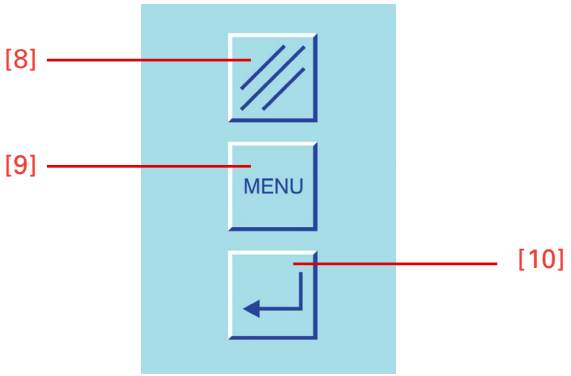

Figure 29. Center keyboard, right buttons.

Indication of cutting processes

Further information on the cutting processes can be seen on the display. Press the scroll/enter button (fig. 30.10), to show the various functions one after the other.

Note:
Within the menu, the scroll/enter bu tton is used to confirm submenus and/ or settings. During operation, i.e. outside the menu, this button is used as a scroll button.

The following information on the carried-out cutting processes of the instrument can be read on the info line of the display:

– number of sections
– sum of section thicknesses
– remaining travel to the front end position
– real time

- Press the scroll button (fig. 30.10) until the required information lights up on the display.
- If no information is required in this line of the display, press button (fig. 30.10) until this line is blank.

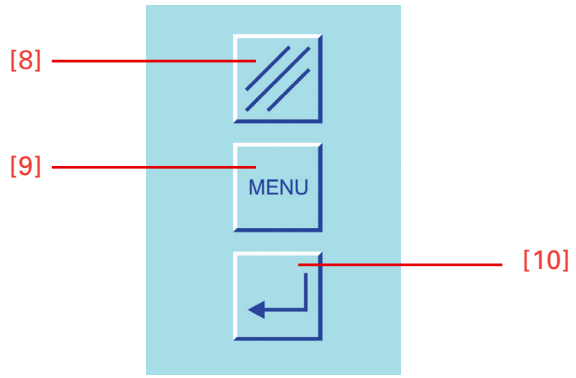

Figure 30. Center keyboard, right buttons.

Section counter

- The section counter adds up the number of sections produced.
- After each downward movement of the specimen holder, the number on the section counter increases by 1.
- The counter can be reset to zero via button (fig. 30.8).

Sum of section thicknesses

- This value shows the sum in microns of the sections already cut.
- Trimming values as well as sectioning values are added up.
- This value can be reset to zero via button (fig. 30.8).

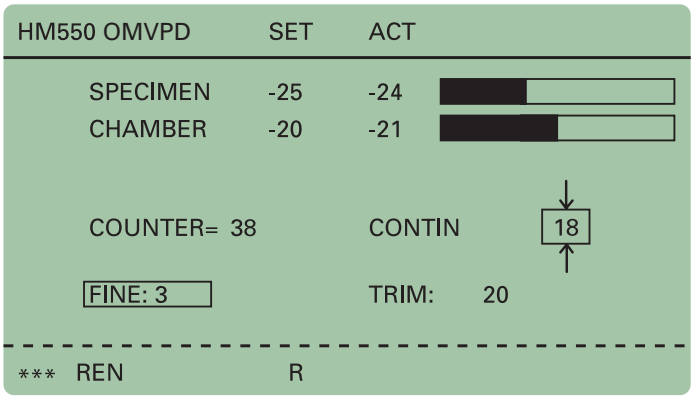

Figure 31. Display: Section counter.

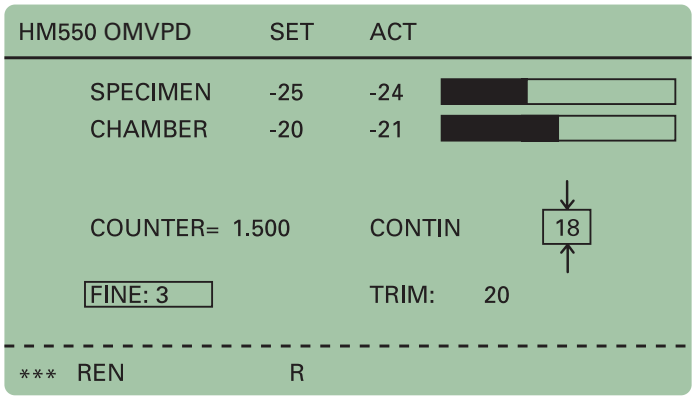

Figure 32. Display: Section thickness sum.

Remaining travel to front end position

- This value shows the distance in microns, which is left for sectioning.
- When the specimen clamping is in the rear end position, the display shows 23 000 µm. This number decreases the closer the specimen holder moves towards the front.

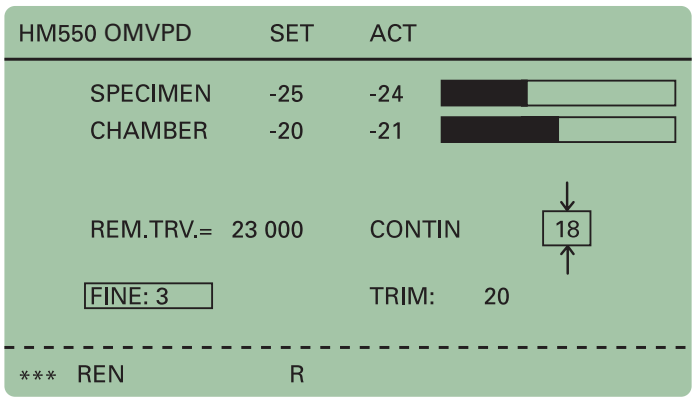

Figure 33. Display: Remaining travel to front end position.

Note:
If no further feed is possible anymore, the display automatically shows the remaining travel, independently which information on the sectioning processes, e.g. number of sections or sum of section thicknesses, was chosen before.

Real time

The real time is shown here.

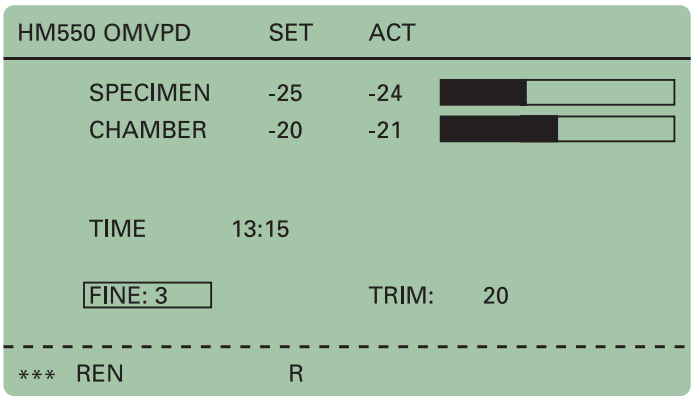

Figure 34. Display: Real time indication.

Setting the real time, WAKE time, ACTIVE time and date

Setting the real time

- Press the menu button (fig. 38.9). This way, you get into the list of the submenus.
- Select “Real Time” via the arrow buttons (fig. 37.5 and 37.6). This submenu is now shown inverted.
- Via the enter button (fig. 38.10) confirm this submenu and simultaneously open it.
- To change the instrument‘s real time at intervals of one minute, press the arrow buttons (fig. 37.5 or 37.6). If the buttons are being pressed for more than 5 seconds, the time changing will be accelerated.
- Confirm via enter button (fig. 38.10).

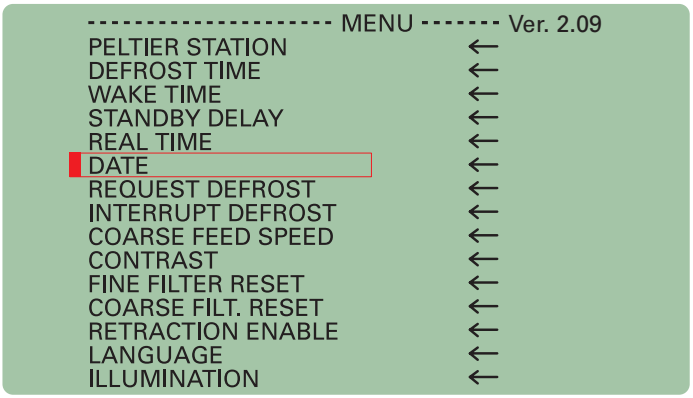

Figure 35. Display: Adjust real time.

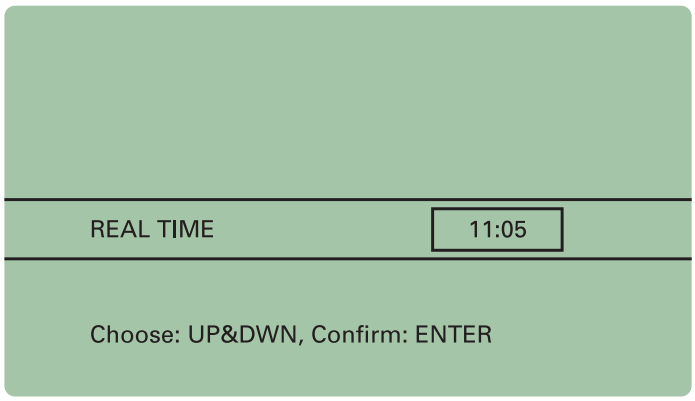

Figure 36. Display: Real time adjusted.

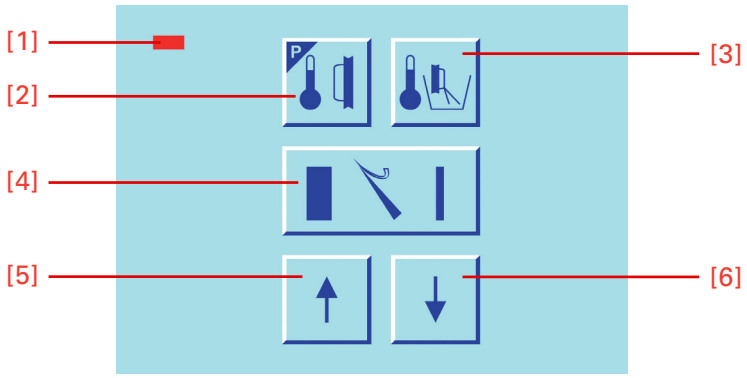

Figure 37. Center keyboard, left buttons.

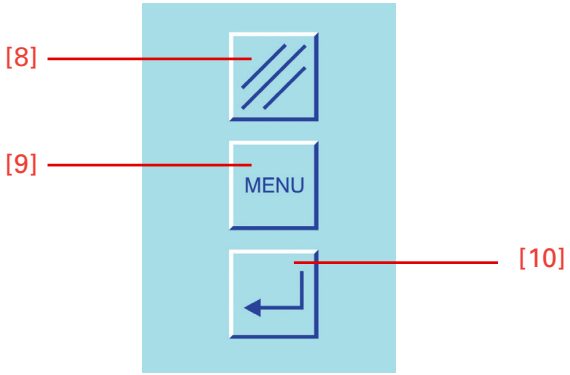

Figure 38. Center keyboard, right buttons.

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

- To quit the submenu, press the menu button (fig. 38.9).
- Now continue working with the selected settings.

Setting the WAKE time

The **WAKE** time is used to trigger the instrument back into the active state. It should be set with sufficient time before work is started (approx. 1,5 h).

- Press the menu button (fig. 42.9). This way, you get into the list of submenus.
- Via the arrow buttons (fig. 41.5 and 41.6) select “Wake Time”. This submenu is now shown inverted.
- Via the enter button (fig. 42.10) confirm this submenu and simultaneously open it.
- To change the WAKE time at intervals of 15 minutes, press the arrow buttons (fig. 41.5 or 41.6).
- Confirm with enter (fig. 42.10).

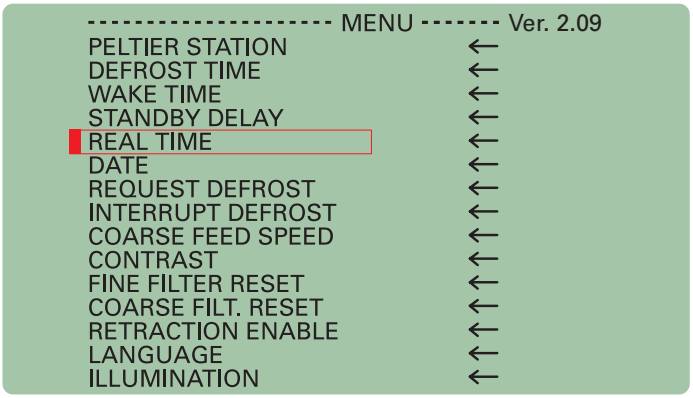

Figure 39. Display: Adjust WAKE-Time.

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

- To quit the submenu, press the menu button (fig. 42.9).
- Now continue working with the selected settings.

After having reached the WAKE time, the instrument switches over to the active status.

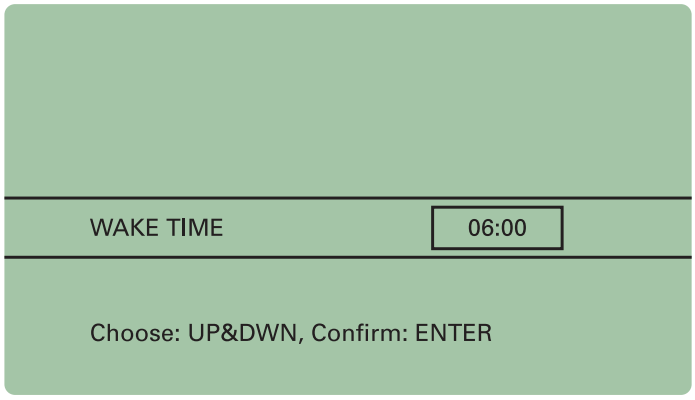

Figure 40. Display: WAKE-Time adjusted.

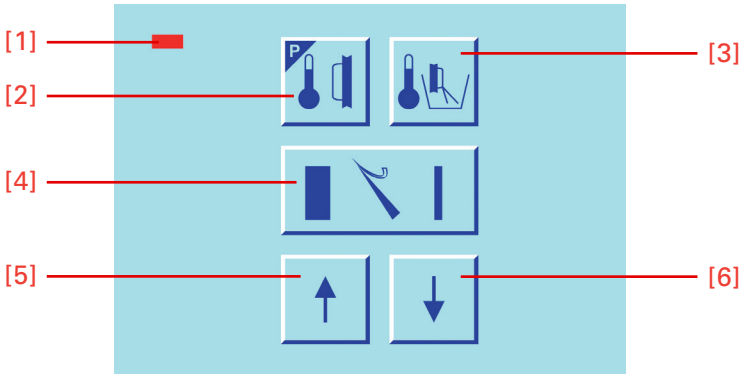

Figure 41. Center keyboard, left buttons.

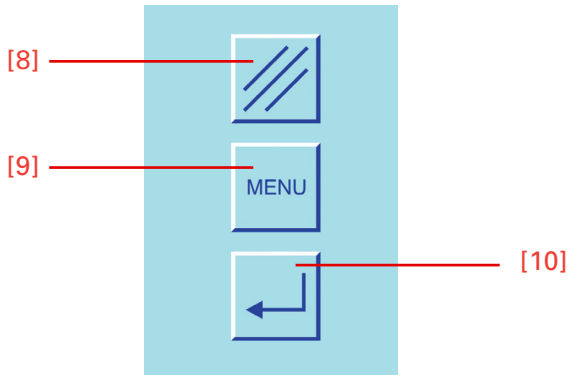

Figure 42. Center keyboard, right buttons.

Setting the ACTIVE time

- Press the menu button (fig. 46.9). This way, you get into the list of the submenus.
- Via the arrow buttons (fig. 45.5 and 45.6) select “Active Time”. This submenu is now shown inverted.
- Via the enter button (fig. 46.10) confirm this submenu and simultaneously open it.

- To change the ACTIVE time at intervals of 1-hour-steps (1 to 9 h), press the arrow buttons (fig. 45.5 or 45.6).

- Confirm it via the enter button (fig. 46.10).

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

- To quit the submenu, press the menu button (fig. 46.9).

- Now continue working with the selected settings.

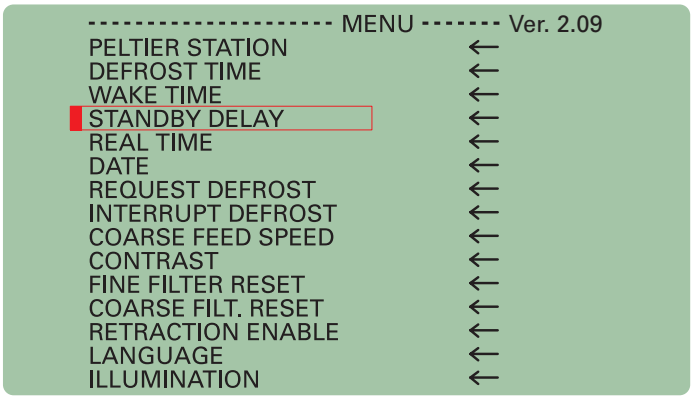

Figure 43. Display: Adjust ACTIVE-Time.

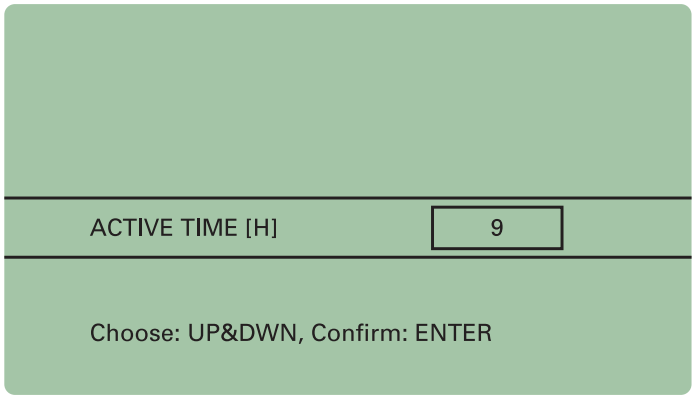

Figure 44. Display: ACTIVE-Time adjusted.

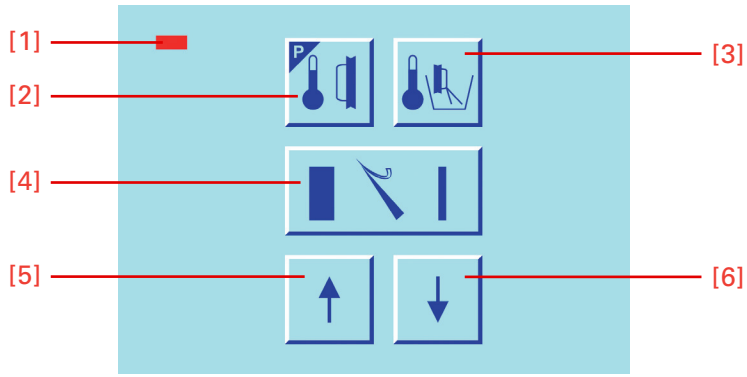

Figure 45. Center keyboard, left buttons.

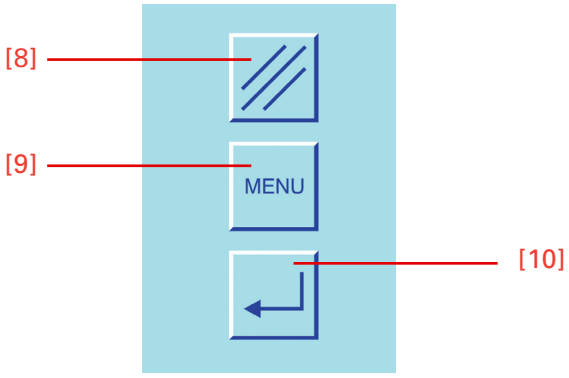

Figure 46. Center keyboard, right buttons.

Setting the date

- Press the menu button (fig. 50.9). This way, you get into the list of the submenus.
- Via the arrow buttons (fig. 49.5 and 49.6) select “Date”. This submenu is now shown inverted.
- Via the enter button (fig. 50.10) confirm this submenu and simultaneously open it.
- To choose between day, month and year, press the reset button (fig. 50.8) to set the correct date.
- Via the arrow buttons (fig. 49.5 and 49.6) change the desired field of the date in steps of day, month or year.
- Confirm it via the enter button (fig. 50.10).

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

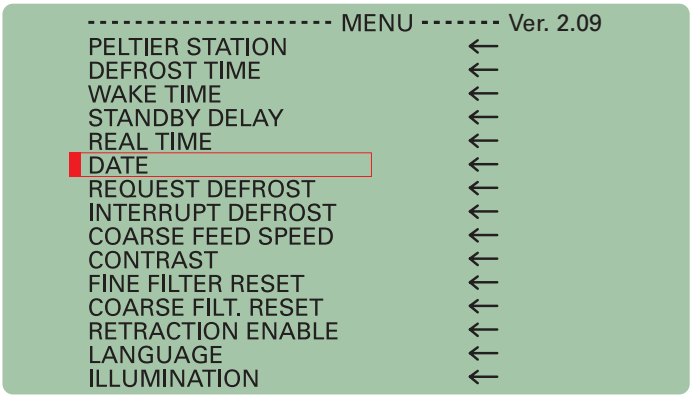

Figure 47. Display: Adjust Date.

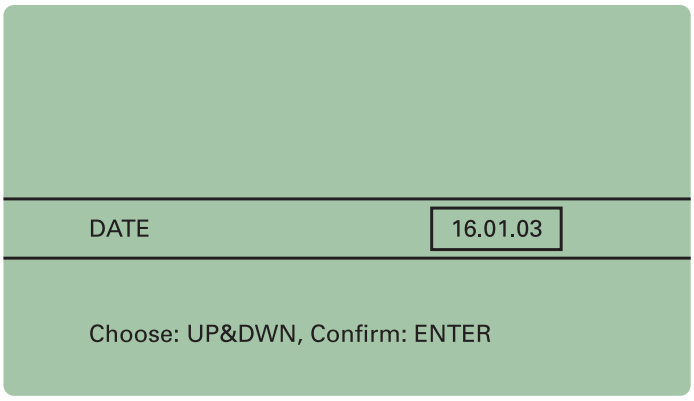

Figure 48. Display: Date adjusted.

- To quit the submenu, press the menu button (fig. 50.9).
- Now continue working with the selected settings.

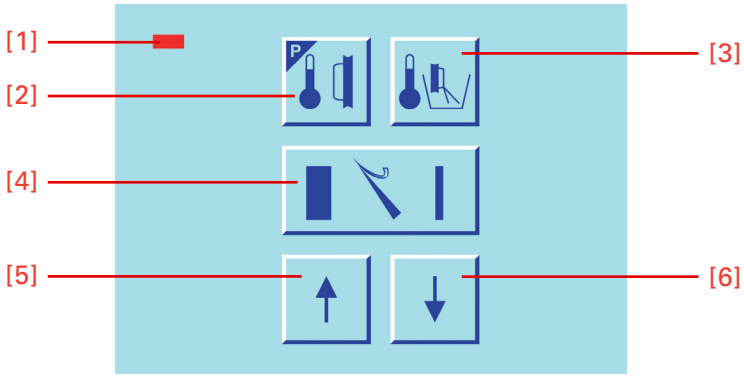

Figure 49. Center keyboard, left buttons.

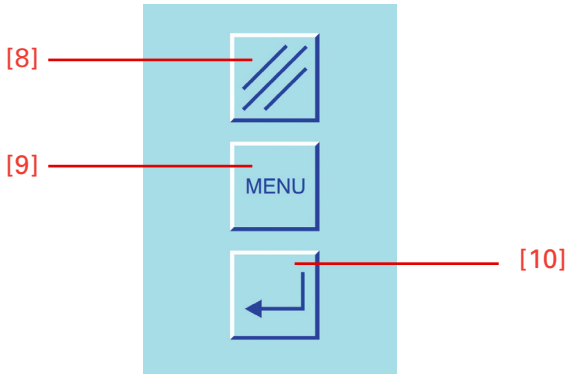

Figure 50. Center keyboard, right buttons.

Defrosting

Setting the defrosting time

- Press the menu button (fig. 54.9). This way, you get into the list of submenus.
- Via the arrow buttons (fig. 53.5 and 53.6) select “Defrost Time”. This submenu is now shown inverted.
- Via the enter button (fig. 54.10) confirm this submenu and simultaneously open it.
- To change the instrument‘s defrosting time at intervals of 15 minutes, press the arrow buttons (fig. 53.5 or 53.6).
- Confirm with enter (fig. 54.10).

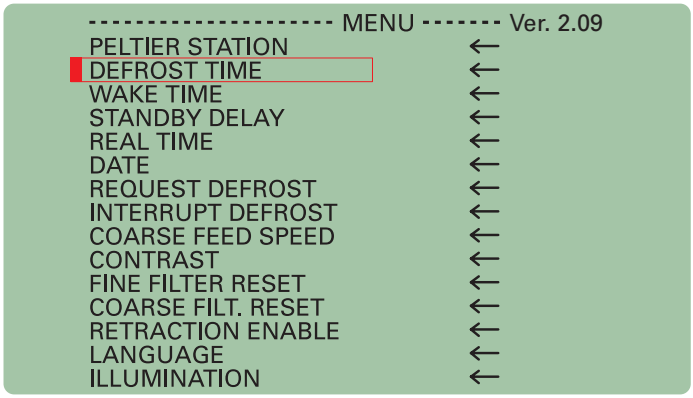

Figure 51. Display: Adjust defrosting time.

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

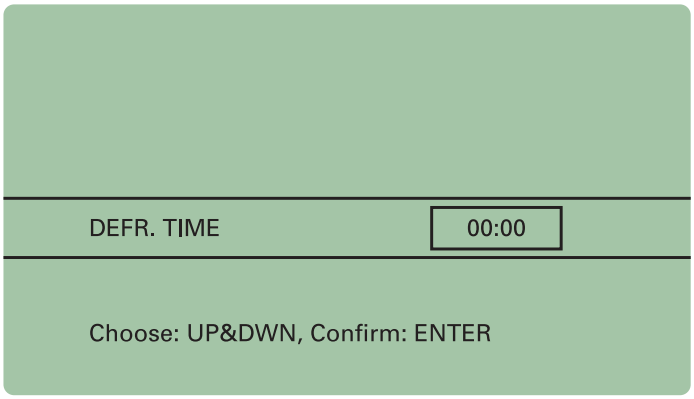

Figure 52. Display: Defrosting time adjusted.

- To quit the submenu, press the menu button (fig. 54.9).
- Now continue working with the selected settings.

Note:
Defrosting can only be carried out at the set defrosting time, if the real time is set correctly (see page 51).

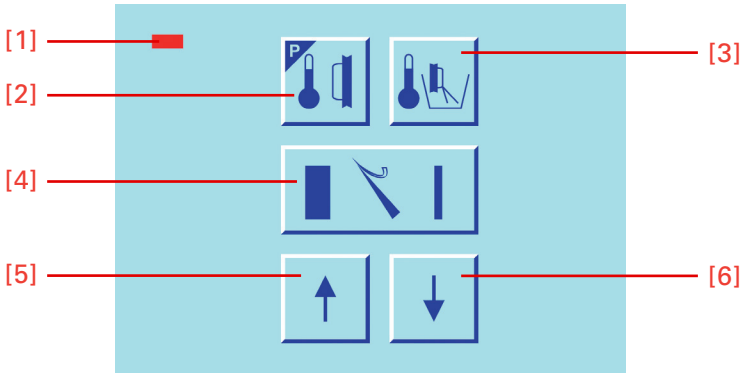

Figure 53. Center keyboard, left buttons.

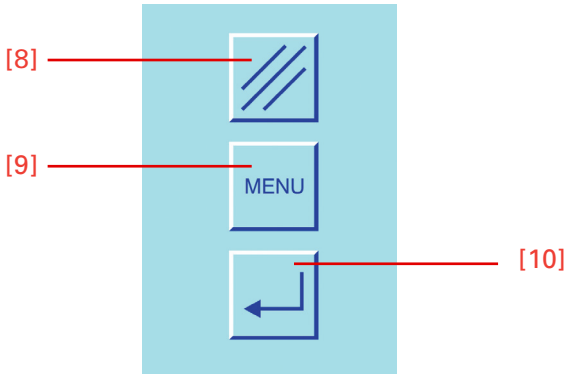

Figure 54. Center keyboard, right buttons.

Defrosting cycle

Every 24 hours the evaporator in the rear part of the microtome chamber is defrosted automatically.

- It is advisable to set the time of the defrosting cycle not during routine working time (see page 54).
- According to the frost built-up, a defrosting cycle normally takes approx. 40 min.
- Immediate defrosting can be carried out at any time (fig. 58.9).
- For this, press the menu button (fig. 58.9),
- Via the arrow buttons (fig. 57.5 and 57.6) select the submenu "request defrost". This submenu is now shown inverted.
- Via the enter button (fig. 58.10) confirm this submenu and simultaneously open it.
- Via the arrow buttons (fig. 57.5 or 57.6) choose "ON" or "OFF".
- If "ON" is confirmed, "request defrost" is shown in the info line.
- To confirm this setting, press the enter button (fig. 58.10).

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

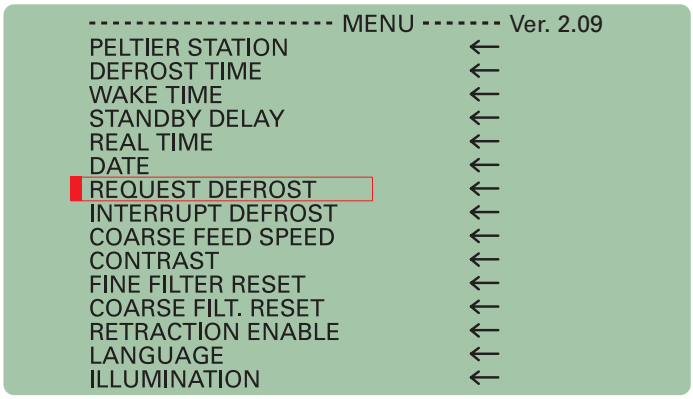

Figure 55. Display: Adjust defrosting cycle.

- To quit the submenu, press the menu button (fig. 55).
- Now continue working with the selected settings.

Note:
Before starting the immediate defrosting, it is absolutely necessary to remove the section waste as well as the tissue

WARNING
Remove the specimen from the chamber when defrosting is carried out. The temperature inside the chamber rises and thus the tissue specimen would be damaged.

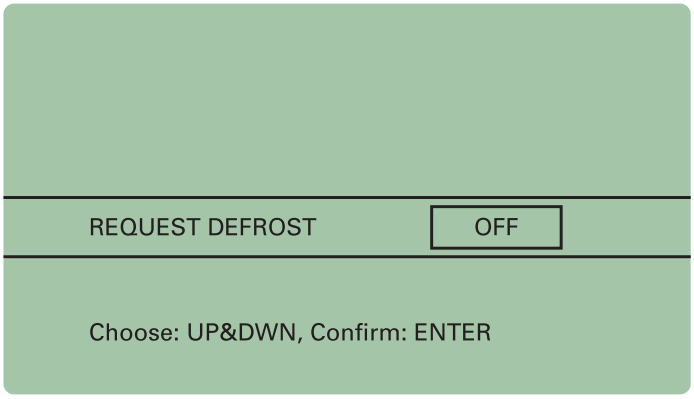

Figure 56. Display: Defrosting cycle adjusted.

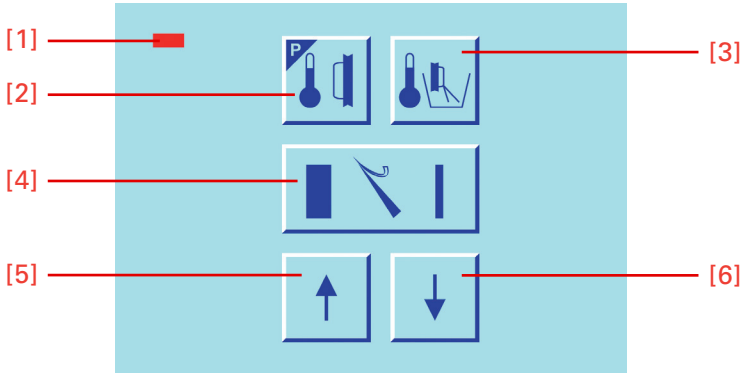

Figure 57. Center keyboard, left buttons.

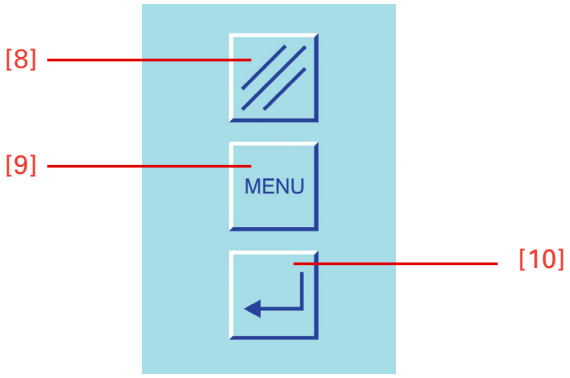

Figure 58. Center keyboard, right buttons.

Interrupting a defrosting cycle

If needed, the daily defrosting can be interrupted or cancelled.

- For this, press the menu button (fig. 60.9) This way, you get into the list of submenus.
- Via the arrow buttons (fig. 59.5 and 59.6) select the submenu “request defrost”. This submenu is now shown inverted.
- Via the enter button (fig. 60.10) confirm this setting and simultaneously open this submenu.
- Via the arrow buttons (fig. 59.5 or 59.6) select “ON” or “OFF”. ON is selected when defrosting is to be interrupted.
- Via the enter button (fig. 60.10) confirm the setting.

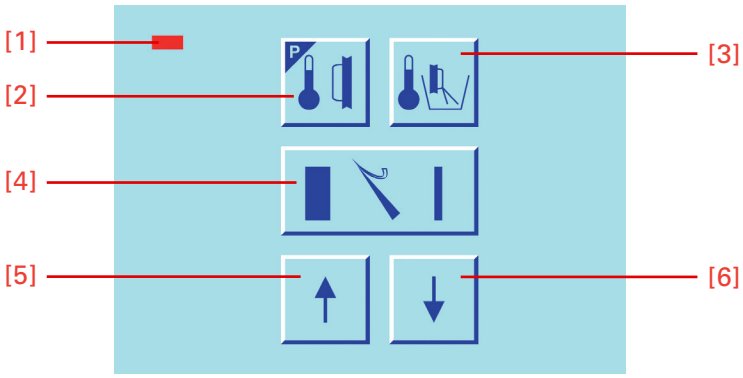

Figure 59. Center keyboard, left buttons.

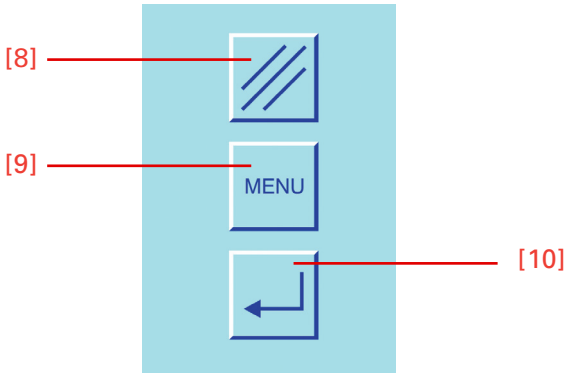

Figure 60. Center keyboard, right buttons.

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

- To quit the submenu, press the menu button (fig. 60.9).
- Now continue working with the selected settings.
- The interrupted defrosting is shown in the status line on the display (fig. 61) as INTR.

Note:
A cancelled or interrupted defrost cycle must be repeated later on, as otherwise the evaporator will cover completely with frost and cannot cool anymore (see immediate defrosting, page 60).

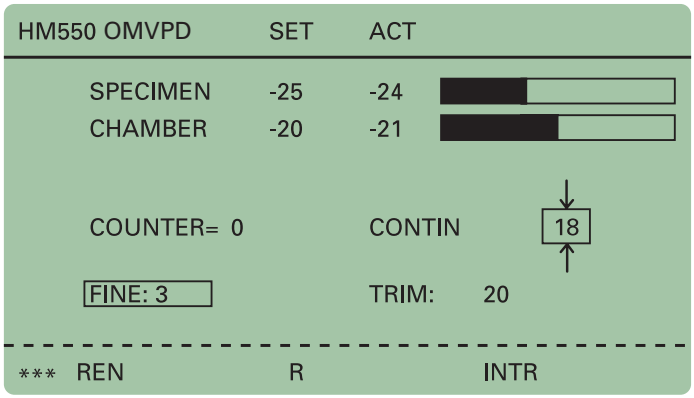

Figure 61. Display: Interrupting a defrosting cycle.

For this reason, the function INTERRUPT is automatically reset at the end of an interrupted defrosting (max. time approx. 1 h), i.e. the next defrosting is carried out again at the pre-selected defrosting time.

Note:
While INT. is active, neither the defrosting time nor the real time can be changed.

When INTR.ACT appears in the status line, this means that INTERRUPT was selected while defrosting should otherwise be carried out and the next defrosting is carried out again at the next pre-selected defrosting time.

Emptying the defrosting liquid

Note:
The liquid from the daily defrosting process is collected in the container (fig. 62.1). Please note that this container is emptied in due time according to the safety precautions at the beginning of this operation manual.

We highly recommend to treat the container with a disinfection solution after having emptied it.

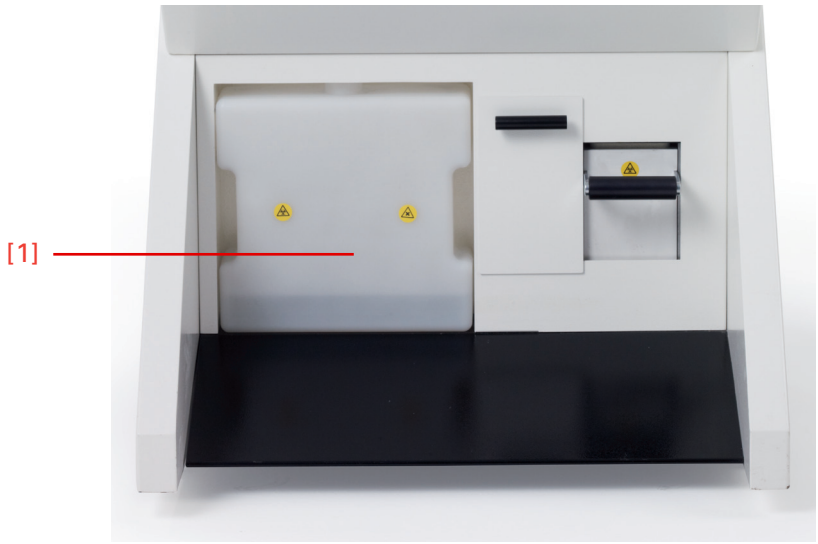

Figure 62. Container for defrosting liquid.

Customer-specific settings

The information on the display can be shown in various contrasts and in four different languages.

Setting the contrast

- To set the contrast higher or lower, press the menu button (fig. 65.9). This way, you get into the list of submenus.
- Via the arrow buttons (fig. 64.5 and 64.6) select “contrast”. This submenu is now shown inverted.
- Via the enter button (fig. 65.10) confirm this submenu and simultaneously open it.
- Several black stripes now appear on the display.
- To set the contrast of the stripes lower, constantly press the button down (fig. 64.6).

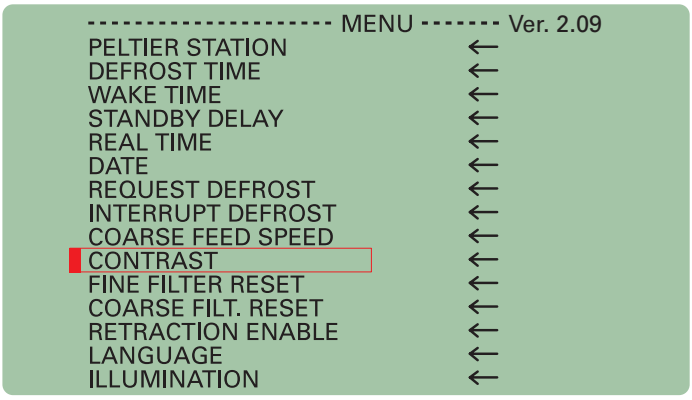

Figure 63. Display: Adjust contrast.

- To set the contrast of the stripes higher, constantly press the button up (fig. 64.5).
- When the desired contrast has been achieved, press the enter button (fig. 65.10) for confirmation.
- To quit the submenu, press the menu button (fig. 65.9).
- Now continue working with the selected settings.

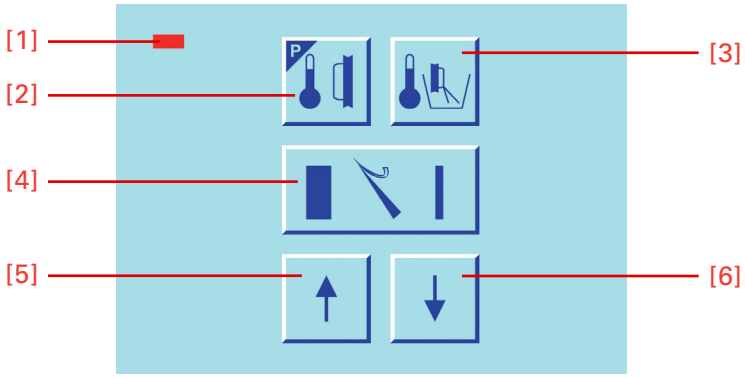

Figure 64. Center keyboard, left buttons.

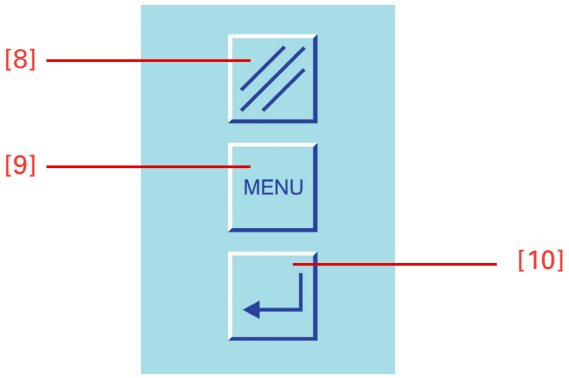

Figure 65. Center keyboard, right buttons.

Selecting the language

The information on the display can be shown in four different languages.

The following languages are available:

– German
– English
– French
– Spanish

- To select or change one of these languages, press the menu button (fig. 69.9). This way, you get into the list of submenus.

- Via the arrow buttons (fig. 68.5 and 68.6) select the submenu “language”. This submenu is now shown inverted.
- Via the enter button (fig. 69.10) confirm this submenu and simultaneously open it.
- Via the arrow buttons (fig. 68.5 and 68.6) select the desired language: “English”, “Deutsch”, “Espanola”, “Français”.
- Via the enter button (fig. 69.10) confirm the setting.

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

- To quit the submenu, press the menu button (fig. 69.9).
- Now continue working with the selected settings.

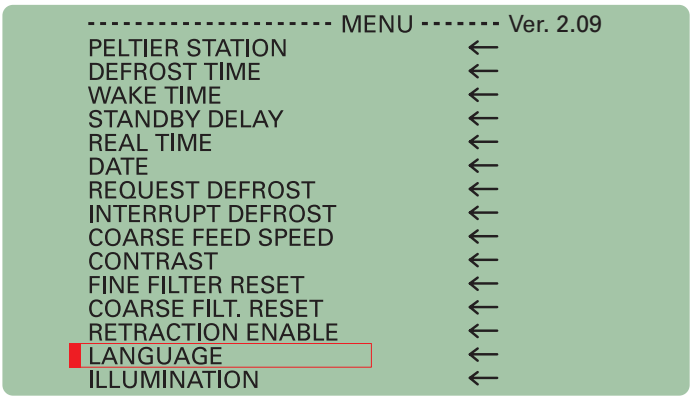

Figure 66. Display: Choose language.

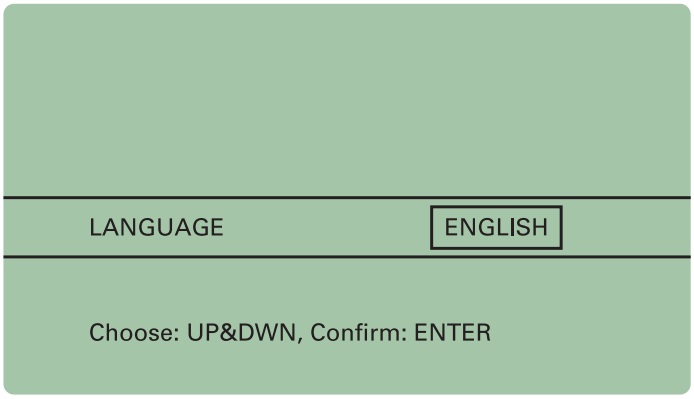

Figure 67. Display: Language selected.

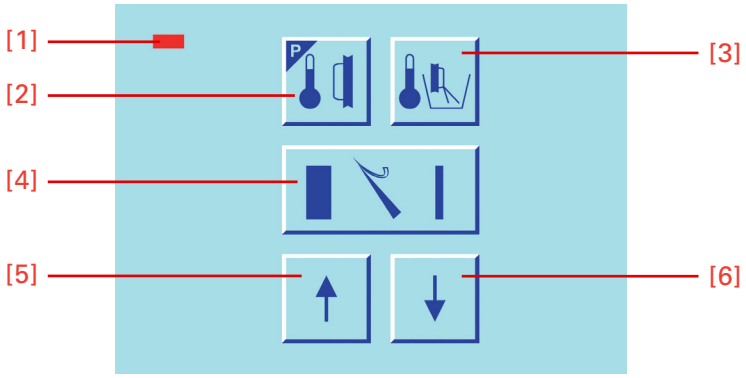

Figure 68. Center keyboard, left buttons.

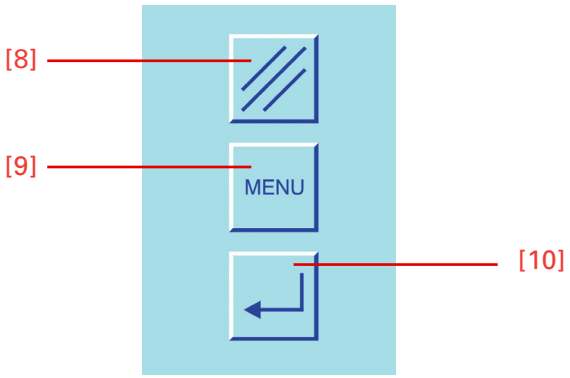

Figure 69. Center keyboard, right buttons.

Illumination of the cooling chamber

To illuminate the cooling chamber, a fluorescent lamp is located in the handle of the sliding window.

- The fluorescent lamp is automatically turned on when the instrument is turned on.
- The lamp remains on as long as the instrument is in its active status (see “ACTIVE Time”, page 51).
- Used lamps can be changed by the user himself (see page 139).

Turning the light on/off

- Press the menu button (fig. 72.9).
- Via the arrow buttons (fig. 72.5 and 72.6) select “Illumination”.
- Confirm it via the enter button (fig. 72.10).
- Via the arrow buttons (fig. 71.5 and 71.6) select either ON or OFF.
- Confirm it via the enter button (fig. 72.10).
- Press the menu button (fig. 72.9) to quit the menu.

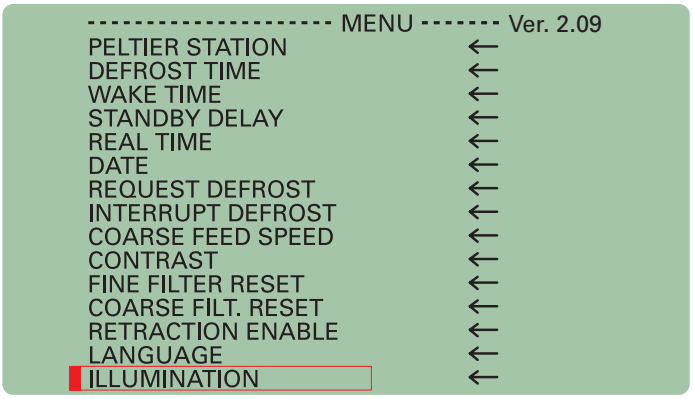

Figure 70. Display: Illumination of cooling chamber.

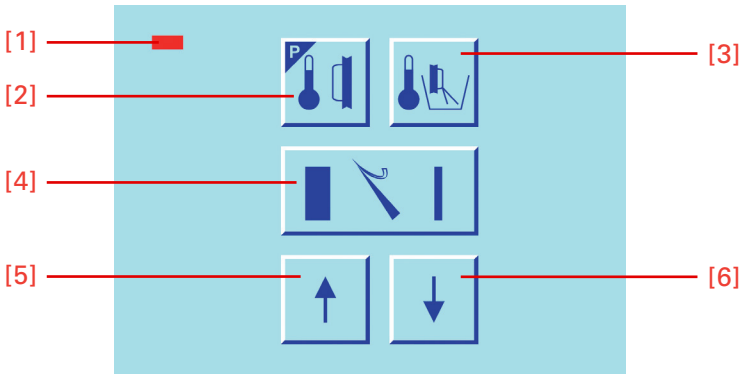

Figure 71. Center keyboard, left buttons.

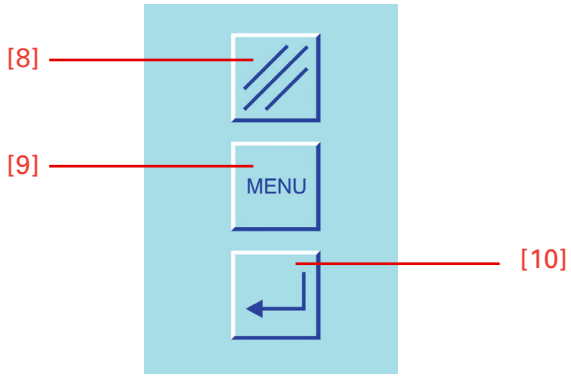

Figure 72. Center keyboard, right buttons.

Service settings

Note:
Menu service settings are only relevant for service technicians.

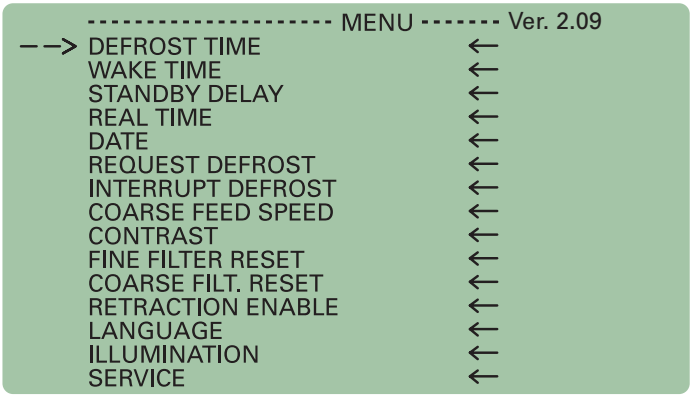

Figure 73. Service settings.

Specimen orientation

In many cases, the orientation of the specimen in relation to the cutting edge would be advantageous.

This can easily be done by means of the orienting specimen holder on the microtome.

- Loosen the clamping lever (fig. 74.7).
- Via the orienting lever (fig. 74.6) the specimen clamping can be moved in all directions by approx. 8°.
- After having achieved the desired alignment, fix the position via the clamping lever (fig. 74.7).
- The orienting lever (fig. 74.6) is also used for clamping the chuck into the orienting specimen holder.

Note:
The specimen orientation includes a zero device for the specimen (chuck is always parallel in relation to the knife). Zero position can be felt noticeably.

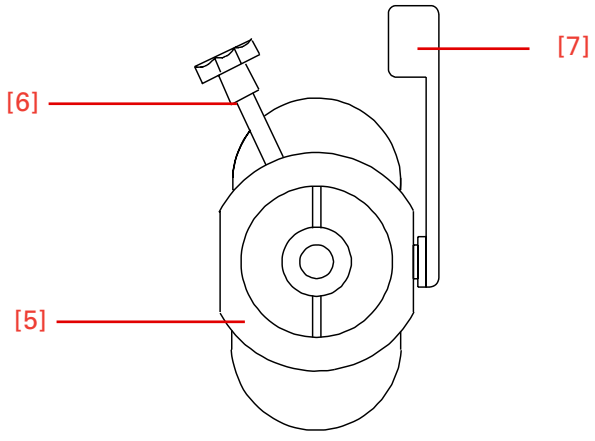

Figure 74. Specimen orientation.

Knife carriers

Standard knife carrier

The standard knife carrier of the cryostat is easy to use. The knife can be inserted either from the side or from the front. The standard knife holder takes up commercially available conventional knives with c- and d-profiles.

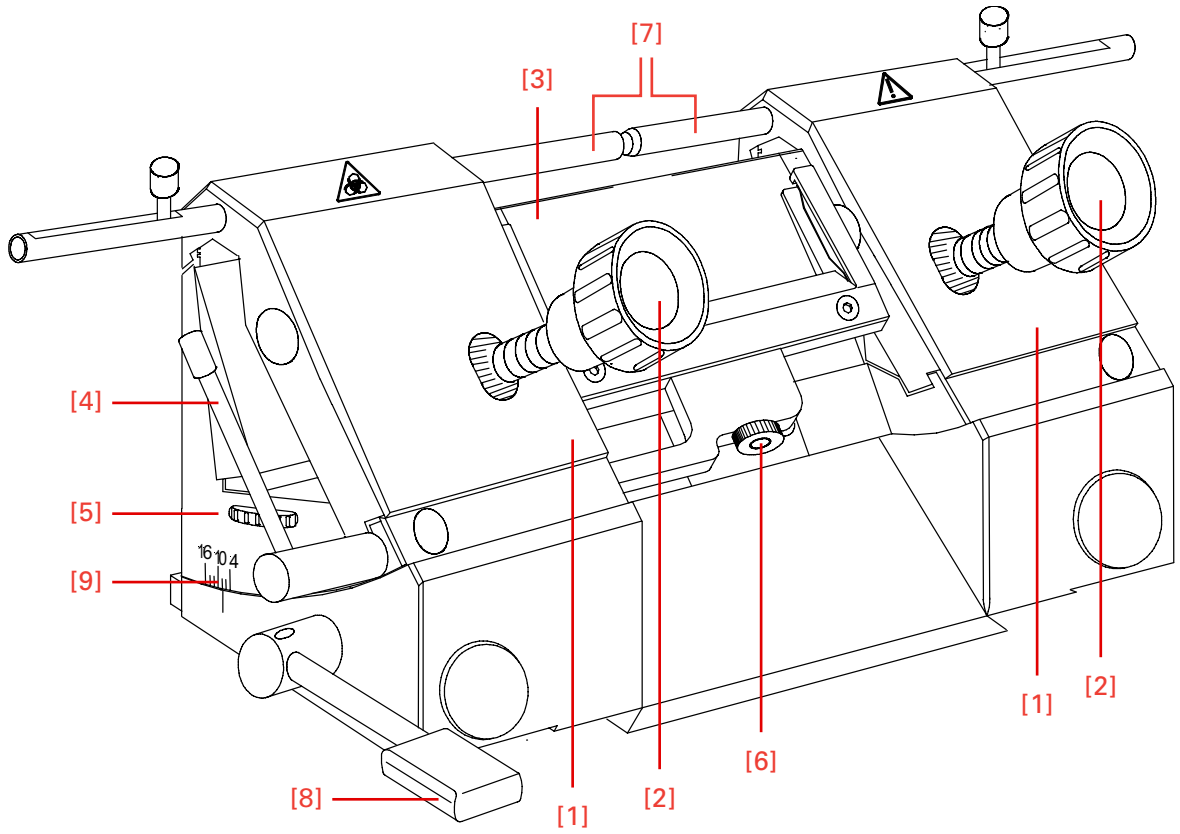

Figure 75. Standard knife carrier.

Inserting the knife

- The knife is inserted into the knife carrier either from the side or from the front, independently if one or two clamping plates (fig. 75.1) have been removed.
- Loosen the clamping screws (fig. 75.2) on the clamping plates (fig. 75.1).
- Turn the turning lever (fig. 75.4) in a clockwise direction to tilt the anti-roll plate (fig. 75.3) forwards.
- Insert the knife.
- Turn the turning lever (fig. 75.4) in a counter clockwise direction to put the anti-roll plate (fig. 75.3) against the knife.

- Then tighten the clamping screws (fig. 75.2) to fix the knife in its position.

If the cutting area of the knife is no longer usable, the knife can be moved

- Open the clamping screws (fig. 75.2) and move the knife to the left or right side as required.
- Fix the knife again via the clamping screws (fig. 75.2).

Caution
To avoid the danger of injury on the knife during adjustment of specimen, always position the knife guards (fig. 75.7) over the blade edge.

Height adjustment of the knife

- Loosen the clamping screws (fig. 75.2).
- Via the knurled screws (fig. 75.5) which are placed on the left and right side of the knife carrier adjust the height of the knife to the position of the anti-roll device.

Note:
Please note the parallel alignment of knife edge and edge of the anti-roll plate.

- Afterwards, tighten the clamping screws (fig. 75.2) to fix the knife in its position.

Fine adjustment of the anti-roll device

- The fine adjustment of the anti-roll device is carried out via the knurled screw (fig. 75.6).

Selecting the clearance angle

- Loosen the clamping lever (fig. 75.8) on the left side of the knife carrier.
- Swivel the upper part of the knife carrier on the base until the desired clearance angle is reached.
- The clearance angle can be read on the scale (fig. 75.9) on the left side on the base.
- Bring the clamping lever (fig. 75.8) upwards into clamping position.
- The selected clearance angle is now fixed in its position.

Note:
Usable cuts are only achieved at a clearance angle of 10° or more!

Disposable blade carrier EC

The disposable blade carrier EC takes up all commercially available low profile blades with a dimension of 80 x 8 mm and a facet angle of approx. 35° and as another version it takes also up high profile blades.

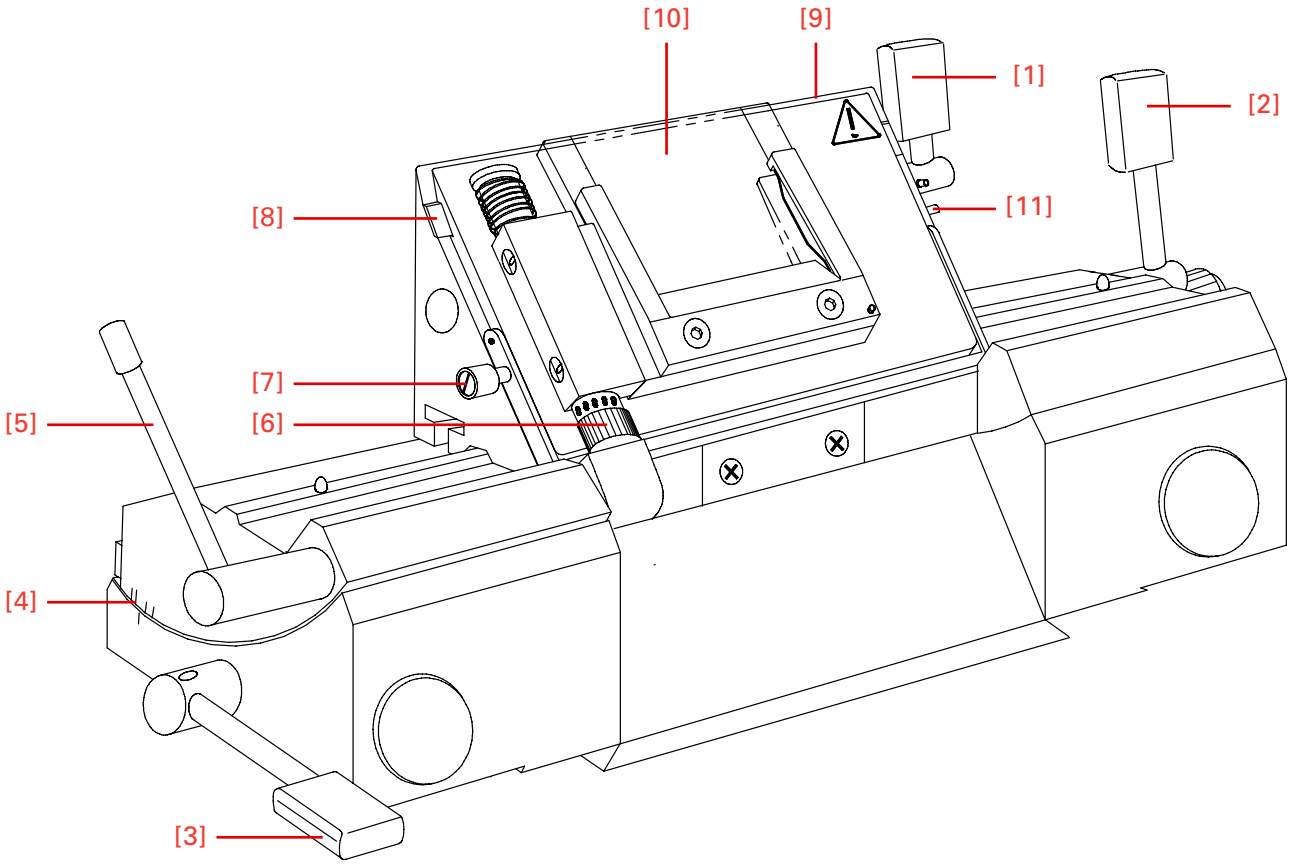

Figure 76. Disposable blade carrier EC.

Inserting the blade

- The blade is inserted into the slot behind the clamping plate.

Note:
When using high profile blades, first loosen the lever (fig. 76.1) and remove the spacer strip (fig. 76.8).

- For this, push in the stop bolt (fig. 76.11) and turn the clamping lever (fig. 76.1) in a counter clockwise direction over the stop bolt.
- Remove the clamping lever (fig. 76.1) together with the eccentric bolt.
- First remove the clamping plate and then the spacer strip.

- Fix the clamping plate with clamping lever (fig. 76.1) again in the blade carrier in reverse order.
- To insert the blade, now loosen the clamping lever (fig. 76.1).

Note:
Press the clamping plate on its lower area to open the slot behind the clamping plate.

- Insert the blade from the left side into the slot behind the clamping plate (fig. 76.9) as far as possible.
- Tighten the clamping lever (fig. 76.1). Thus fixing the blade in its position.

If the cutting area of the blade is no longer usable, the blade carrier can be moved:

- The blade itself is clamped solidly into the blade carrier. The complete carrier is moved.
- Open the clamping lever for the upper part of the carrier (fig. 76.2) and move the blade together with the upper part to the left or right side.
- Tighten the clamping levers (fig. 76.2) to fix this position.

Caution
To avoid the danger of injury on the blade during adjustment of specimen, always position the knife guards (fig. 76.7) over the blade edge.

Fine adjustment of the anti-roll device

- The fine adjustment of the anti-roll device is carried out via the knurled screw (fig. 67.6).

Selecting the clearance angle

- Loosen the clamping lever (fig. 76.3).
- Swivel the upper part of the blade carrier on the base until the desired clearance angle is reached.
- The clearance angle can be read on the scale (fig. 76.4) on the left side on the base.
- Bring the clamping lever (fig. 76.3) into clamping position.
- The selected clearance angle is now fixed in its position.

Note:
Usable cuts are only achieved at a clearance angle of 10° or more!

Disposable blade carrier EC 70

The disposable blade carrier EC takes up all commercially available low profile blades with a dimension of 80 x 8 mm and a facet angle of approx. 35° and as another version it takes also up high profile blades. The anti-roll plates have a length of 69,5 mm.

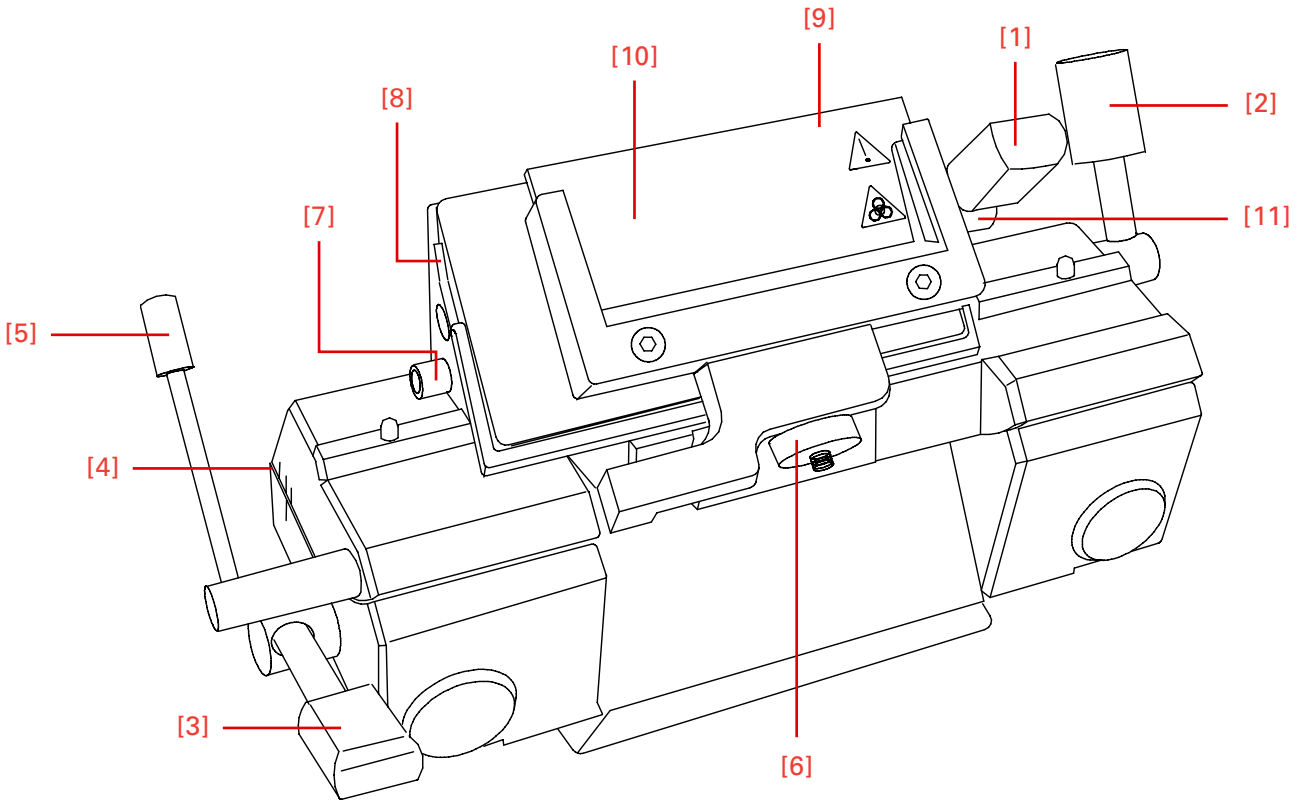

Figure 77. Disposable blade carrier EC 70.

Inserting the blade

- The blade is inserted into the slot (fig. 77.9) behind the clamping plate.

Note:
When using high profile blades, first loosen the lever (fig. 77.1) and remove the spacer strip (fig. 77.8).

- For this, push in the stop bolt (fig. 77.11) and turn the clamping lever (fig. 77.1) in a counter clockwise direction over the stop bolt.
- Remove the clamping lever (fig. 77.1) together with the eccentric bolt.
- First remove the clamping plate and then the spacer strip.

- Fix the clamping plate with clamping lever (fig. 77.1) again in the blade carrier in reverse order.

- To insert the blade, now loosen the clamping lever (fig. 77.1).

Note:
Press the clamping plate on its lower area to open the slot behind the clamping plate.

- Insert the blade from the left side into the slot behind the clamping plate (fig. 77.9) as far as possible.

- To section the specimen, put the anti-roll plate (fig. 77.10) against the blade via the turning lever (fig. 77.5) in a counter-clockwise direction.

- Tighten the clamping lever (fig. 77.1). Thus fixing the blade in its position.

If the cutting area of the blade is no longer usable, the blade carrier can be moved:

- The blade itself is clamped solidly into the blade carrier. The complete carrier is moved.

- Open the clamping lever for the upper part of the carrier (fig. 77.2) and move the blade together with the upper part to the left or right side.

- Tighten the clamping levers (fig. 77.2) to fix this position.

CAUTION
To avoid the danger of injury on the blade during adjustment of specimen, always position the knife guards (fig. 77.7) over the blade edge.

Fine adjustment of the anti-roll device

- The fine adjustment of the anti-roll plate is carried out via the knurled screw (fig. 77.6).

Note:
Insert the glass anti-roll plate parallel towards the blade edge.

Selecting the clearance angle

- Loosen the clamping lever (fig. 77.3).

- Swivel the upper part of the blade carrier on the base until the desired clearance angle is reached.

- The clearance angle can be read on the scale (fig. 77.4) on the left side on the base.

- Bring the clamping lever (fig. 77.3) into clamping position.
- The selected clearance angle is now fixed in its position.

Note:
Usable cuts are only achieved at a clearance angle of 10° or more!

Magnetic disposable blade carrier MC

The magnetic disposable blade carrier takes up Thermo Scientific Microm blades with the dimensions 80 x 19 mm and/or 60x19 mm and a facet angle between 24° and 30°.

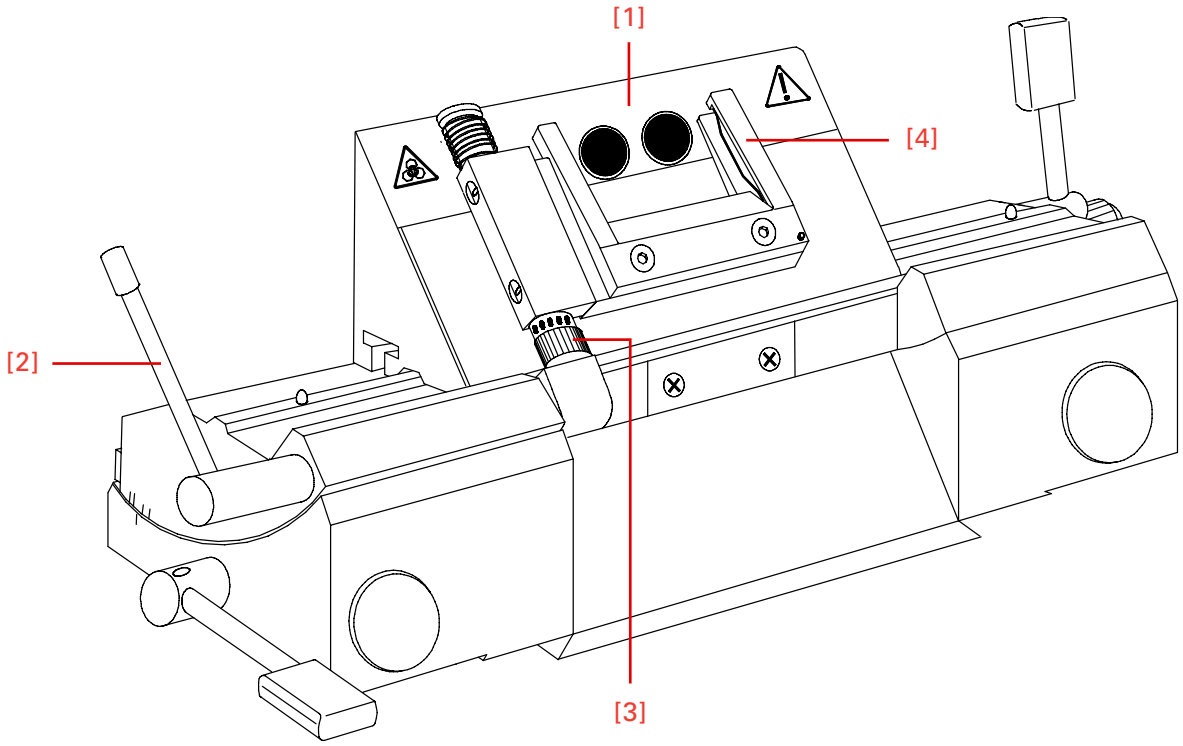

Figure 78. Magnetic disposable blade carrier MC.

Note:
Special Thermo Scientific magnetic blades must be used only!

Inserting the blade

- Insert the blade into the blade slider and put it onto the magnetic surface (fig. 78.1) of the blade carrier from the side.

Note:
Always insert the blade in a way that the large facet of the blade is inserted downwards. So it is invisible for the user.

- When inserting the blade, the blade slider together with the blade must be press downwards, so that the blade is put properly against ledge.

- Turn the lever (fig. 78.2) to move the anti-roll plate (fig. 78.4).

If the cutting area of the blade is no longer usable, the blade can be moved:

- Put the blade slider onto the blade and shift it.

Note:
The blade slider must always be put on in a way that the inscription can be read.

- This way, it is guaranteed that the slanted edge of the blade slider shows to the rear side of the blade.

CAUTION
To avoid the danger of injury on the blade during adjustment of specimen, always position the knife guard over the blade edge.

Fine adjustment of the anti-roll device

- The fine adjustment of the anti-roll device is carried out via the knurled screw (fig. 78.3).

Setting the clearance angle

- Loosen the clamping lever as well as the clamping screw on the right side of the magnetic disposable blade carrier.
- Swivel the upper part of the blade carrier on the base until the desired clearance angle is achieved.
- The clearance angle can be read on the scale on the left side of the base.
- Again tighten the clamping lever and the clamping screw.
- The selected clearance angle is thus fixed in its position.

Note:
Usable cuts are only achieved with a clearance angle between 24° and 30°.

Option O – Specimen cooling

If the cryostat is equipped with a specimen cooling, the chamber as well as the specimen temperature is shown on the display (fig. 79).

Acutal and set value of the specimen temperature

The specimen cooling of the cryostat is set via the corresponding part on the operating controls (fig. 80.2).

The actual and set values of the specimen cooling are shown in °C on the display (fig. 79). On the right side of the display, the actual value is also shown graphically.

- Press button (fig. 80.2) for specimen temperature.
- "SPECIMEN" is then shown inverted.

The set value settings are made via the

- up button (fig. 80.5)
- down button (fig. 80.6)

Note:
The valid range of the set value goes from +10°C down to -50°C.

- The actual value of the specimen temperature is shown as actual temperature and as a graphic.
- After having chosen the requested values, the display automatically returns to its basic indications after three seconds, i.e. fine section thickness is again shown inverted.

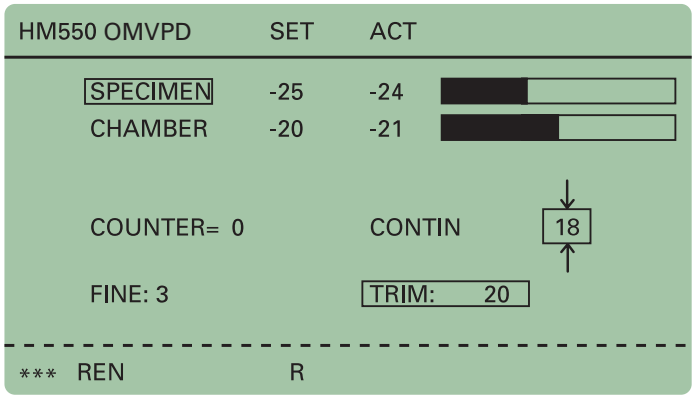

Figure 79. Display: Actual / Target specimen temperature.

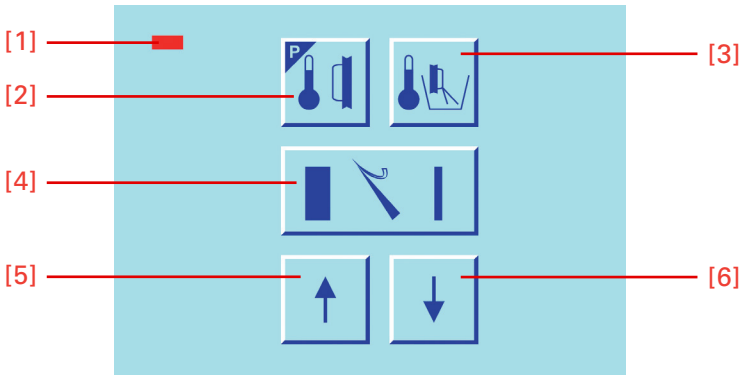

Figure 80. Center keyboard, left buttons.

Specimen orientation with zero advice (with Option O)

In many cases, the orientation of the specimen in relation to the cutting edge would be advantageous.
This can easily be done by means of the orienting specimen holder on the microtome.

- Before the chuck can be inserted, pull off the spring-loaded eccentric bolt (fig. 81.1).
- Insert the chuck while the bolt is pulled off. Afterwards insert the eccentric bolt (fig. 81.1) again.
- For the specimen orientation now loosen the clamping lever (fig. 81.2) towards the front.
- The entire specimen head can now be oriented manually (together with specimen cooling, if equipped) in all directions by approx. 8°.
- After having achieved the desired alignment, press the clamping lever (fig. 81.2) upwards to fix this position.

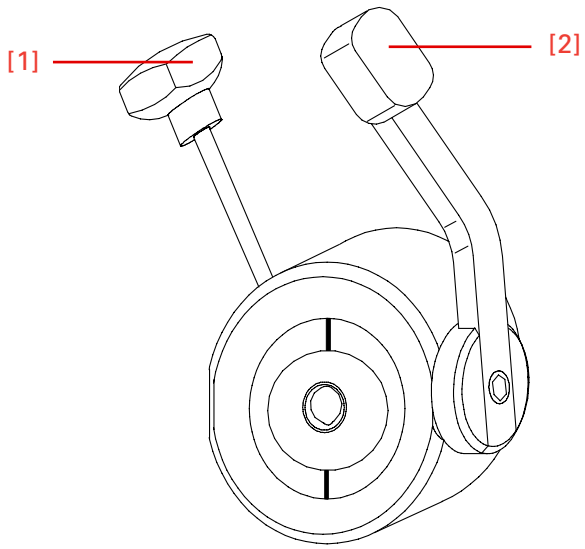

Figure 81. Specimen orientation with zero device.

For the further orientation of the specimen, the chuck can be rotated by 360°.

- Turn the spring-loaded eccentric lever (fig. 81.1) either to the right or left side. Then the chuck is loosened.
- Turn the chuck together with the specimen as desired.
- Then bring the eccentric lever (fig. 81.1) again into clamping position by turning it to right or left side.

Note:
The specimen orientation includes a zero device for the specimen (chuck is always parallel in relation to the knife). Zero position can be felt noticeably.

Option M – Motorized cutting drive

Sectioning can be carried out either manually by turning the hand wheel or by means of a motorized cutting drive.

- The controlled cutting speed can be set continuously from 0 up to 250 mm/s.
- The cutting speed refers to the cutting window (see "Setting the cutting window", page 80).
- For the upward return travel a proportionally higher retraction speed is carried out.
- To adjust the cutting window in relation to a specimen, it can be set continuously within the maximum values (60 mm) and can be adjusted to the respective specimen.

Setting the cutting window

The size of this zone is shown in millimeters within the symbol for the cutting window. When passing the cutting window this symbol is shown inverted on the display.

Note:
Cutting and suction window are identical.

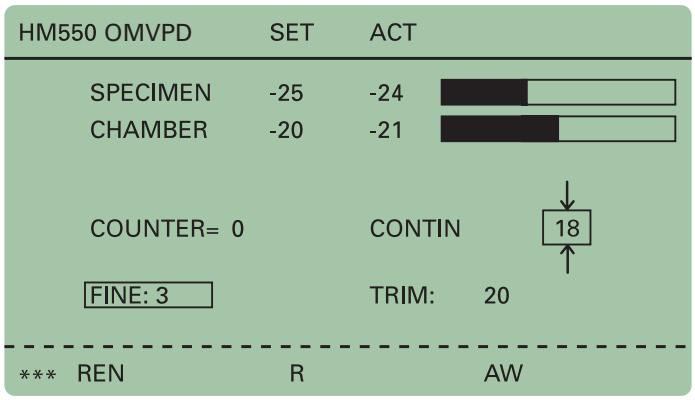

Figure 82. Display: Adjust cutting window.

Manual setting

- The cutting window is determined by manual entries.
- For this, turn the hand wheel so that the lower edge of the specimen is positioned slightly above the knife edge.
- Press button (fig. 83.1) to set the upper limit of the cutting window.

- Continue turning the hand wheel clockwise to place the upper edge of the specimen just below the knife edge.
- Press button (fig. 83.1) to set the lower limit of the cutting window.
- The LED in button (fig. 83.1) lights up during each further passing through of the cutting window. The length of the cutting window is shown in mm within the cutting window symbol on the display.

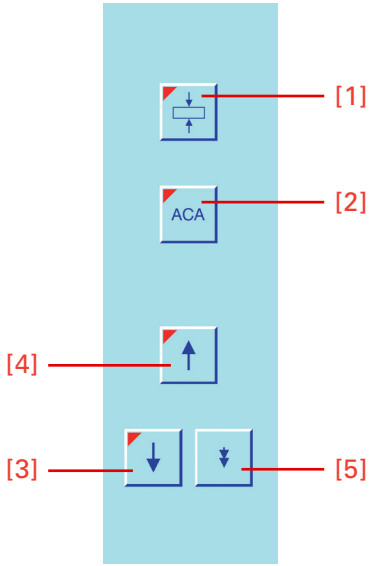

Figure 83. Keypad left.

Note:
A cutting window should only be set while the specimen is moved downwards.

Note:
In case the cutting window limits are set incorrectly, please repeat above-mentioned process again.

Selection of operating modes

For the motorized cutting movement of the microtome, the following operating modes are available:

– continuous stroke
– single stroke
– interval stroke

- If the cutting drive is turned off, choose one of the above-mentioned operating modes by pressing the button MODE (fig. 85.1) once or twice.

- The selected operating mode is shown on the display as CONTIN, SINGLE and INTERV and the corresponding LED in button (fig. 85.1) lights up.

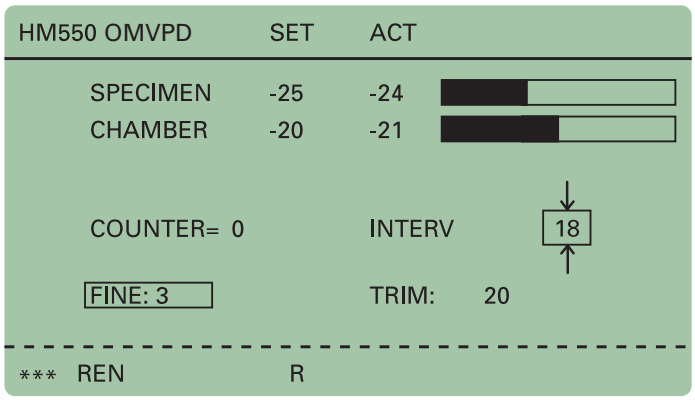

Figure 84. Display: Setting the operation mode.

Continuous stroke

- Press button (fig. 85.1) until the operating mode continuous stroke CONTIN is shown on the display.
- To start a continuous cutting cycle, use the foot pedal or press the two start buttons (fig. 85.3 and 85.4).
- To stop the continuous stroke, press foot pedal or one of the two start buttons (fig. 85.3 or 85.4).
- However, if a cutting cycle has been started, it will continue through and stop in the next lower reversal point.

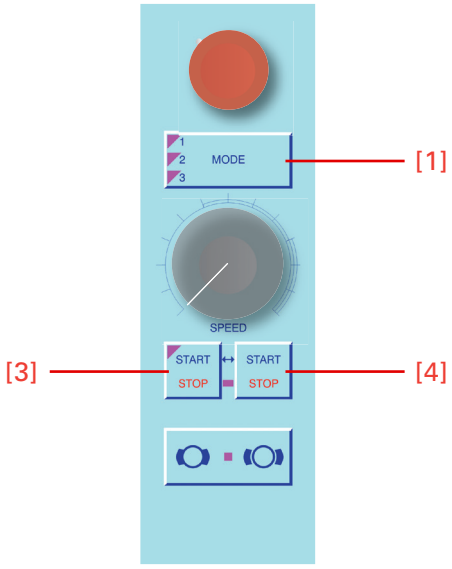

Figure 85. Keypad right.

Single stroke

- Press button (fig. 85.1) until the operating mode single stroke SINGLE is shown on the display.
- Press the two start buttons (fig. 85.3 and 85.4) or the foot pedal once to release a single cutting cycle.
- The movement stops in the lower reversal point.

Interval stroke

- Press button (fig. 85.1) until the operating mode interval stroke INTERV is shown on the display.
- The cutting drive only moves as long as the two start buttons (fig. 85.3 and 85.4) or the foot pedal are being pressed.

Setting the cutting speed

- The desired cutting speed is set on the operating knob (fig. 86.2).

Note:
To save time, the return travel speed is enhanced in relation to the cutting speed, especially for slow cutting speeds.

Start and stop of the cutting drive

Start

- Press the two buttons (fig. 86.3 and 86.4) of the safety switch either at the same time or briefly one after the other.
- As an option, the motorized cutting drive can also be started via the foot pedal.
- The LED in button (fig. 86.3) lights up while the motorized cutting drive is active.

Note:
To start the motorized cutting drive, the functions handwheel brake and emergency stop must not be activated.

The course function of the cutting drive results from the selected cutting window, the selected operating mode and the set cutting speed.

Stop in operating mode continuous stroke

- Press one of the two buttons (fig. 86.3 or 86.4) or
- press the foot pedal.
- The LED (fig. 86.3) goes off.

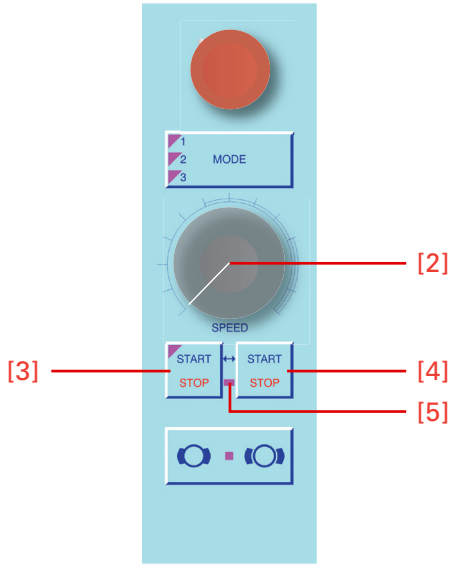

Figure 86. Keypad right.

Hand wheel brake

Unintended movements of the specimen holder can be avoided via the hand wheel brake.

This reduces the danger of being injured while adjusting specimen clamp and knife carrier!

WARNING
When the instrument is turned off, the hand wheel brake is not operative.

WARNING
For your personal safety, the hand wheel brake should be turned on when working on the specimen holder or knife carrier.

Activating the brake

- Stop the motorized cutting movement via buttons (fig. 87.3 and 87.4).
- Then activate the function hand wheel brake via button (fig. 87.6).
- The red LED (fig. 87.7) lights up.
- The motorized cutting drive cannot be started by mistake anymore!

Releasing the brake

- To release the hand wheel brake, press button (fig. 87.8).

Emergency stop

To quickly eliminate danger, the microtome is equipped with two **emergency stop** functions.

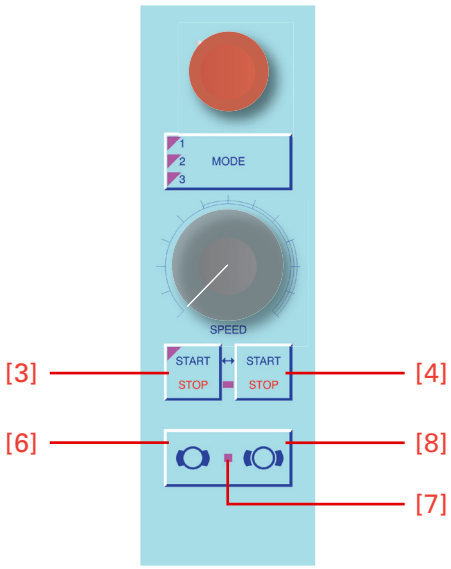

Figure 87. Keypad right.

CAUTION
In case danger arises from cutting drive, activate the emergency stop!

Hand emergency stop

- The hand emergency stop (fig. 89.1) is located above the right arm rest.
- Press this button to immediately stop the motorized cutting drive.
- When the hand emergency stop is activated, the red LED (fig. 88.5) between the buttons (fig. 88.3 and 88.4) lights up.

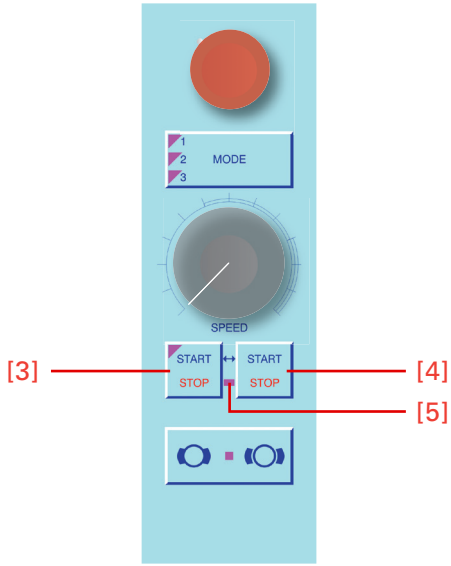

Figure 88. Keypad right.

Note:
After having activated the hand emergency stop, STOP is shown inverted on the display (fig. 90).

- After having eliminated the danger and to continue sectioning, pull out the red button (fig. 89.1).
- The cutting drive can be started again.

Foot emergency stop

- The second emergency stop installation is located in the foot pedal (fig. 91).
- Vigorously step on the foot pedal to immediately stop the motorized cutting drive.
- However, the LED (fig. 88.5) **does not** light up when the foot emergency stop is pressed.

Figure 89. Position emergancy stop button.

Note:
After having activated the foot emergency stop, STOP is shown inverted on the display (fig. 90).

- After having eliminated the danger and to continue sectioning, release the foot pedal.
- The cutting drive can be started again.

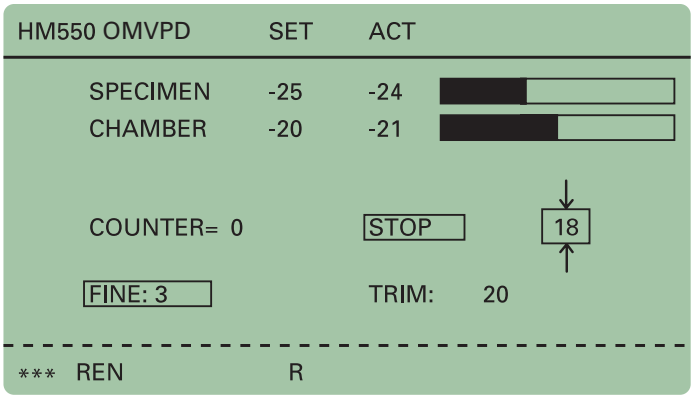

Figure 90. Emergency stop activated.

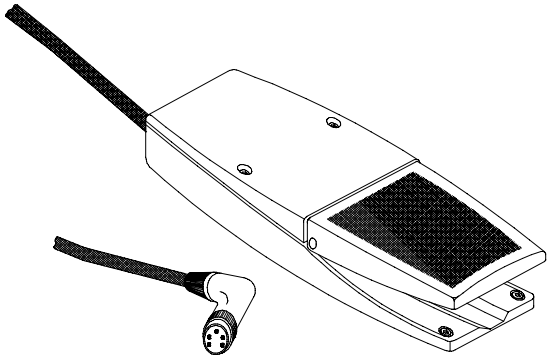

Figure 91. Foot pedal with interlock plug.

Option V – Vacutome

Setting the vacuum for stretching sections and disposing of section waste

Setting the vacuum

- To select the suction power or the required vacuum between 0 – 10, turn the operating knob (fig. 92.1). (0 = no suction power, 10 = highest suction power).

Note:
The user sets the desired value depending on the desired function (stretching or suction process), section thickness and size of the specimen.

Note:
The applied vacuum for stretching sections and/or disposing of section waste is only active during the cutting window representing also the suction

window. Outside the cutting window, the selected vacuum is turned off by means of a valve.

Setting the suction window is carried out in the same way as the cutting window.

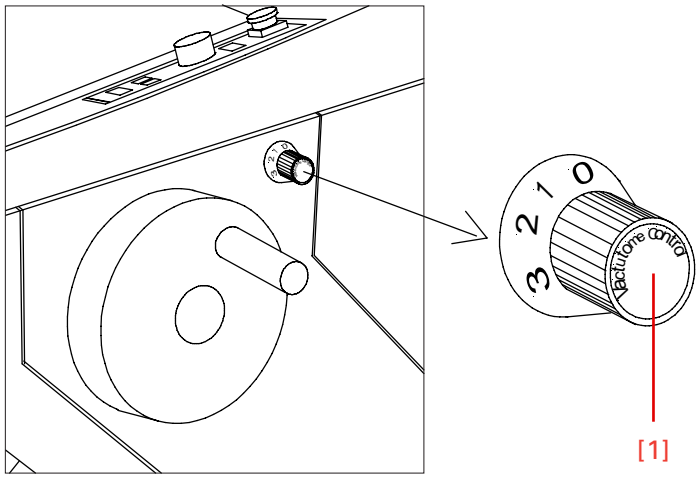

Figure 92. Operating knob for adjusting suction power.

Inserting and replacing the filter unit

When the suction power and suction window are set in a correct way, the section to be disposed of gets via the suction slot in the knife carrier into the filter unit, consisting of a coarse filter for collecting section waste and a micro filter for filtering the air.

Section waste is collected in the coarse filter. This coarse filter must be replaced depending on the volume of waste. The coarse filter is actively cooled.

The micro filter must also be replaced regularly, however, at least every 6 months.

Removing coarse filter

- Press the bow (fig. 93.2) of the coarse filter downwards either manually or via the foot.
- The coarse filter tilts forwards.
- Remove the coarse filter by means of the attached clamp for filter replacement.

Replacing the coarse filter

The coarse filter must be replaced depending on the volume of the existing section waste. If the integrated counter detects that the sum of all sections exceeds 50 000 µm after the last resetting, the message “Change coarse filt.” appears on the display.

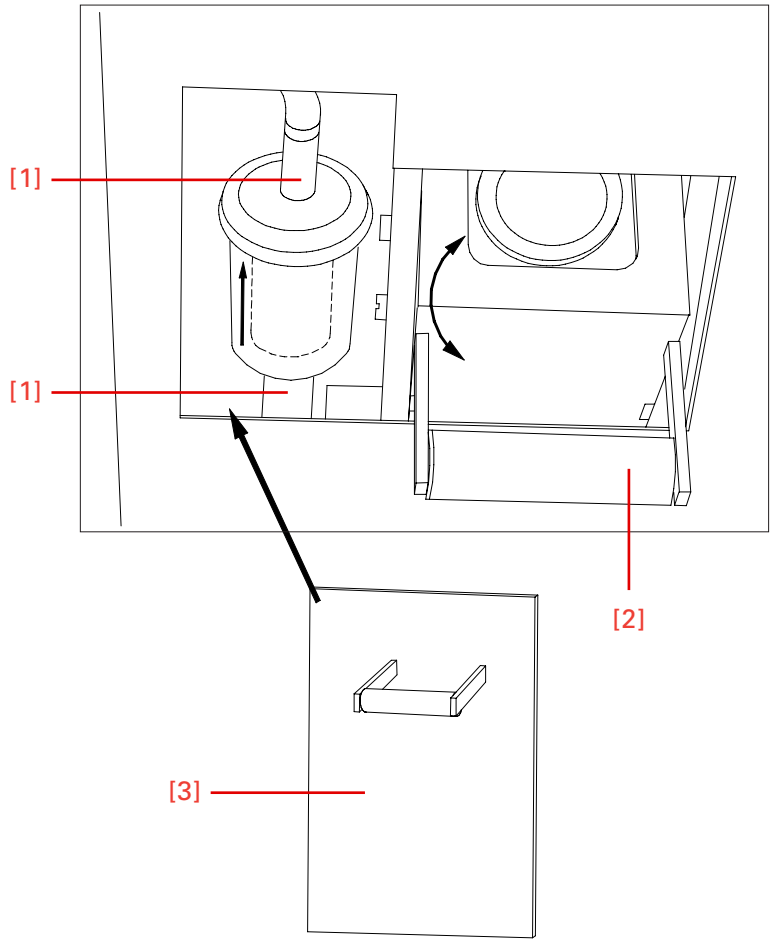

Figure 93. Inserting and replacing the filter unit.

- For this, remove the coarse filter as described above.
- **Use lab gloves!!!**
- Remove the coarse filter from the metal carrier by using forceps or the like.
- Dispose of the coarse filter together with the section waste according to the respective lab regulations.

Note:
The coarse filter is to be understood as a disposable filter and must not be used again.

- Insert new coarse filter and close the filter.

Note:
In case section waste blocks the suction hoses of the Vacutome against ones expectations, it can be removed by using the attached hose cleaner. During this cleaning cycle, the Vacutome should be operated with maximum power to guarantee that the released section waste is drained off properly.

The internal counter for the coarse filter must be reset:

- For this, press the menu button (fig. 95.9). This way, you get into the list of submenus.
- Via the arrow buttons (fig. 94.8 and 94.6) select “coarse filter”. This submenu is now shown inverted.
- Via the enter button (fig. 95.10) select this submenu and simultaneously open it.
- Via the arrow buttons (fig. 94.5 and 94.6) reset the sum of sections since the last resetting to 0 µm.
- Via the enter button (fig. 95.10) confirm the setting.

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the submenu is also chosen and will still be valid.

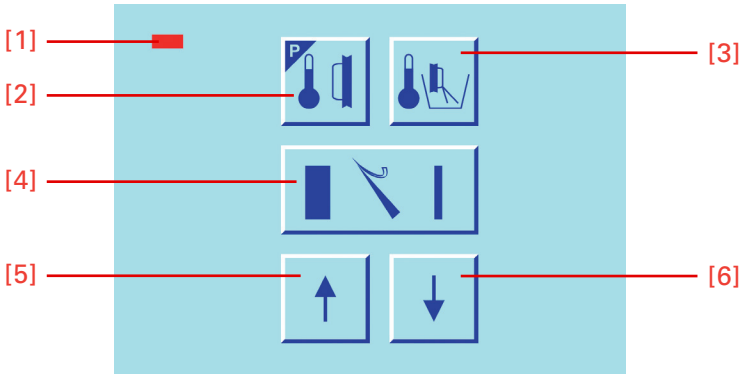

Figure 94. Center keyboard, left buttons.

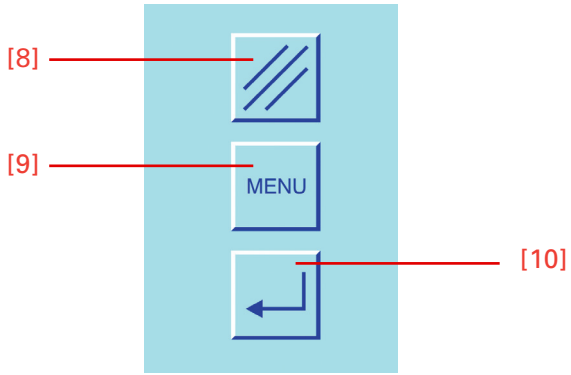

Figure 95. Center keyboard, right buttons.

- To quit the submenu, press the menu button (fig. 95.9).
- Now continue working with the selected settings.

Note:
If there is no time to reset the internal counter for the coarse filter, it is possible to ignore the message "CHANGE COARSE FILT." for the moment.

- For this press the scroll/enter button (fig. 95.8). However, this means that the counter must still be reset. After further sections, the message will appear on the display again every 1000 µm.

Note:
It is also possible to check if the filter must be replaced.

- For this open the submenu "coarse filter" in the menu.
- If the message "COARSE FILT. ==> OK" appears on the display, the entire sum of sections of 50 000 µm has not yet reached.
- However, if the message "COARSE FILT.!!!!!" appears on the display, the filter must be replaced.

Replacing the micro filter

Depending on how often the instrument is used, the micro filter must be replaced at regular intervals, however, at least every 6 months.

If the internal software detects that the micro filter must be replaced, the message "CHANGE MICRO FILT." appears on the display.

- For this, remove the cover for the micro filter (fig. 96.3) which is placed beside the coarse filter.
- Pull off upper and lower connecting pieces (fig. 96.1) and remove the micro filter.
- Dispose of the micro filter according to the respective lab regulations.

Note:
The micro filter is to be understood as a disposable filter and must not be used again.

Inserting the micro filter

- Connect the filter again with the connecting pieces.

Note:
When inserting the filter, please note the correct direction (fig. 96.4). The arrow on the micro filter must show upwards.

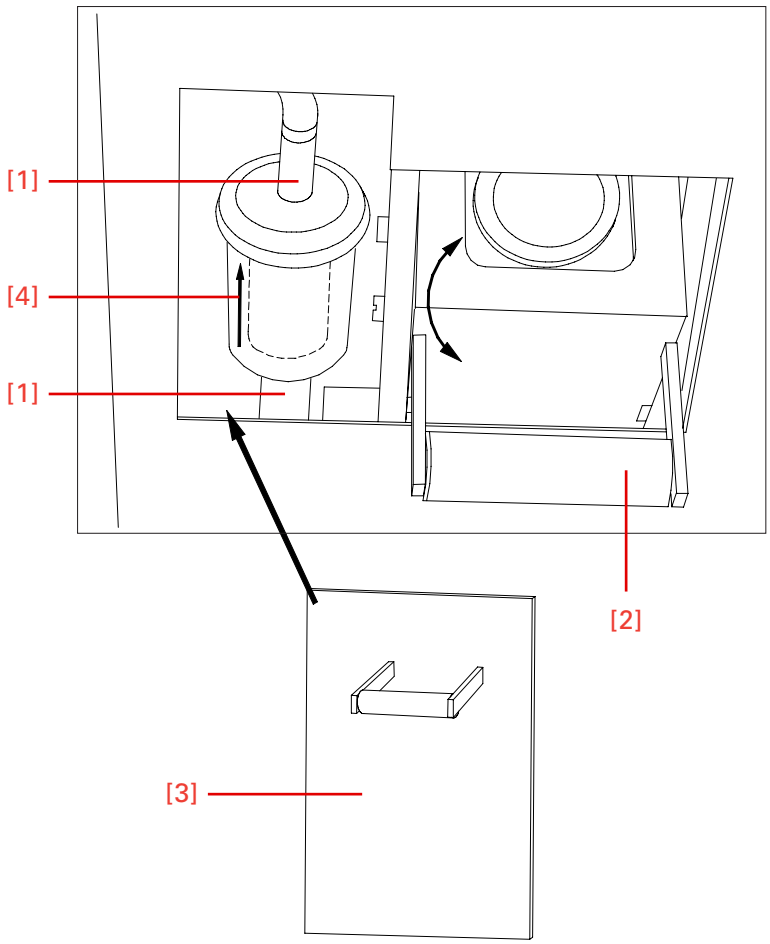

Figure 96. Inserting and replacing the filter unit.

The internal counter for the micro filter must now be reset:

- For this, press the menu button (fig. 98.9). This way, you get into the list of submenus.
- Via the arrow buttons (fig. 97.5 and 97.6) select “micro filter”. This submenu is now shown inverted.
- Via the enter button (fig. 98.10) confirm this setting and simultaneously open it.
- Via the arrow buttons (fig. 97.5 and 97.6) reset the sum of sections since the last resetting to 0 µm.
- Via the enter button (fig. 98.10) confirm this setting.

Note:
You return immediately to the list of submenus. If the setting is not confirmed via the enter button, you will quit the submenu automatically after five seconds and you return into the list of submenus. The current setting of the

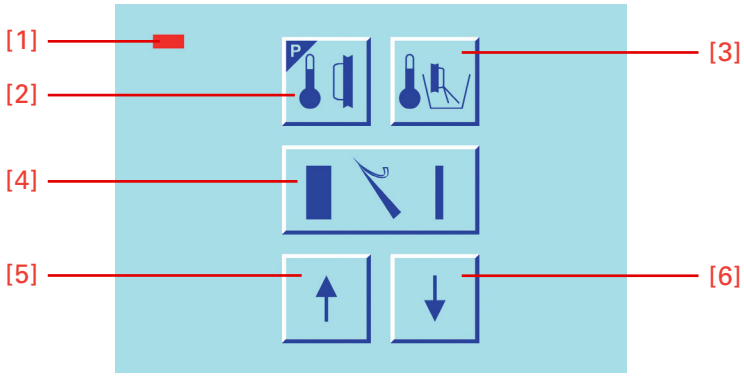

Figure 97. Center keyboard, left buttons.

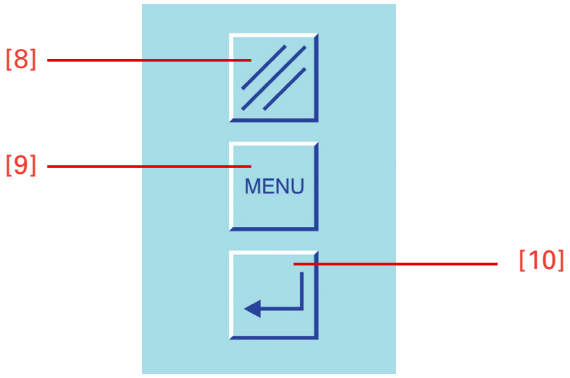

Figure 98. Center keyboard, right buttons.

submenu is also chosen and will still be valid.

- To quit the submenu, press the menu button (fig. 98.9).
- Now continue working with the selected settings.

Note:
If there is no time to reset the internal counter for the micro filter, it is possible to ignore the message "CHANGE MICRO FILT." for the moment.

- For this press the scroll/enter button (fig. 98.8). However, this means that the counter must still be reset. This message will appear on the display every 24 h.

Note:
It is also possible to check if the filter must be replaced.

- For this press the menu button (fig. 98.9) until the message "MICRO FILT. ==> OK" appears on the display.
- However, if the message "MICRO FILT.!!!!!" appears on the display, the filter must be replaced.

Setting the suction window

The size of this zone is shown in millimeters within the symbol for the suction window. When passing the suction window this symbol is shown inverted on the display.

Note:
Cutting and suction window are identical.

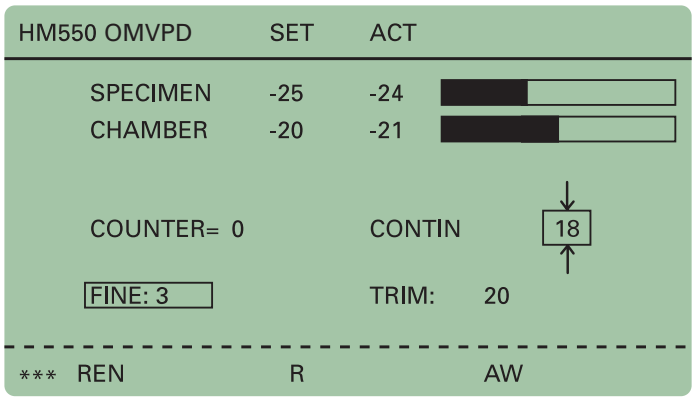

Figure 99. Display: Adjust suction window.

Manual setting

- The suction window is determined by manual entries.
- For this, turn the hand wheel so that the lower edge of the specimen is positioned slightly above the knife edge.
- Press button (fig. 100.1) to set the upper limit of the suction window.
- Continue turning the hand wheel clockwise to place the upper edge of the specimen just below the knife edge.
- Press button (fig. 100.1) to set the lower limit of the suction window.
- The LED in button (fig. 100.1) lights up during each further passing through of the suction window. The length of the suction window is shown in mm within the suction window symbol on the display.

Note:
A suction window should only be set while the specimen is moved downwards. If, by mistake, a suction window limit is set during return travel of the specimen, the set limits are applied to the cutting movement accordingly.

Note:
In case the suction window limits are set incorrectly, please repeat abovementioned process again.

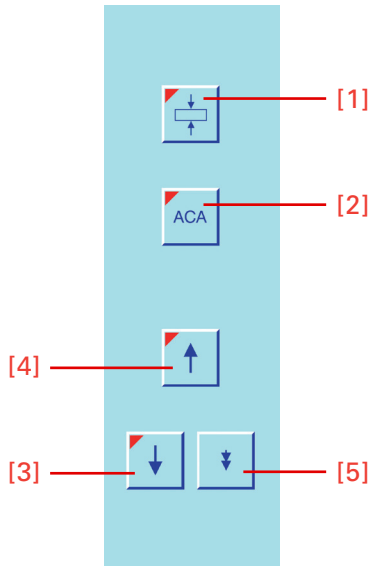

Figure 100. Keypad left.

Knife carrier for Vacutome

Disposable blade carrier EV

The disposable blade holder EV takes up all commercially available low profile blades with a dimension of 80 x 8 mm as well as high profile blades with a dimension of 76 x 14 mm an a facet angle of approx. 35°.

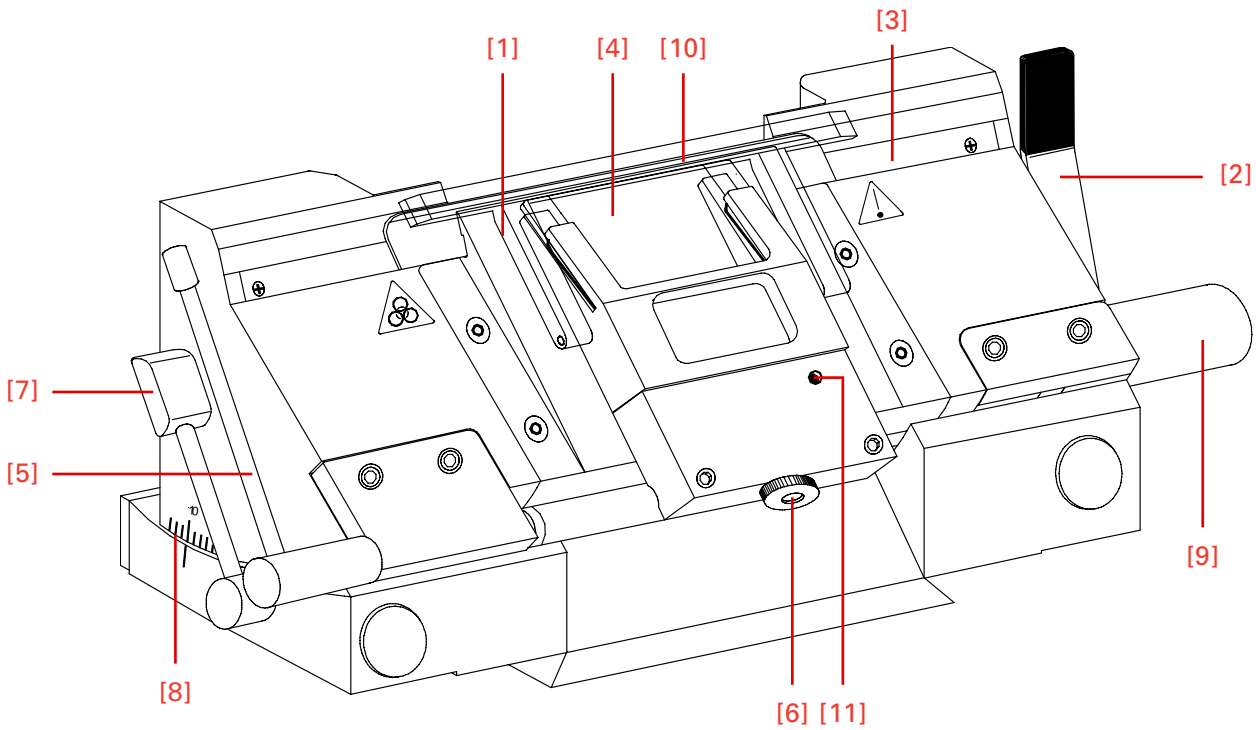

Figure 101. Disposable blade carrier EV.

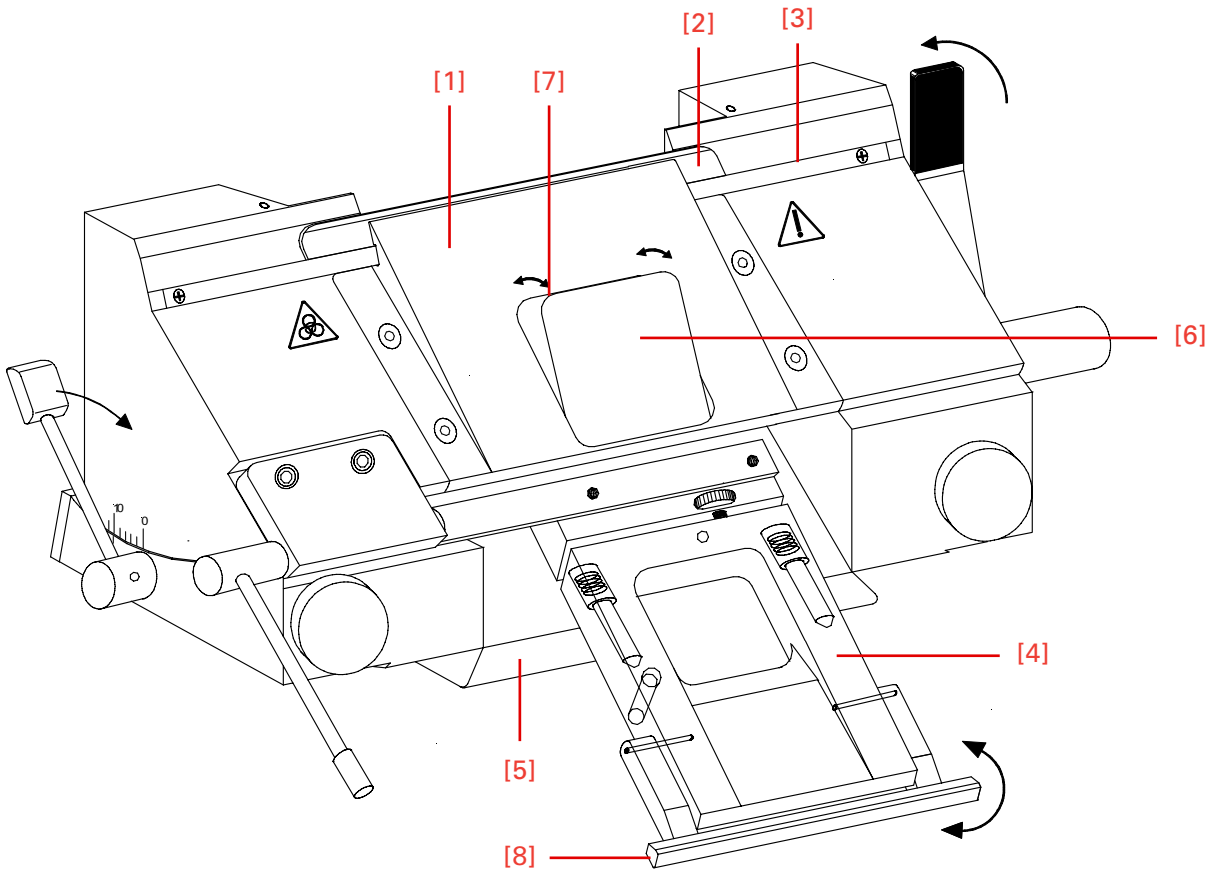

Figure 102. Insert a blade into the disposable blade carrier EV.

Inserting the blade

- Insert the blade into the slot behind the clamping plate (fig. 101.1).

Note: When using high profile blades, first loosen the lever (fig. 101.2) and remove the spacer strip. The blade is clamped via the clamping plate which is placed on the rear part of the blade carrier.

- To insert the blade now loosen the clamping lever (fig. 101.2).

Note:
Press the clamping plate on its lower area to open the slot behind the clamping plate.

- Push the blade from the left side into the slot behind the clamping plate (fig. 101.1) as far as possible.

- Close the clamping lever (fig. 101.2). Thus fixing the blade in its position.

If the cutting area of the knife is no longer usable, the knife can be moved:

- Tilt the knife guard (fig. 101.10) forwards.

- Loosen the clamping lever (fig. 101.2). The blade is no longer clamped and can be moved e.g. by means of a brush until a suitable position of the blade is found.
- Clamp again the clamping lever (fig. 101.2)

Caution
To avoid the danger of injury on the blade during adjustment of specimen, always position the knife guards (fig. 101.10) over the blade edge.

Setting the clearance angle

- Loosen the clamping lever (fig. 101.7).
- Swivel the upper part of the blade carrier on the base until the desired clearance angle is achieved.
- The clearance angle can be read on the scale (fig. 101.8) on the left side of the base.
- Again tighten the clamping lever (fig. 101.7).
- The selected clearance angle is thus fixed in its position.

Note:
Usable cuts are only achieved at a clearance angle of 10° or more!

Moving the blade carrier

- To move the blade carrier, loosen the lever on the right side of the base plate.
- To fix the blade carrier in its new position, clamp the lever again.

Fine adjustment of the vacuum anti-roll hood

- The vacuum anti-roll hood (fig. 101.4) can be removed and put on by using the turning lever (fig. 101.5).
- The knurled screw (fig. 101.6) allows the adjustment of the edge of the vacuum anti-roll hood (fig. 101.4) in relation to the blade edge.
- The fine adjustment of the anti-roll device is carried out via the knurled screw (fig. 101.6).

Function of the Vacutome

- A closed vacuum anti-roll hood (fig. 102.4) and a suitable suction vacuum generate stretching or suction effects.
- For this, the closed vacuum anti-roll hood (fig. 102.4) slightly tilts the underneath flap (fig. 102.6) via the stud screw (fig. 101.11), thus opening a suction slot (fig. 102.7).

- Lift the vacuum anti-roll hood (fig. 102.4), the flap (fig. 102.6) beneath falls back in place and the slot gets closed.

Magnetic blade carrier MV

The magnetic blade carrier is suitable to take up Thermo Scientific Microm blades with the dimensions 60 x 19 mm and a facet angle of approx. 33°.

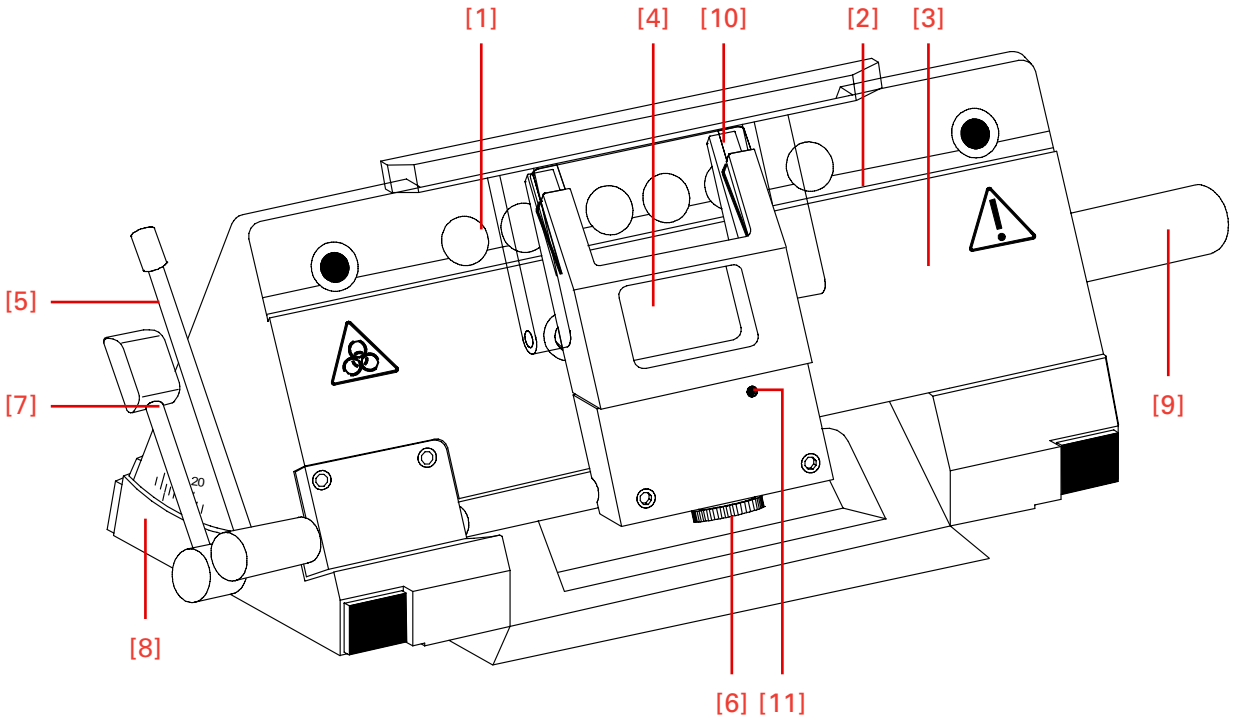

Figure 103. Magnetic blade carrier MV.

Note:
Only special Thermo Scientific magnetic blades must be used!!

Inserting the blade

- Insert the blade (fig. 103.1) into the blade slider (fig. 103.2) and put it on the magnetic surface (fig. 103.2) of the blade carrier from the side.

Note:
To move the blade to the side, press the blade slider downwards so that the blade is properly put against the ledge (fig. 103.3) of the blade carrier.

- To move the blade to the side, always use the blade slider (fig. 104.2) and shift it.

If the cutting area of the blade is not longer usable, the blade can be moved:

- Put the blade slider (fig. 104.2) onto the blade and shift it.

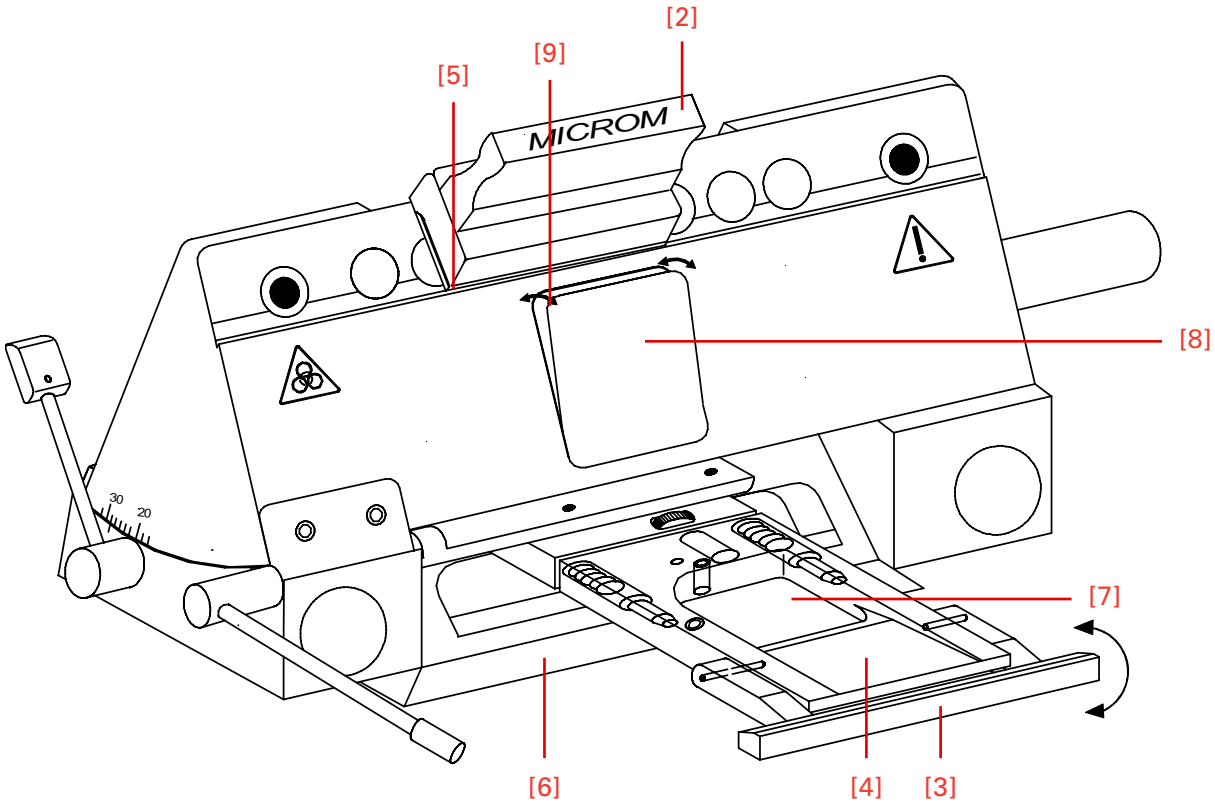

Figure 104. Insert a blade into the magnetic blade carrier MV.

Note:
The blade slider must always be put on in a way that the inscription can be read.

- This way, it is guaranteed that the slanted edge (fig. 104.5) of the blade slider shows to the rear side of the blade.

CAUTION
To avoid the danger of injury on the blade during adjustment of specimen, always position the knife guard (fig. 103.10) over the blade edge.

Clearance angle adjustment

- Loosen the clamping lever (fig. 103.7).
- Swivel the upper part of the magnetic blade carrier on the base until the desired clearance angle is adjusted.
- The set clearance angle can be read on the scale (fig. 103.8) on the left side of the base.
- Again tighten the clamping lever.
- This way, the set clearance angle is fixed in its position.

Note:
Usable cuts are only achieved at clearance angles between 24 – 30°!

Moving the magnetic blade carrier

- To move the magnetic blade carrier, loosen the lever on the right side of the base plate.
- To fix the blade carrier in its new position, tighten the lever again.

Fine adjustment of the vacuum anti-roll hood

- The vacuum anti-roll hood (fig. 1034) can be removed and put on by using the turning lever (fig. 103.5).
- The knurled screw (fig. 103.6) allows the adjustment of the edge of the vacuum anti-roll hood (fig. 103.4) in relation to the blade edge.
- The fine adjustment of the anti-roll device is carried out via the knurled screw (fig. 103.6).

Function of the Vacutome

- A closed vacuum anti-roll hood (fig. 104.4) and a suitable suction vacuum generate stretching or suction effects.
- For this, the closed vacuum anti-roll hood (fig. 103.4) slightly tilts the underneath flap (fig. 104.8) via the stud screw (fig. 103.11), thus opening a suction slot (fig. 104.9).
- Lift the vacuum anti-roll hood (fig. 104.4), the flap (fig. 104.8) beneath falls back in place and the slot gets closed.

Option P – Active deep freezing station with peltier element

To accelerate freezing-on of a specimen on a chuck, choose the function fast freezing. If this function is activated in due time (approx. 2 – 3 min.) before freezing-on, the fast freezing plate can achieve a temperature of -60°C.

Note:
This fast freezing device can only be activated at a chamber temperature of less than -10°C.

Note:
The upper side of the freezing station must not be covered by frost or ice. To avoid this, use acetone, ethanol or the like.

- Press the menu button (fig. 108.9).
- Via the arrow buttons (fig. 107.5 and 107.6) select “Peltier Station”.
- Confirm it via the enter button (fig. 108.10).

- Via the arrow buttons (fig. 107.5 and 107.6) select HEAT., COOL. or OFF.
- Confirm the selected function via the enter button (fig. 108.10).
- The Peltier functions are turned off automatically after 8 min.
- To active or deactivate the fast freezing function, press button (fig. 107.2) for 1 sec. (fig. 109).

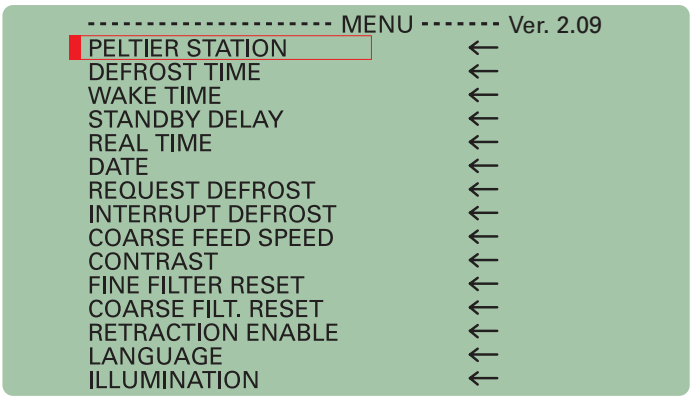

Figure 105. Display: Fast freezing station.

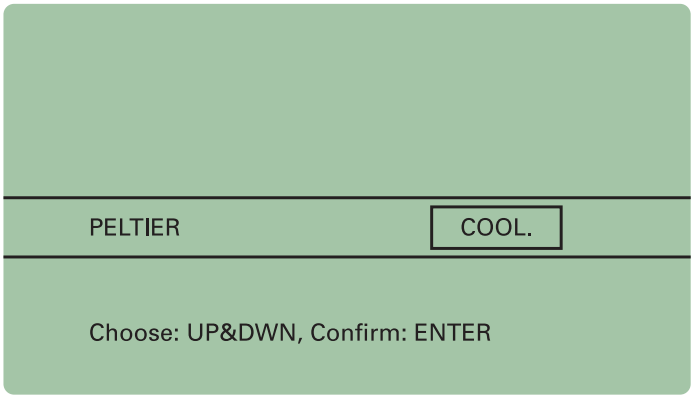

Figure 106. Display: Fast freezing station activated.

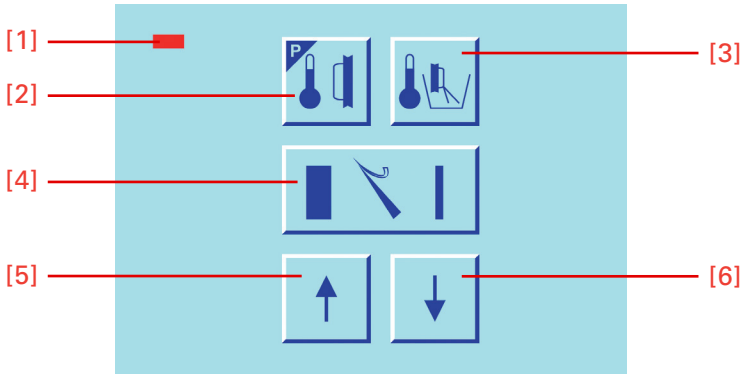

Figure 107. Center keyboard, left buttons.

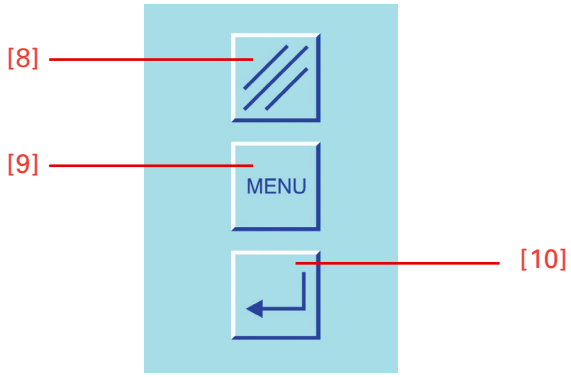

Figure 108. Center keyboard, right buttons.

- If "HEAT." is selected, the Peltier element heats up until it has reached a positive end temperature. This way, tissue specimens can be detached from the chuck inside the chamber (fig. 110).
- First put freezing medium onto an non-cooled chuck.
- Then put the specimen onto the freezing medium.

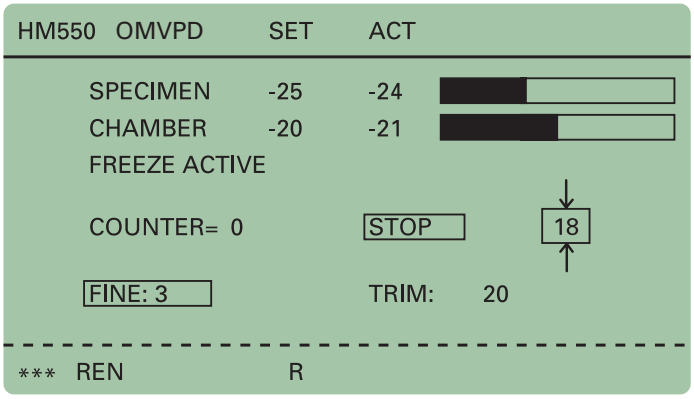

Figure 109. Display: Fast freezing station active.

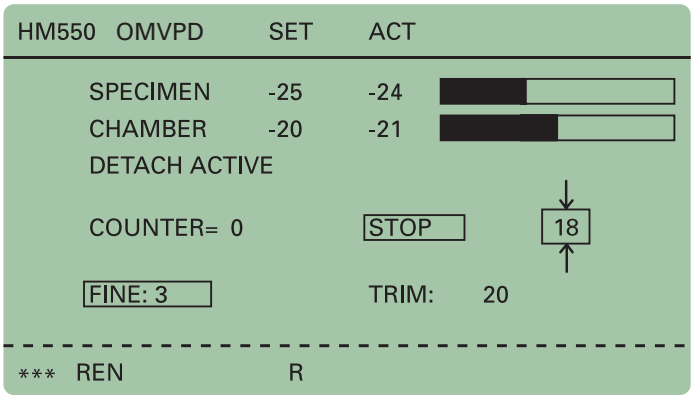

Figure 110. Display: Detaching function active.

- Afterwards, the chuck together with the specimen is inserted with the peg into one of the four front fast freezing stations (fig. 111). These four front fast freezing stations are equipped with a Peltier cooling element.

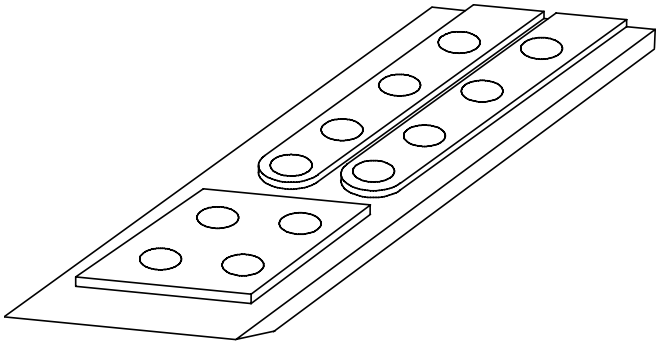

Figure 111. Peltier element.

Cold D (Option DC) function

Integrated system for nebulization of disinfectant (Sanosil®) into the cold cryostat chamber

During Cold D, the disinfectant (Sanosil®) is distributed throughout the cryostat chamber. In the following chapter “disinfectant” stands for the exclusive use of Sanosol®; use of other products may not prove as efficacious.

The disinfectant is introduced to the chilled chamber by ultrasonic nebulization of the disinfectant solution (Sanosil®). The droplet size of the disinfectant mist is 1 to 3 µm. These droplets ensure an even distribution of the disinfectant throughout the entire cryostat chamber.

The Cold D process takes 50 minutes to complete, allowing disinfection to be carried out during mormal operation of the cryostat.

The cryostat cannot be used in the 50 minutes while disinfection is carried out, but you can continue working safely with the unit as soon as Cold D has been completed.

Disinfection Procedure

Universal Precautions
All specimens can be potentially infectious; because of this universal precautions should always be followed when handling cryotomy specimens and cryostats.

Definition of Disinfection
Disinfection is the destruction of pathogens by physical or chemical means. It is not as fully effective as sterilization. Disinfection destroys most recognized pathogens, but not necessarily all microbial forms, such as bacterial spores.

The efficacy of microbial (and viral) inactivation was determined in analogy to the standard methods of the DGHM (German Society for Hygiene and Microbiology) and the European standard EN13697:2002-01 for quantitative non-porous surface testing for evaluation of chemical disinfectants with adaptations to the test item. The instrument temperature during the tests was set to -20°C.

By employing a 15 min fogging period (corresponding to 54g Sanosil®) followed by an additional 35 min contact time, a 99.5 to 99.99% destruction of vegetative test bacteria was demonstrated. The yeast Candida albicans was inactivated by 99.98%.

The silver content in the disinfectant has an additional bacteriostic effect.

The Cold D procedure thus offers a safe and convenient way significantly reduce microbial contamination in the cryostat working space and, therefore, infection risk.

However, the Cold D system cannot replace the safety precautions, regular cleaning and disinfection of the cryostat chamber according to the manufacturer's instructions (refer to Appendix A of this user manual: Cryostat disinfection)

Warning
Please observe the safety warnings on page 15 as well as the general safety instructions at the beginning of this operation manual.

Note:
The use of the specified disinfectant (Sanosil®), following the safety instructions and warnings above, and the results of the disinfection using this disinfectant are the responsibility of the operator.

Note:
The user of this cryostat must be aware of and adhere to any local requirements for the safe operation of medical laboratory instrumentation.

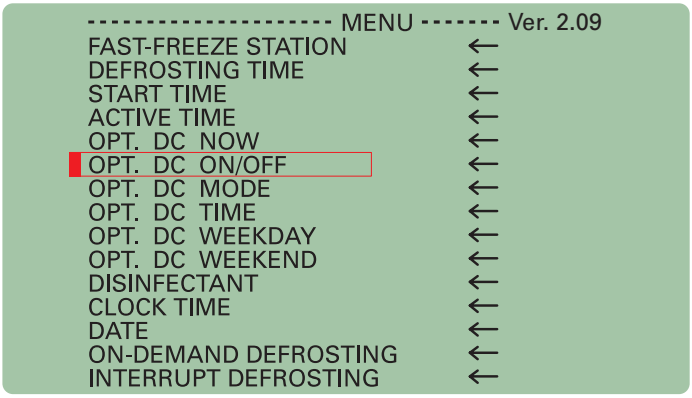

Figure 112. Display: Activating Cold D (Option DC).

Preparing to perform Cold D

To perform Cold D, the disinfectant tank (Fig. 112a.1) needs to be attached to the back of the unit with two screws (Fig 112a). This only needs to be done once.

- Position the tank on the bracket with the inlet hose centered in the lower bracket.
- Insert the quick-action coupling onto the back of the unit, as shown in Fig. 112a.2.

Once you have filled the tank you can utilize the Cold D process.

Filling the tank with disinfectant solution (Sanosil®)

- Pour disinfectant solution (Sanosil®) into the disinfectant tank on the back of the unit (Fig. 112a). Before filling the tank, check the shelf life and the hazardous substance warnings on the disinfectant (Sanosil®). Also, always follow the manufacturer's instructions for handling, storage and disposal of the disinfectant used (Sanosil®) as well as the information provided by the manufacturer concerning any precautionary measures to be taken in the event of an accidental release or spillage of the disinfectant.

Warning
Please note the safety warning in warnings on page 15.

- The max. capacity of the disinfectant tank is 1 l. This is typically sufficient for approximately 5 Cold D cycles.

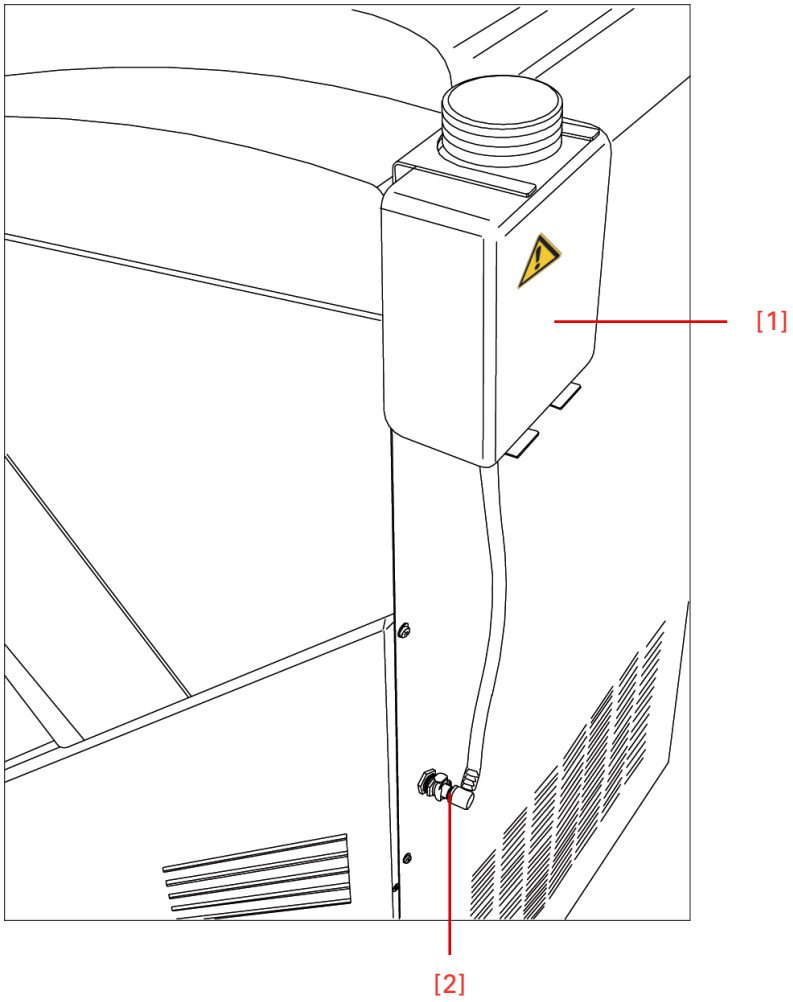

Figure 112a. Fast coupling of the Sanosil® container.

Note:
To ensure that the Cold D system can function properly, always adhere to the sequence of operations specified above.

WARNING
To avoid the frosting of the chamber, the Cold D should not be used more than 2 times per day, plus 1 cycle overnight.

Starting Cold D

Note:
The heated window must always be closed before starting Cold D.

If the heated window has not been closed, the command “Please close the heated window” is displayed.

- Press the Menu button (Fig. 113.9) to access the submenus listed.
- Next, use the arrow keys (Fig. 114.5 and 114.6) to select the “OPT. DC NOW” submenu from the list (Fig. 115).
- Press Enter (Fig. 113.10) to confirm.

CAUTION
DO NOT OPEN CRYO CHAMBER DURING THE COLD D PROCESS.

BIOHAZARD
To ensure effectiveness of the disinfectant (Sanosil®), all of the surfaces need to be accessible to the mist. **Ensure that the anti-roll plate is in the upright position!**

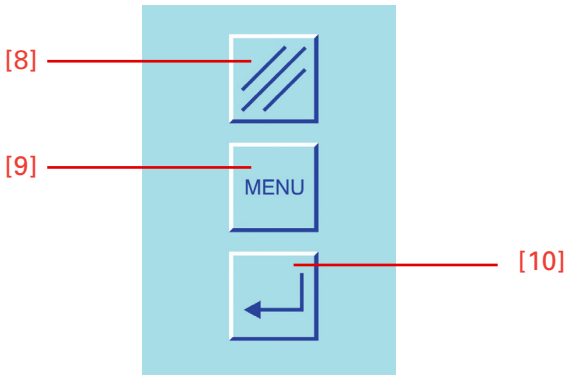

Figure 113. Center keyboard, right buttons.

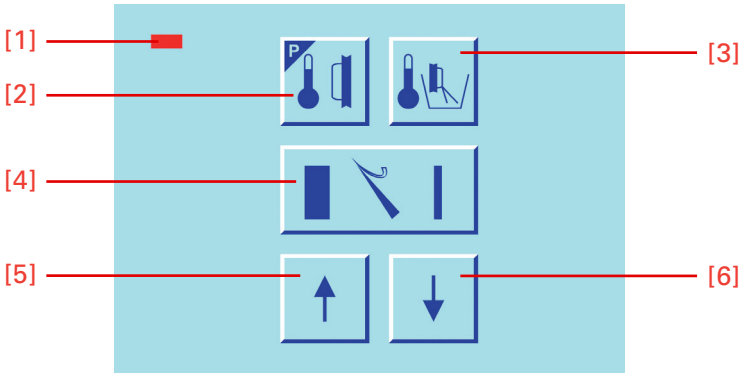

Figure 114. Center keyboard, left buttons.

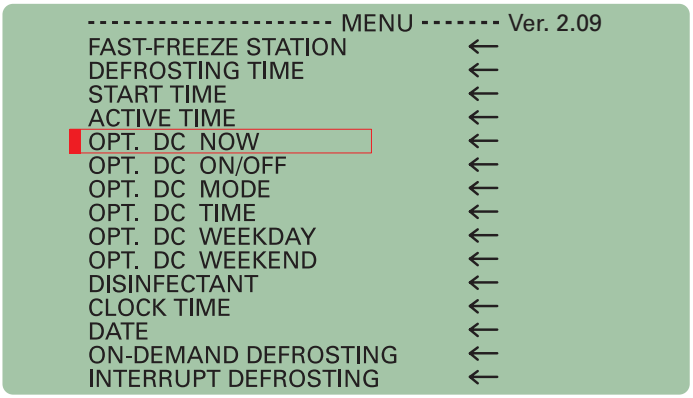

Figure 115. Starting the Cold D (Option DC).

Interrupting Cold D

The cycle can be aborted at any time by

- Pressing the Reset button (Fig. 113.8).

Note:
At the end of the Cold D cycle, remove all debris from the chamber. If any ice has formed on the cryobar, it is easily removed by spraying with alcohol.

Programming Cold D

In addition to the instant use automatic Cold D cycles can be programmed. Follow the directions below to activated (or deactivate) the automatic Cold D.

- Press the Menu button (Fig. 113.9) to access the submenus listed.
- Next, use the arrow keys (Fig. 115.5 and 115.6) to select the required submenu from the list.
- Press Enter (Fig. 113.10) to open the selected submenu.
- Select the required operation (Fig. 114.5 and 114.6) and press Enter to confirm.
- Press the Menu button (Fig. 113.9) to exit the list of submenus or select another submenu using the arrow keys (Fig. 114.5 and 114.6).

"OPT. DC ON/OFF" submenu

The following submenus on the list are relevant to programming the Cold D cycle:

- Use the arrow keys (Fig. 114.5 and 114.6) to select the required setting in this submenu (Fig. 116).
- Press Enter (Fig. 113.10) to confirm.

Note:
Selecting "On" restores the last mode selected in the "Option DC Mode" submenu.

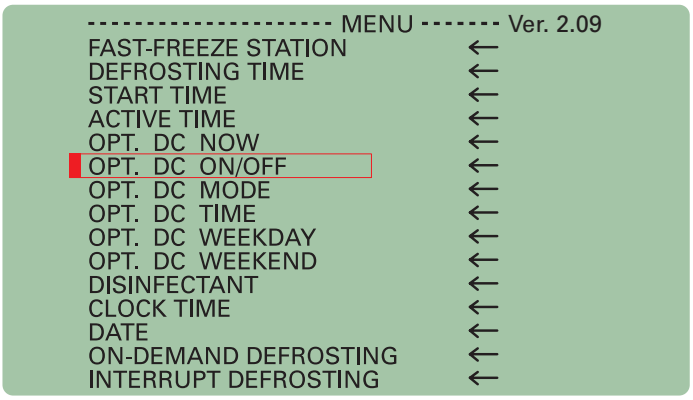

Figure 116. Display: Cold D (Option DC) ON/OFF.

"OPT. DC MODE" submenu

This menu sets how often the Cold D will take place automatically.

- Press Enter (Fig. 113.10) to open the submenu.
- Use the arrow keys (Fig. 114.5 and 114.6) to select between "Weekly" and "Daily" in this submenu.
- Press Enter (Fig. 113.10) to confirm.

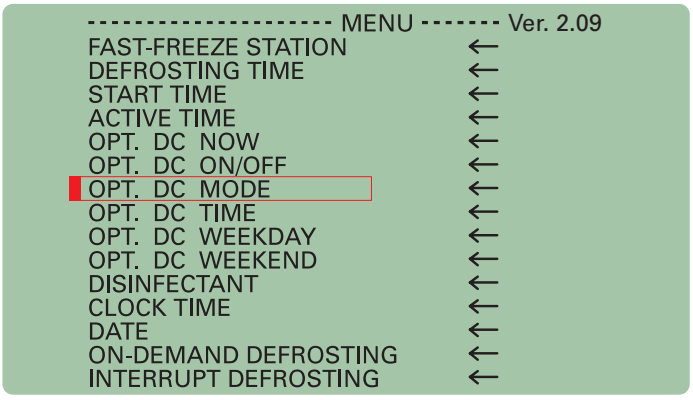

Figure 117. Display: Cold D (Option DC) Mode.

Daily cycle mode ("Daily")

If the "Daily" mode is selected (Fig. 118), the Cold D cycle runs daily.

Once-weekly mode ("Weekly")

If the "Weekly" mode is selected (Fig. 119), the Cold D cycle runs once a week on the day selected.

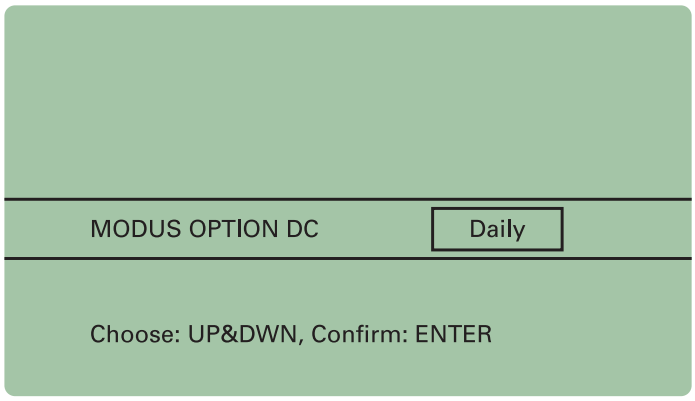

Figure 118. Display: Cold D (Option DC) daily cycle.

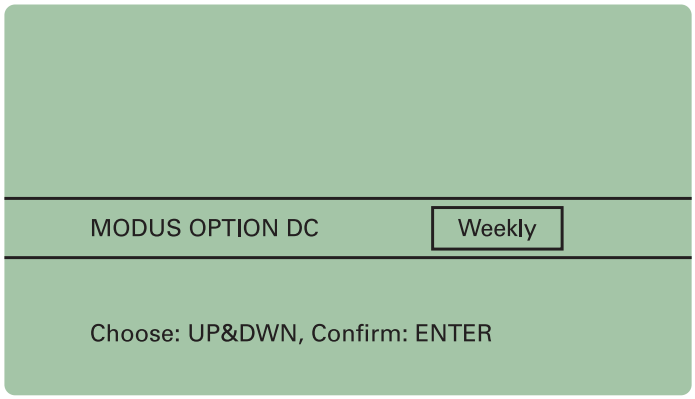

Figure 119. Display: Cold D (Option DC) weekly cycle.

"OPT. DC TIME" submenu

This menu sets the time of an automatic Cold D.

- Press Enter (Fig. 113.10) to open the submenu.
- Use the arrow keys (Fig. 114.5 and 114.6) to select the required time in this submenu.
- Press Enter (Fig. 113.10) to confirm.

Cold D cannot be performed during the defrosting cycle.

Note:
There must be a delay of at least 2 hours between the beginning of the defrosting cycle and the next Cold D cycle. If this delay is ignored when programming the Cold D time an error message is displayed and the Cold D time is automatically reset to the next possible time.

Note:
If operating the unit in programmed daily or weekly mode please close the heated window when you leave the workplace, as the Cold D cycle cannot run otherwise.

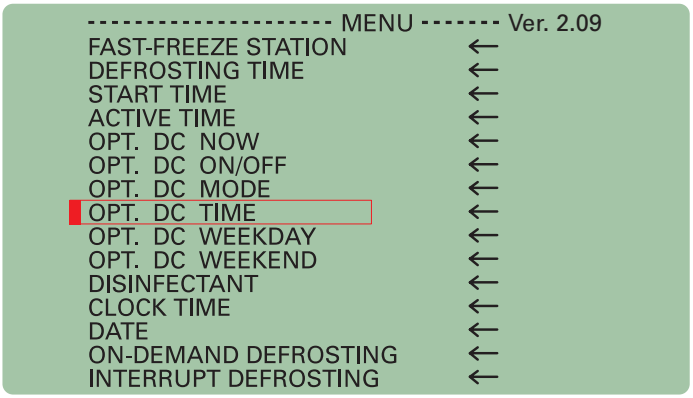

Figure 120. Display: Option DC, Real time.

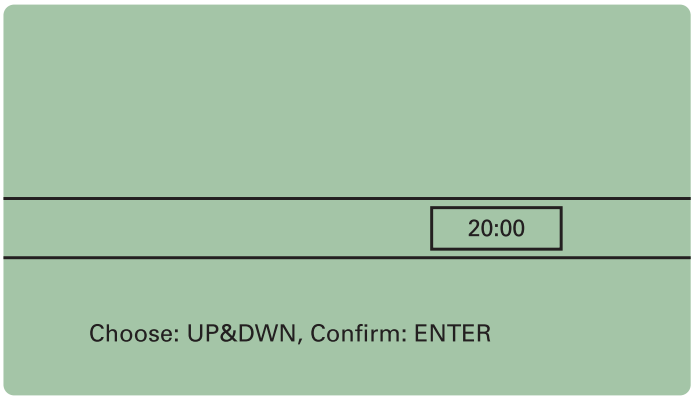

Figure 121. Display: Cold D (Option DC) real time set up.

"WEEKDLY" submenu

This option sets the day of the week that the automatic Cold D will take place (OPT. DC MODE set to Weekly).

- Press Enter (Fig. 113.10) to open the submenu (Fig. 122).
- If the "Weekly" cycle has been selected in the "OPT. DC MODE" submenu, enter the day of the week on which you wish Cold D to be performed in this submenu.
- Use the arrow keys (Fig. 114.5 and 114.6) to scroll through the days from "Monday" to "Sunday" (Fig. 123).
- Press Enter (Fig. 113.10) to confirm your selection.

"WEEKDAY" submenu

If OPT. DC MODE is set to "Daily" this option determines if the Cold D cycle will be carried out on weekends or only weekdays.

- Press Enter (Fig. 113.10) to open the submenu (Fig. 124).

- If the “Daily” cycle has been selected in the “OPT. DC MODE” submenu, you can select whether you wish Cold D to be performed at the weekend in this submenu.

- Use the arrow keys (Fig. 114.5 and 114.6) to select either “Yes” or “No” (Fig. 125).

- Press Enter (Fig. 113.10) to confirm your selection.

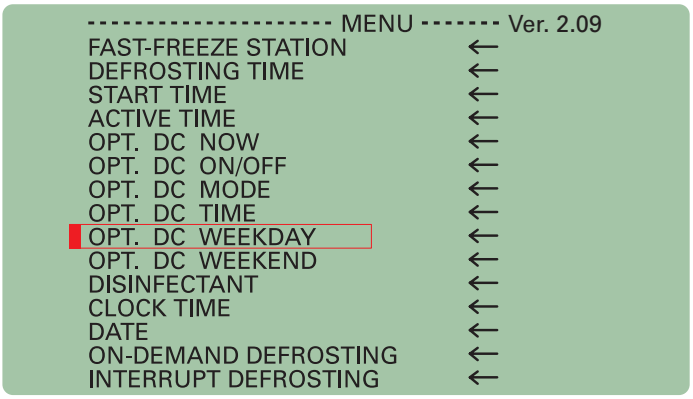

Figure 122. Display: Selecting a weekday for the weekly Cold D.

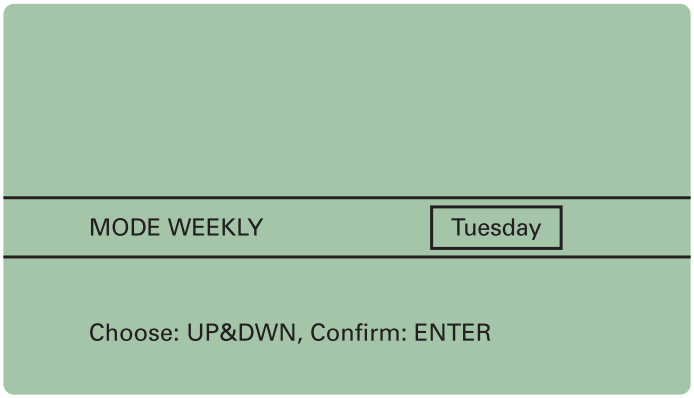

Figure 123. Display: Starting day for the weekly Cold D is selected.

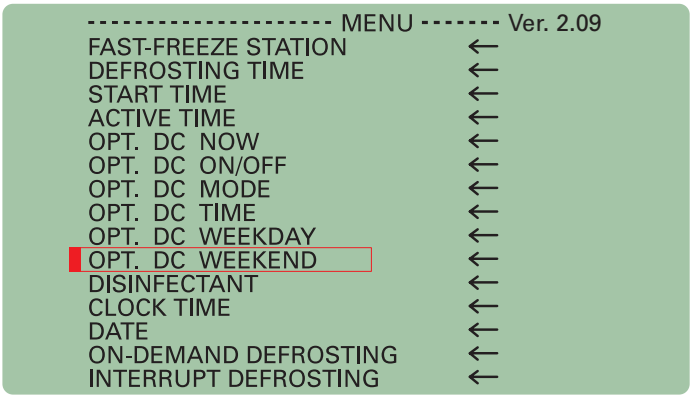

Figure 124. Display: Selecting the weekend for the weekly Cold D.

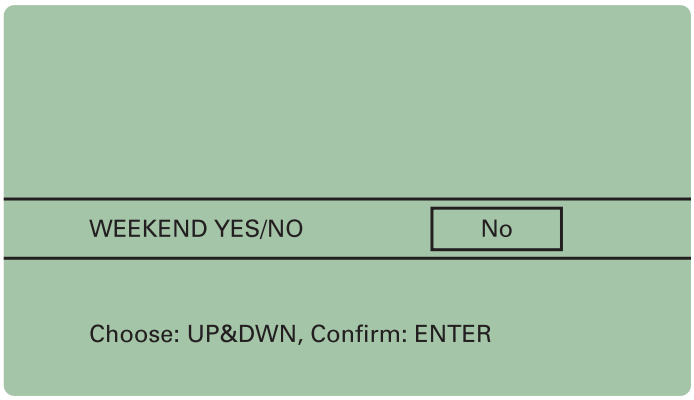

Figure 125. Display: Weekend turned off for weekly Cold D.

"Disinfectant expiry date" submenu

This submenu is where the expiry date of the disinfection solution is entered. A warning will appear on this date.

- Press Enter (Fig. 113.10) to open the submenu.
- Use the arrow keys (Fig. 114.5 and 114.6) to enter the date on which you wish the expiry date reminder to be displayed in the six-digit date box (day, month, year).
- Press the Reset button (Fig. 113.8) to switch between day, month and year.
- Press Enter (Fig. 113.10) to confirm the date entered.
- If the "Disinfectant" reminder is displayed you can cancel the message by pressing Enter (Fig. 113.10).

Note:
This message is not displayed again after being cancelled by pressing Enter.

Thorough cleaning of the cooling chamber

See Appendix A: Cryostat disinfection.

Error code indication

The instrument has an error code indication to define faster and better possible malfunctions.

The error codes describe so-called system errors. Additionally, error messages are shown on the display as text messages, e.g. when the temperature sensors are faulty, when the end position of the specimen clamping has not been reached, when there is a high pressure in the cooling system and when the function of the automatic approach system is faulty (see page 43).

Note:
If an error code appears on the display of your instrument, please note it down and contact your sales organization where you bought the instrument or directly contact Thermo Scientific Microm International GmbH.

Definition of the error codes

Error of a temperature sensor

Four different error codes, which indicate a defect on a temperature sensor, can appear on the display. The message is shown on the second line from below on the display (fig. 126):

1. `SPECIMEN SENSOR ERR´

The instrument recognizes a faulty operation on the specimen temperature sensor, which is placed in the specimen head.

2. `BOX SENSOR ERR´

The instrument recognizes a faulty operation on the box sensor, which is placed on the base plate of the microtome.

3. `FREEZE SENSOR ERR´

The instrument recognizes a faulty operation of the defrost limiting sensor, which is placed between the fins of the evaporator.

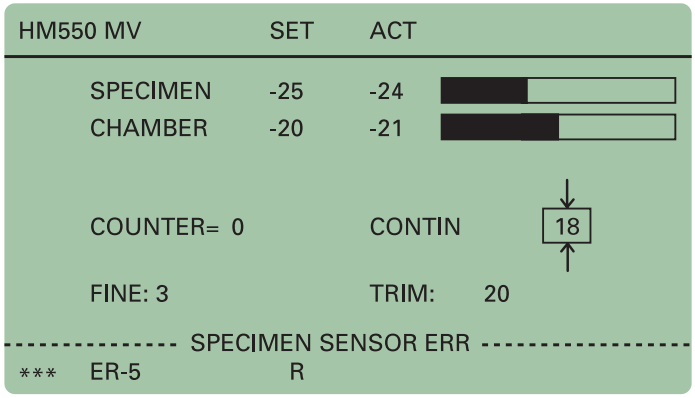

Figure 126. Display: Error codes on the display.

4. `EVAP SENSOR ERR´

The instrument recognizes a faulty operation of the defrosting limiting sensor, which is placed between the fins of the evaporator.

Note:
However, you can work with the instrument to a certain extent until the operational fault is removed by a trained service technician.

Error code `NO END POSITION´

Before turning on the instrument on the main switch, it carries out an automatic travel calibration of the specimen clamping. The specimen clamping is brought into that position which has the longest distance to the knife carrier.

If there is an operational fault during this process, e.g. debris or frost impedes the specimen clamping movement, this is shown via the message ‚NO END POSITION' and means that a calibration was not carried out.

A service technician must be called.

System-error

The instrument is designed to check for internal system errors.
In case such an error is recognized, it is shown as **‚ER-10'** to **‚ER-16'** for approx. 5 sec. in the middle of the display.

The recognition of such an error leads to an automatic RESET-process.

The cause for this might be a temporary fault.

Note:
In case one of these messages occur more than once, please note down the error code and contact a service technician.

Error codes of the Cold D (Option DC)

1. `Timeout during filling´

There is insufficient disinfection medium in the container. Please check and refill disinfection medium if necessary. Restart the Cold D. It might be possible that a repeatedly restart is necessary after filling the container especially for the first time.

2. `Please close window to start with Option DC cycle´

The Cold D cycle can only be carried out if the heated window is completely closed. Please check whether the heated window is closed and restart the Cold D cycle.

3. `Error Window open during disinfection´

The heated window needs to remain closed during the whole Cold D cycle. If the heated window is opened during the process, this error code appears. Close the window and continue.

4. `*Parameter Error***Option DC time in 2h around defrost time. New Option DC time:´**

A 2-hour wait period is required between the beginning of a subsequent defrost cycle and a Cold D cycle. If this wait period is not complete during the programming of the Cold D time, an error message appears and the Cold D time is set at the next possible time.

5. `CAUTION: Option DC cycle interrupted power failure or unit switched off from power! Continue with RESET-Button´	If the Cold D cycle was interrupted by a power failure or by switching off the unit, this is indicated by this error code. Important: The Cold D cycle was not completed and should be restarted.
6. `Error Servomotor running´	The Cold D cycle can not be started as long as the servo motor is running. Please turn off the motor and restart the Cold D.
7. `Error Step motor running´	The Cold D cycle can not be started as long as the step motor is running. Please turn off the motor and restart the Cold D.
8. `Error Defrost active´	The Cold D cycle can not be started as long as defrost is activated. Please wait at least for two hours after the defrosting is completed and restart the Cold D.
9. `Error Temperature sensor´	Please notify your service technician or your local contractor.
10. `Error on Disinfection-Board´	Please notify your service technician or your local contractor.

Accessoires

Standard equipment

The microtome cryostat HM550 series is equipped with the following accessories:

Description	Cat. No.
2 specimen chucks, 30 mm round	715710
1 specimen chuck, 40 mm round	715720
1 Allan key 2,5 mm	362220
1 Allan key 5 mm	362260
1 Allan key 6 mm	362120
1 flat brush	334170
1 brush	334170
1 Center grip	424210
1 cryostat oil no. 407, 100 ml	350040
1 freezing medium, 118 ml	161425
Section waste tray for instruments **without** specimen cooling, consisting of:	
1 Abfallwanne	415600
1 Zwischenwanne	415620
1 Pinselablage	415640
Section waste tray for instruments **with** specimen cooling, consisting of:	
1 waste tray	415610
1 intermediate tray	415630
1 brush shelf	415640
1 hose cleaner (option V)	202170
25 coarse filters (option V)	281070
1 hose with nozzle for Vacutome cleaning (option V)	570230
1 foot pedal (option M)	640280
1 operation manual	387747
Universal specimen holder	715060

Additional equipment (optional)

Description	Cat.-No.
Specimen chucks	
ø 20 mm	715700
ø 30 mm	715710
ø 40 mm	715720
50 x 50 mm	715730
55 x 55 mm	715740
60 x 55 mm	715750
70 x 55 mm	715760
Cryo-Molds	
10 mm	570400
15 mm	570380
22 mm	570390
Knife carriers	
Standard knife carrier	705460
Disposable blade carrier EC	705470
Magnetic blade carrier	705250
Knife carriers for option Vacutome	
Disposable blade carrier EV	705580
Magnetic blade carrier	705590
Other accessories	
Heat extractor	524510
Detach block	522500
Active detach function	
Coarse filter	281070
Micro filter	281060
Disinfection filter Cold D (Option DC)	281050
Disposable blade SEC 35 (50 pcs. in dispenser)	152200

Chapter 4
Theory of operation

Specimen and chamber cooling, defrosting

The chamber, the microtome and the specimen head are cooled by a refrigeration machine.

In the rear area of the microtome chamber is an evaporator which the cold coolant flows through as well as through the specimen head. Due to the heat extraction from the microtome chamber a cooling down of the microtome and/or cryo chamber to -35°C can be achieved.

The temperature of the microtome and/or chamber can be adjusted continuously down to -35°C. For this, pre-select the desired temperature as set value on the control panel. The actual value is constantly measured and sent to the control unit.

By means of an installed thermo-electrical element, controlled temperatures down to -50°C can be achieved on the specimen head.

On the left side of the microtome chamber, there are freezing stations (fast freezing stations) which can be cooled down to a temperature of -35°C depending on the cryo chamber temperature. This fast freezing station has 12 positions for one chuck each. The instrument can optionally be equipped with an active deep freezing device.

The station can be cooled down to -60°C by means of a Peltier cooling element. This Peltier cooling element has four positions for one chuck each. The eight positions correspond to the conventional fast freezing stations.

The specimen temperature control serves for a more efficient working with the cryostat. For various specimens, different cutting temperatures can be achieved very quickly.

After having cut, the specimen can be detached quickly from the chuck by using the function detach. Another possibility to detach the specimen is to warm it up outside the chamber.

The specimen temperature control is supplied via a secondary cooling circuit. The coolant flows through the cooling head serving as an evaporator of the system and cools it in combination with a Peltier element.

A thermo-electrical element is coupled with the evaporator housing on the specimen head. Via a set value input for the specimen head on the control panel, the electronics control the thermo-electrical element at any desired temperature between +10°C and -50°C.

Inevitably, when working on the microtome the dry cold air of the microtome chamber mixes with the warm humid air outside the chamber. Frost forms on the finned evaporator. The increasing thickness of the frost reduces the efficiency of the evaporator. For this reason, the daily defrosting of the evaporator becomes necessary. To carry out the defrosting cycle, a heating warms the evaporator from below.

Set the time of the daily defrosting on the control panel. The period of the defrosting takes approx. 40 min. and varies according to the thickness of the frost.

Possible frost built-up on the microtome or on the knife carrier are not removed by defrosting the instrument. However, the frost recedes after defrosting as now the evaporator is fully efficient again.

In addition, the instrument is equipped with an immediate defrosting function.

To avoid condensation the sliding window is heated when closed.

Cutting movement

The microtome of this cryostat is a rustproof rotary microtome.
The cutting movement is carried out by turning the hand wheel.
The rotary movement results in the vertical and horizontal movement of the specimen clamp.

Sectioning is carried out by knives or blades, which must be adjusted and fixed on the knife carrier.

With the downward movement of the specimen, sectioning is carried out (cutting movement).

The upward return travel of the specimen is carried out by turning the hand wheel further in a clockwise direction. During this return travel, the specimen clamping is drawn back automatically to protect knife and specimen. If required, the function retraction can be turned off.

The selected section thickness is delivered at the upper reversal point of the return travel.

The number of the sections made can be shown on the section counter on the display. After each downward movement of the specimen holder, the number on the section counter increases by 1.

The sum of the sections carried out can also be seen on the display.
For this, trimming values and sectioning values are added up. Section counter and sum of section thicknesses can be reset to zero at any time by means of the RESET-button.

Moreover, the remaining travel to the front end position can also be shown on the display. The remaining travel, which is still available for sectioning, is shown in microns. When the specimen clamping is in the back end position, the display shows 28 000 µm. This number decreases, the further the specimen clamping is moved towards the front, i.e. in the direction of the blade.

Specimen coarse feed and trimming function

After changing the specimen or moving the knife or knife carrier, it is necessary to adjust the knife edge to the specimen again. This can easily be done by means of the coarse feed and the trimming function.

After the specimen and the knife are adjusted, further gradual feed for trimming can be carried out by pressing the button for trimming. If this function is chosen, the specimen clamping moves forwards by the pre-selected trimming value whenever pressing the button for trimming.

Automatic approach system

The automatic approach system is used for the fast and exact approach of the specimen towards the knife edge.

The function of the automatic approach system is limited to the temperature range between -5°C and -35°C.

CAUTION
In case the specimen was frozen on to the chuck with CO2 gas, liquid nitrogen or with the Peltier element it is not guaranteed that the automatic approach system functions perfectly. For the specimen temperature must not be lower than -35°C when activating the ACA.

In case the temperature is lower than -35°C, it is recommended to insert the chuck into the specimen clamping and wait until the specimen temperature has adjusted to the chamber and or set specimen temperature.

The automatic approach system uses the intrinsic capacity of the specimen to notice a first contact between specimen and knife edge. If specimen and knife edge get in contact with each other, a very low current is measured via a pre-amplifier, which is placed directly behind the specimen holder. The signal form of the detected current is transferred via the outlet of the pre-amplifier to the micro-processor. A corresponding software recognizes the threshold value causing an immediate interruption of the horizontal drive. The threshold value is also determined regarding the temperature.

The optimal function of the automatic approach system is based on the fact that the knife is conductively connected with the knife carrier base, whereas the specimen holder is separated by an isolating piece.

Option M – Motorized cutting drive

The motorized cutting drive facilitates routine work and ensures an even cutting speed also for harder specimens.

When using the motorized cutting drive a regulated D.C. motor works on the hand wheel of the cryostat microtome by means of an electromechanical clutch and a reduction gear.

The speed of the motorized drive can be pre-selected continuously on the operating controls from 0 to 250 mm/s. The selected speed will be carried out in the cutting window.

Outside the cutting window a higher return speed is determined by the electronic control unit. Use either the operating controls or the foot pedal to turn on/off the drive.

The limits of the cutting window can be changed continuously and can be adjusted to the specimen.

Three operating modes for the motorized cutting drive are available. When in operating mode “interval stroke”, the cutting drive only moves as long as the button START/STOP or the foot pedal is pressed. The movement can be stopped in any position.

When in operating mode “single stroke” the cutting drive moves from the starting position to the next lower reversal point.
When in operating mode “continuous stroke”, an unlimited number of sections is carried out. To stop the continuous stroke, press the button START/STOP or the foot pedal. The cutting drive will stop after reaching the next lower reversal point.

In case of danger, the motor drive can be stopped in every operating mode by pressing the emergency stop button or the emergency stop in the foot pedal. Continue sectioning pull out the emergency stop button or unlock the emergency stop in the foot pedal.

Option V – Stretching sections and disposing of section waste

The compression of sections when gliding onto the blade is a well known phenomena during sectioning in general and especially during cryo-sectioning. However, this can be enormously reduced by using a Vacutome with a special blade carrier.

For this, a vacuum can be set below the vacuum anti-roll hood via an operating knob. This vacuum anti-roll hood acts as a traditional anti-roll guide. By means of the suction vacuum prevailing in the slot between vacuum anti-roll hood and blade edge, the cut is drawn on the air cushion over the blade thus immensely reducing the compression. The section remains on the blade in stretched form.

The vacuum for stretching sections is turned off immediately after reaching the end of the specimen via an in-line valve, however, depending on a correct setting of the cutting/suction window. Turn the vacuum anti-roll hood backwards to transfer the cut onto a slide.

The Vacutome is also highly suitable for the disposal of debris.
For this, the vacuum anti-roll hood is used as described above. When the anti-roll hood is put on, an air stream is generated in the suction window.

Continue cutting and the penultimate section is pushed forwards and reaches the area of the suction slot. From here the section gets through the blade carrier and the tubing into the filter unit. Section waste is collected in the coarse filter which can easily be replaced. It must be disposed of according to the respective lab regulations.

The air of the suction flow now passes the micro filter and is filtered there. Afterwards, the filtered air flows back into the rear area of the cryo-chamber.

Option O – Specimen fast and temperature control

The specimen fast cooling and temperature control serves for a more efficient working with the cryostat. For various specimens, different cutting temperatures can be achieved very quickly.

There is the possibility to rapidly freeze-on the specimen at -50°C on a chuck with the freezing medium.

However, the freezing-on can also be carried out on the fast freezing stations or with the Peltier cooling element.

To bring the specimen to the desired cutting temperature, switch over to temperature control. The set value of the cutting temperature can be selected on the operating controls.

The specimen fast cooling and temperature control works with a refrigeration unit and an electronic control unit. The coolant (brine) flows through the cooling head of the system and cools it.

While sectioning, the pre-selected cutting temperature is kept constant by means of a corresponding control unit.

The specimen can be detached directly on the specimen head:
- Set specimen temperature from 0°C to 5°C (inside the chamber).

The following two processes are also possible:
- Active detach function, in case the instrument is equipped with this accessory (inside the chamber).
- Cooling block with 6 stations for one chuck each (outside the chamber.

Cold D (Option DC)

The Cold D (Option DC) is a fumigation unit for the application of disinfection media (Sanosil®) onto the operation areas in the cryo chamber which are accessible for the user during the intended use.

Please refer to the *Recommended Disinfection Procedure* in **Appendix A** at the end of this manual.

Warning
To guarantee the functionality and reliability of the fumigation unit, it is recommended to solely use Sanosil®. When using other disinfection media, Thermo Scientific Microm International GmbH assumes no liability concerning functionality and disinfection effectiveness.

Chapter 5
Working with the cryostat

Preparations on the microtome and inside the cooling chamber

Before sectioning, the specimen clamping and the cryo chamber should be at a stable temperature around the desired cutting temperature. Select a chamber and specimen temperature corresponding with the consistency of the specimen that should be sectioned.

All tools which are necessary to take off sections or to manipulate the specimen must also be cooled, as the section will stick to them. For this reason, the required working accessories should always be stored on the shelves or brush tray in the microtome chamber.

The heated sliding window should be closed during breaks and while preparing work to avoid warm air getting into the chamber. Consequently, more favorable work conditions with a lower frost built-up on the microtome and knife are achieved.

In case the instrument is equipped with a Vacutome, please note that both the coarse filter and the micro filter are properly inserted in the filter unit. When needed, replace them and dispose of them according to the respective lab regulations.

Freezing-on the specimen

The specimen is frozen-on to the specimen chuck with clinging groves by means of a freezing medium.

To freeze-on specimens, use the fast freezing device or the active deep freezing device on the left side of the chamber.

When using the fast freezing device put some freezing compound onto the specimen stage, which should be outside the chamber at a low positive temperature. Then put the specimen onto the stage and surround it with some freezing compound. Please note that the frozen tissue remains connected with the freezing medium and the chuck.

Then insert the specimen stage into one of the fast freezing stations. The standard version is equipped with a fast freezing station with 12 stations. A cryostat with option P has an active deep freezing device with eight freezing stations and another four stations with Peltier element.

Start the function “Fast freezing of standard instruments” in due time before freezing-on the specimen. It will take the deep freezing device approx. 2 - 3 min. to achieve a temperature of max. -60°C.

If the instrument is equipped with a heat extractor (additional equipment) the specimen can be frozen faster and more evenly. Put the pre-cooled heat extractor onto the specimen from above. This way, the specimen is frozen at the same time from above and below, which reduces the formation of artifacts considerably.

Orientation and trimming of specimens

Clamp the specimen chuck together with the frozen specimen into the specimen holder.

For this loosen the orienting lever (standard version) and/or spring-loaded eccentric lever (version with option O) and insert the chuck into the specimen clamping. To loosen the chuck, turn the eccentric lever.

Loosen the clamping lever to have the possibility to adjust the specimen parallel in relation to the cutting edge. Afterwards, press the clamping lever to the rear.

To position the chuck parallel in relation to the knife, please use the zero device of the specimen clamp, i.e. the specimen clamping together with chuck and specimen latches noticeably into the zero position.

Afterwards, clamp the specimen clamping via the clamping lever. The chuck is now in a parallel position with regard to the knife.

After this orientation, now set the cutting/suction window. Please note that the lower cutting window limit corresponds with the upper edge of the specimen.

With the motorized coarse feed specimen and knife can roughly be adjusted.

The process of the first approach between specimen and knife edge can also be carried out via the automatic approach system.

Then carry out a further gradual feed by using the function trimming. Turn the hand wheel in a clockwise direction resulting in the first contact between knife and specimen. Continue this thus achieving the desired level.

Any waste should be wiped away in an upward direction with a brush.

When doing first cuts in combination with a Vacutome, these sections are removed automatically.

While trimming, determine the correct force of the vacuum by continued cutting and varying it via the operating knob.

The setting is optimal, when the last section remains stretched on the blade, while the penultimate section gets into the suction slot when starting a new cut.

Sectioning and taking off sections

For sectioning, pre-select the desired section thickness by means of the buttons on the operating controls.

Put the anti-roll plate against the knife by means of the knob. Turn the hand wheel in a clockwise direction or use the motorized cutting drive to carry out sectioning. The section slides into the space between the knife and the anti-roll guide.

Then remove the anti-roll guide by means of the knob. The section sticks to the knife surface. Transfer the specimen now onto a slide by using a brush or tweezers.

For instruments which are equipped with a Vacutome, also pre-select the desired section thickness by means of the buttons on the operating controls (see page 34).

In addition, set the desired vacuum on the operating knob.
Put the vacuum anti-roll hood against the blade by means of the lever. Turn the hand wheel in a clockwise direction or use the motorized cutting drive to carry out sectioning.

At the same time, the vacuum prevailing in the slot between vacuum anti-roll hood and blade draws the section over the blade. The section remains stretched on the blade. Open the vacuum anti-roll hood to pick up the section onto a slide.

How to avoid malfunctions

To cut usable sections, the following points are of utmost importance:

- Condition of the knife edge, probably move it horizontally to the left or right side.
- Check adjustment of anti-roll guide and correct it, if necessary.
- Carefully remove frost from front and rear part of the knife and from the anti-roll plate (i.e. with ethanol, acetone or the like).
- Tighten all clamping screws and clamping levers on the knife carrier and specimen holder.
- Select the appropriate chamber and specimen temperature according to the specimen.

Note:
If the specimen was frozen with liquid nitrogen or similar freezing techniques, the specimen must adapt itself to the cutting temperature.

- Carefully select the required knife material and profile.
- Adjustment of knife height.
- Adjustment of proper clearance angle. Select a clearance angle of 8-12° according to the facet angle of a steel knife.
- Select a proper cutting speed:
  The harder the material, the slower the cutting speed!
- Take care in bringing specimen and knife together.
- The most protruding point of the specimen must be recognized for the optimal operation of the automatic approach system.
- The specimen must not be covered at all or too thick by freezing medium.
- Moreover, for the functionality of the automatic approach system, a certain conductivity must be given via the specimen chuck as well as from the knife edge to the microtome base.
  For this reason, the original equipment such as knife carrier and specimen chucks should be used only.
- The specimen clamping of the microtome is connected with a sensitive electronic detecting device. The temperature sensor on the left side of the microtome housing is also connected with such a device. Malfunctions might occur after electrostatic discharges on one of the above-mentioned parts.

Recommendation: Before touching the cylinder head or temperature sensor, touch another metallic part, e.g. knife carrier, inner wall of chamber or waste tray to guarantee a safe discharge.

- When working with the active deep freezing device, sufficient time must have been passed to allow this device reaching a temperature of -60°C.

For optimal sectioning, the knife and anti-roll guide must be cleaned of paraffin waste. Only use a sharp knife and exactly adjust the anti-roll guide in relation to the knife edge.

WARNING
During defrosting, remove the specimens from the cooling chamber, as the temperature inside the chamber will increase.

Do not leave or store tissue inside the cryostat over a longer period. Due to a power failure or other unexpected malfunctions of the instrument, the specimen might be damaged.

How to avoid malfunctions when working with the Vacutome:

- Assure the opening of the Vacutome flap via a correct adjustment of the stud screw in the vacuum anti-roll hood. (Normally, it is adjusted in the factory!)

- Exactly adjust the cutting and suction window to the specimen size, to avoid inadvertent disposal of good sections.

- Set the suction vacuum according to the specimen and the selected section thickness.

- Always note that the specimens are cooled sufficiently to avoid that section waste sticks together and thus blocks the suction hoses of the Vacutome

Note:
However, in case section waste blocks the suction hoses of the Vacutome inadvertently, it can be removed by using the attached hose cleaner. During this cleaning cycle, the Vacutome should be operated with maximum power to guarantee that the released section waste is drained off properly.

Possible sources of errors – cause and removal

Problem	Cause	Removal
Cryostat temperature cannot be achieved	Ambient temperature too high	Lower ambient temperature by fresh air, climate. Please note the specified temperature of +22°C!
	Cryostat is influenced by near, heat-generating instruments	Change site of installation
	Draught into the cryostat	Change site of installation
	Soiled condenser	Open the service door on the left side, clean the condenser
	Defective cooling	Call a service technician
Frost built-up on chamber wall and on microtome	Draught (open doors, windows)	Change site of installation; close windows, doors
Retarded freezing-on of the specimen	Surface of the fast freezing station is soiled	Remove debris
	Lower part of the chuck is soiled or damaged	Remove debris, remove damage
Chatter while cutting	Unfavorable clearance angle	Readjust clearance angle
	Insufficient knife sharpness	Move the knife in the knife carrier
	Knife not adequately clamped	Check knife clamping
	Chuck inadequately clamped	Check clamping
	Specimen inadequately frozen on onto the chuck	Again freeze on the specimen
	Specimen grossed too thick – it loosens from the chuck	Again freeze on the specimen
	Specimen very hard and inhomogeneous	Select new section thickness, reduce the specimen
Sticky sections	Specimen not cold enough	Select a deeper temperature
	Knife and/or anti-roll plate are not yet cold enough – section melts	Wait until the knife and/or the anti-roll plate have reached the corresponding chamber temperature
		connect foot pedal (optional) or interlock plug
Sections do not stretch, although the correct temperature has been selected and the anti-roll plate has been adjusted correctly	Knife and/or anti-roll plate are not clean	Clean with a dry cloth or brush
	Edge of anti-roll plate is damaged	Replace anti-roll plate
	Blunt knife	Move the knife
Sections break, fissures in the sections, sections are not stretched properly	Specimen too cold	Select a higher temperature
	Static charge/draught	Remove the cause
	Specimen not cold enough	Select a deeper temperature

Problem	Cause	Removal
	Spacious specimen	Trim the specimen in a parallel way; select a thicker section thickness
	Anti-roll plate not adjusted properly	Readjust the anti-roll plate
	Anti-roll plate not aligned parallel towards the knife edge	Align parallel
	Incorrect clearance angle	Readjust the clearance angle
	Blunt knife	Move the knife
Sections roll over the anti-roll plate	Anti-roll plate does not project over the knife edge properly	Readjust the anti-roll plate
Scratching noise while cutting and during the return travel of the specimen clamping	Anti-roll plate projects over the knife edge too much and scratches on the specimen	Readjust the anti-roll plate
Thick-thin-sections	Knife sharpness	Move the knife
	Knife angle	Readjust
	Clamping on knife carrier	Check clamping
	Clamping on specimen holder	Check clamping
Tight hand wheel punctual	Debris and section waste between microtome and base plate	Remove and clean
during the entire movement	Soiled link block Toothed belt tension	Please call a service technician
No chamber illumination	Defective lamp	Check, replace
	Defective starter	Check, replace
Automatic approach system (ACA) cannot be started	Temperature outside the area	Check
	Specimen clamping outside the cutting window	Check
	Contact between specimen and blade/knife already at the ACA start	Check
Automatic approach system does not stop	Specimen too cold	Check

Note:
In case of malfunctions and/or service work, please turn off the instrument and contact your local dealer.

Chapter 6
Maintenance and care of the cryostat

Shutting-off for cleaning

Cleaning, care and decontamination of the cryostat depends on how frequently the instrument is used. However, it is recommended to shut the instrument off every 6 - 8 weeks.

CAUTION! BIOHAZARD!
As the following work might be hazardous because of the danger of freezer burns on frozen parts and potential contaminated material, it should only be done by skilled or trained personnel.

Please proceed as follows:

- Wear protective gloves.
- Remove knife/blade from the knife carrier and store it in a knife case.
- Remove the brush shelf, tools as well as chucks.
- Bring the hand wheel handle into its upper position, i.e. the specimen clamping is also in its upper position.
- Remove the middle and rear section waste tray. Dispose of the section waste according to the respective lab regulations.
- Remove and/or suck off cold section waste.
- If the instrument is equipped with the option Vacutome, pull off the Vacutome connection on the right side of the knife carrier and insert the cleaning hose on the Vacutome connection.
- Turn off the mains switch and unplug the unit.
- When equipped with the option Vacutome remove the coarse filter and if necessary the fine filter and dispose of according to the applicable lab regulations.
- Loosen the clamping lever on the knife carrier and pull off the knife carrier. If necessary, treat it with disinfectant.

CAUTION
Caution of freezer burns due to the frozen knife carrier.

- Remove the left and right side sheet. For this, turn the knurled screws approx. two rotations.

- Remove the sheets on the black grips with a circular movement upwards/forwards.

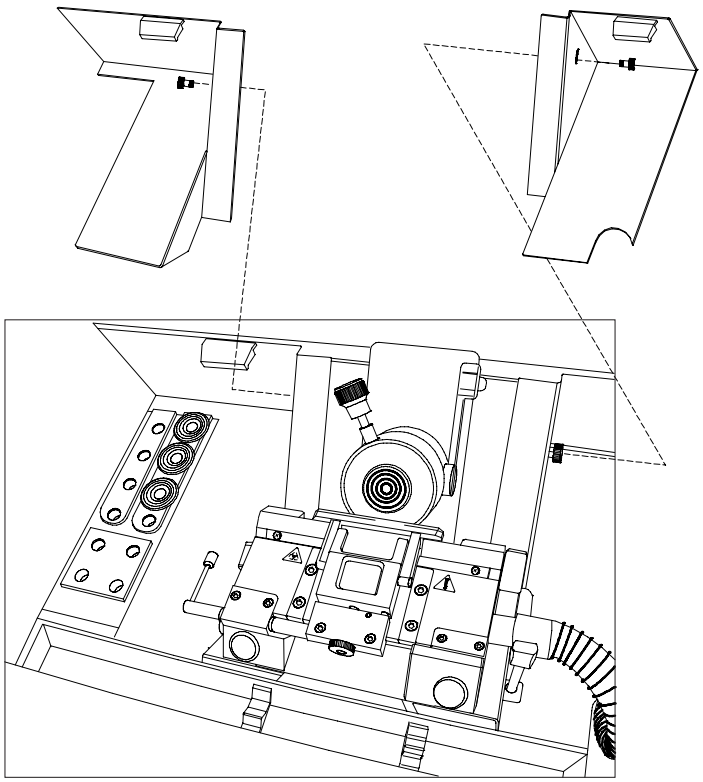

Figure 127. Removing the side sheets.

Removing the microtome

- In the left rear part of the microtome there is the so-called connector housing including the two electrical connections and for the option O (specimen cooling) two cool-technical quick couplings as well.

- Pull off the red and blue coded electrical connector. For this, touch the connectors on their connector housings.

- Insert the blue coded connector (fig. 129.1) into the park position 9 (fig. 129.9) of the fast freezing station.

- Insert the red coded connector (fig. 129.2) into the park position 10 (fig. 129.10).

Warning
Cover the connector sockets via the attached caps, as cooling liquid is critical for the electrical connectors.

Note:
Put a small cloth under the quick coupling of the option O before pulling it off, as a small amount of cooling liquid might leak out.

- For the option O pull off the quick coupling. For this, touch the connectors on the ring sleeve and pull them towards the operator to the front and pull the connector off.

- Insert the left connector into park position 11 (fig. 129.11) and the right one into park position 12 (fig. 129.12) of the fast freezing station. (If the positions are mixed up, this will have no influence on the function.)

Note:
The described electrical/cool-technical order as well as the corresponding insertion of the connectors must be ***strictly observed*** *for the option O.*

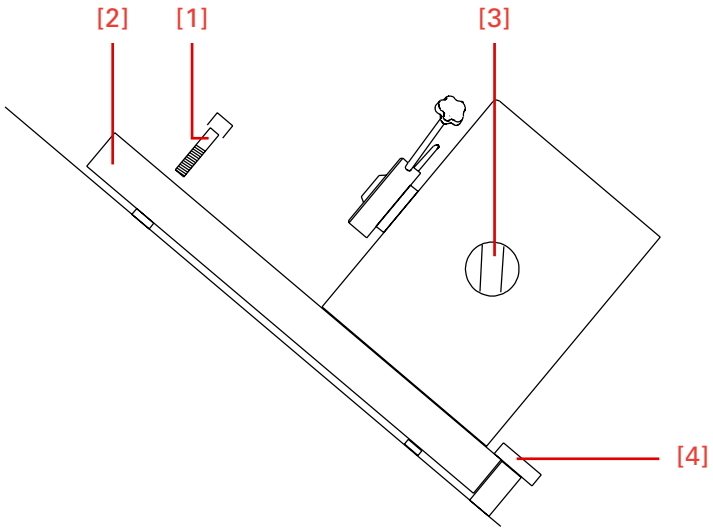

Figure 128. Removing the microtome.

- Bring the hand wheel handle into its lower position, i.e. the specimen clamping is also in its lower position.

- Slightly lift the heated window on the handle and pull it forwards over the front arm rest.

- Then swivel the window upwards and slightly move it backwards. Then insert it into the anchorage of the guide rails (fig. 130).

- Unscrew the Allan screw (fig. 128.1) in the middle of the front part of the microtome base plate via an Allan screwdriver size 5 mm.

Caution
It is recommended for all further work to wear isolating gloves because of the danger of freezer burns on the frozen microtome.

- Move the microtome to the left side until the stop. This way, the clutch on the right side of the microtome becomes free.

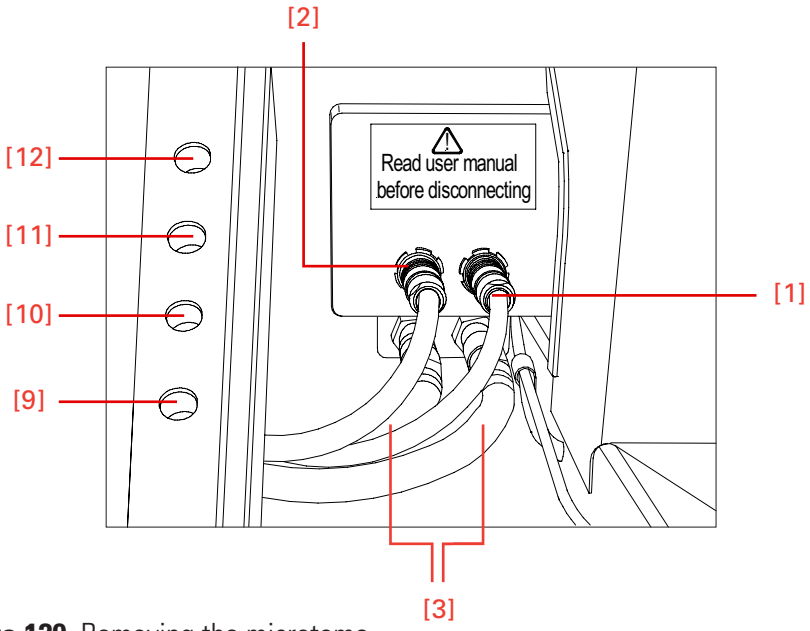

Figure 129. Removing the microtome.

- Move the microtome forwards and remove it from the cryo-chamber.
- Thoroughly clean and wash the interior.

CAUTION
Chloric cleaning agents must not be used for cleaning purposes. In case of a malfunction hazardous gases might be generated together with the cooling brine Tyfoxit of the cooling system.

- Pull off the red stopper at the bottom of the chamber. The cleaning liquid is collected in the container (fig. 131.1) with a volume of 4,8 l at the front lower side

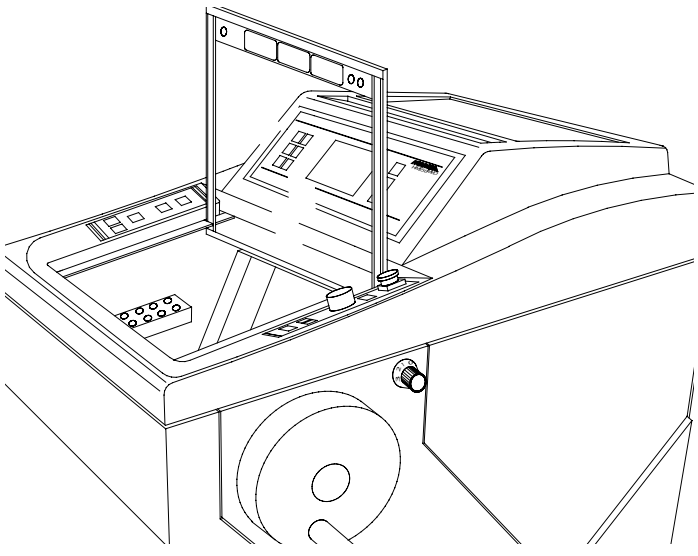

Figure 130. Removal of the heated window.

Note:
Please observe the filling level!!

- The red stopper must be inserted after cleaning as otherwise cold air leaks out during cooling operation. Thus generating frost built-up.
- The installation and re-setting up of the instrument is carried out in reverse order.

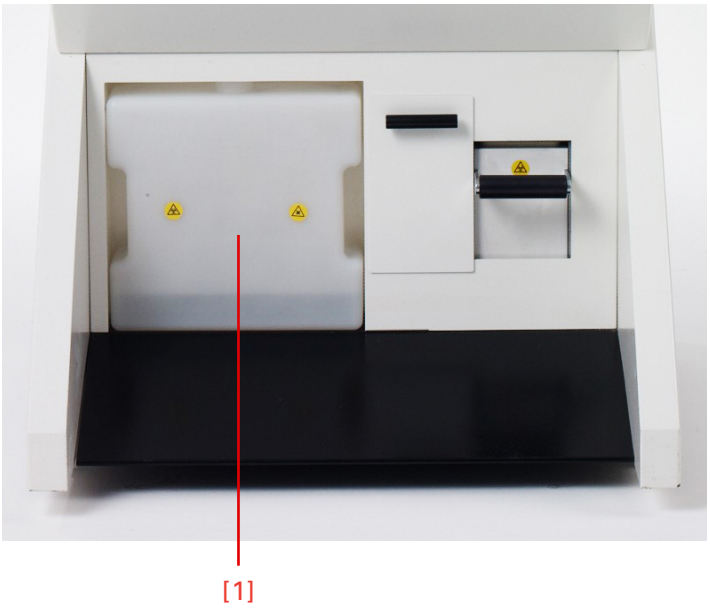

Figure 131. Container for the defrosting- and cleaning liquid.

Cleaning and care of the microtome

- Carefully clean and dry the dismounted microtome.
- Carefully clean and dry the dismounted knife carrier as well.
- As there is condensated humidity inside the microtome, dry the microtome components inside the cooling chamber very carefully.
- For this, the microtome can be treated in a drying closet at temperature up to +60°C.
- After each shutting-off or cleaning of the cryostat, the cross roller bearing should be lubricated.
- By means of a pipette (fig. 132.3) the cross roller bearings (fig. 132.4) can be reached from an angle from behind below the housing (fig. 132.1).
- Fill the pipette with a small amount of cryostat oil (cat. no. 350040).

- Put one or two drops into the space (fig. 132.2) of the cross roller bearings.
- The specimen clamping should be in the lower position.
- Also slightly lubricate the horizontal cylinder guide behind the specimen clamping.

Note:
For the examination and re-adjustment of the microtome a routine maintenance should be performed by trained service technician once a year.

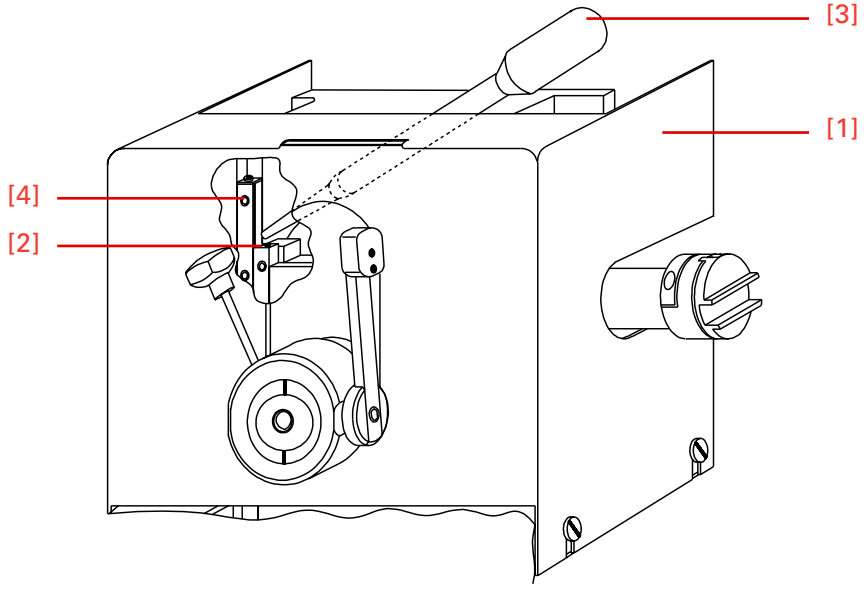

Figure 132. Lubrication of the cross roller bearings.

Cleaning and care of the microtome during routine work:

CAUTION
A regular and/or immediate disinfection of the blade carrier, the cryo chamber as well as all the other potentially contaminated parts of the instrument is highly recommended. All commercially available cryostat disinfection solutions can be used.

Cleaning the cooling lamella

- Open the cleaning opening via the attached tool (fig. 134.1).
- For this, insert the tool (fig. 133.1) through one of the middle ventilation slots.
- Turn the tool by 90° so that the t-shaped holder latches into the adjacent slots.
- Pull the tool to open the grid (fig. 133.1) of the cleaning hole.

Note:
The grid of the cleaning hole is kept on the right side by a magnet (fig. 133.2) an is inserted on the left side.

- Remove the dust from the cooling lamella by means of a commercially available vacuum cleaner.

Note:
Carry out this cleaning in regular intervals. Thus expending the lifetime of the compressor.

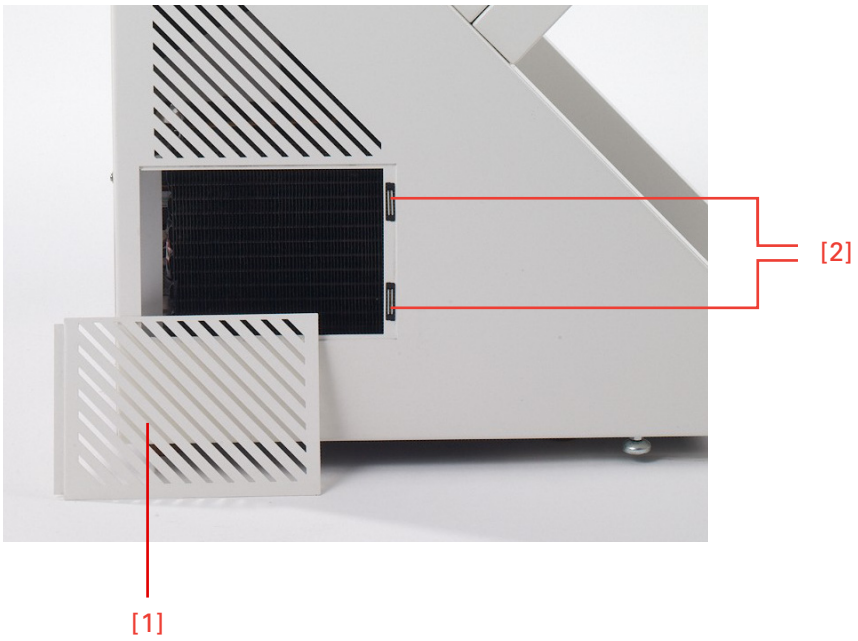

Figure 133. Cleaning the cooling lamella.

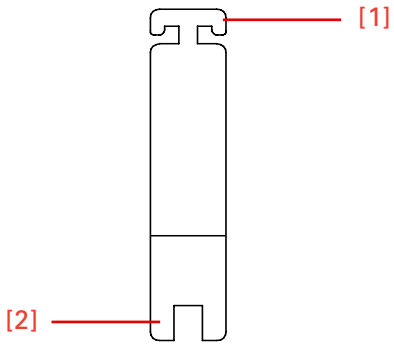

Figure 134. Tools.

Changing the fluorescent lamp

The fluorescent lamp L8/12 of the cryostat is integrated in the grip (fig. 135.1) of the heated sliding window.

- Before exchanging the lamp, turn off the mains switch and unplug the instrument.
- Open the sliding window halfway.
- Turn the two red knurled screws (fig. 135.2) which are placed on the right and left lower side of the sliding window in a counter-clockwise direction and remove them.
- Remove the grip (fig. 135.1) from the upper side of the sliding window.
- Turn the lamp by 90° forwards or backwards and remove it from the sockets (fig. 135.4).
- Insert the new lamp from above into the socket and turn it by 90°.

Note:
Only use the lamp type L8/12, cat. no. 346190, which was installed in the factory.

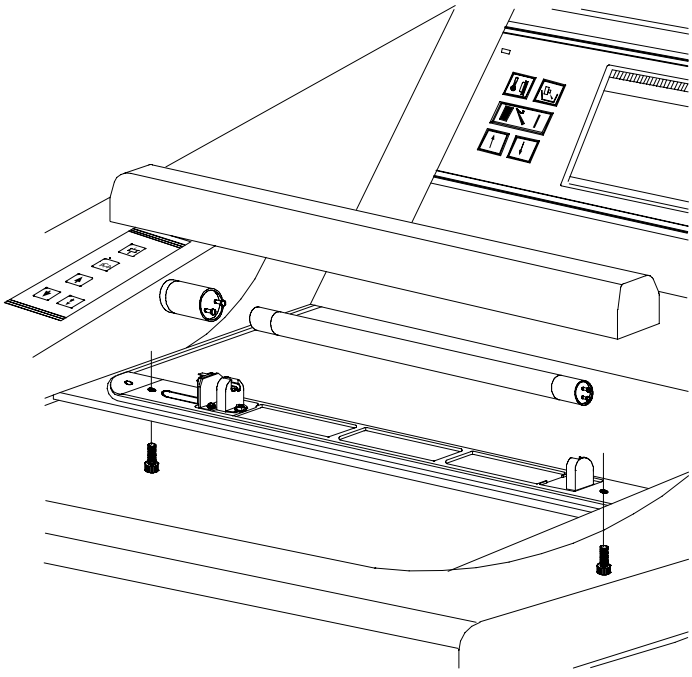

Figure 135. Changing the fluorescent lamp.

Note:
Whenever exchanging the fluorescent lamp, please also exchange the starter S10 Philips (cat. no. 322710).

- Turn the starter (fig. 135.5) in a counter-clockwise direction and remove it from the socket.
- Insert the new starter into the socket.
- Turn the new starter clockwise until the starter is positively locked.
- Place the grip (fig. 135.1) onto the illumination ledge from above.
- Screw in the two red knurled screw clockwise from below and tighten them.
- Plug in and then turn on the instrument and check the illumination.

Chapter 7
Conditions for the transportation of the instrument

Taking back the instrument for the repair or routine maintenance

Repair or maintenance work are normally carried out at the site of installation. If this is not possible for some special reasons, the instrument can be returned to Thermo Fisher Scientific Microm International. The contact address can be found at the beginning of this operation manual.

- To guarantee trouble-free function of the instrument after transportation, please note the below-mentioned measures for the transportation preparation.
- In addition, the conditions for storage and transportation as mentioned on pages 16 –18 must be observed during the entire transportation.

Biohazard!
Please also note the precautionary measures described in our safety precautions concerning biological hazards!

Measures for closing down

- Turn off the instrument.
- Unplug the unit.
- Remove blade and/or knife from blade and/or knife carrier.
- Remove section waste trays, brush shelf, blade/knife carrier and other accessories as well as tools from the cryo chamber.

- Before the transportation, empty all containers for defrosting liquid and disinfection solution to avoid the unintended release of the fluids. When removing the containers, please also note the precautionary measures which are described in the chapter “Safety Precautions”.

Note:
Clean and disinfect these accessories according to the respective applicable lab regulations and transport them in dry condition.

Caution
Any shipping of the instrument requires original packaging materials! Damages caused by shipping with non-conform packaging are not covered by the manufacturer warranty! Any damage repairs resulting in non-conforming package are fully charged to the sending party. We reserve the right depending on seriousness of damage NOT to repair. To order original packaging materials, please contact Thermo Fisher Scientific or your local, by Thermo Scientific authorized, dealer.

Caution
The user must care for a clean and safe condition of the instrument when returning it to an appropriate service provider.

Note:
If the original packaging is no longer available, please contact your local Thermo Scientific representation.

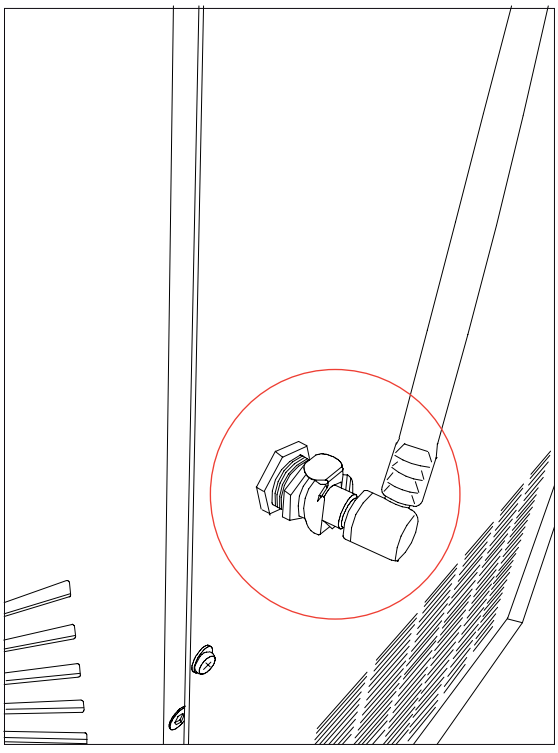

Figure 136. Fast coupling of the Sanosil® container.

- To remove the container for the disinfection medium, first loosen the rapid action hose (fig. 136). Then remove the container from the supports.
- Clean and disinfect the cryo chamber according to the respective applicable lab regulations.
- Unscrew the hand wheel handle for transportation.
- Before the transportation, loosen the fastening screws of the rollers.
- Keep the heated sliding window closed during transportation.

Note:
If the new site of installation can be reached in less than half an hour, keep the sliding window closed so that the cryo chamber does not heat up. This avoids the formation of condensation water inside the chamber.

Note:
It is recommended that at least two persons are available for the transportation.

Measures for turning on again

- Again install the blade carrier, section waste trays and the brush shelf.
- Attach the hand wheel handle again.
- After having turned on the instrument and after having reached the set temperature, the instrument is ready of operation again.

Note:
Blade carrier which was heated up to ambient temperature, needs approx. 1 h in the chamber at -25°C to be able to section specimens again.

For transportation outside closed buildings, please observe the following measures:

- Turn off the instrument.
- Unplug the unit.
- Remove blade and/or knife from blade and/or knife carrier.
- Remove section waste trays, brush shelf, blade/knife carrier and other accessories as well as tools from the cryo chamber.

Note:
Clean and disinfect these accessories according to the respective applicable lab regulations and transport them in dry condition.

- Clean and disinfect the cryo chamber according to the respective applicable lab regulations.
- Unscrew the hand wheel handle for transportation.

Note:
To make sure that these is no condensation water inside the chamber, let the instrument approx. 48 h dry.

- Loosen the fastening screws of the rollers to move the instrument.
- Arrange the dismounted accessories into the intended transportation packing.

Note:
Before the further transportation, tighten the fastening screws so that the instrument does not move during transportation.

- Slightly tilt the cryostat and insert the foam parts underneath it.
- Place the case over the instrument.
- Insert the wooden cover.
- Attach the tightening strips around the packing.

Disposal of the instrument after final shutdown

After the final shutdown of the instrument, we recommend to contact a local recycling company for the disposal according to the national applicable regulations.

To be applied in the countries of the European Union and other European countries with a separate collecting system within the waste management.

The marking of the product and/or the respective literature indicates that, after its final shutdown, it must not be disposed of together with ordinary domestic waste.

- Please dispose of your instrument separately from other waste to not harm our environment and/or human health by uncontrolled waste disposal.
- Recycle your instrument to support the sustainable recycling of material resources.
- Industrial users should contact their suppliers and observe the conditions of the contract. This product must not be disposed of together with other commercial waste.
- **Please contact your supplier!!**

Appendix A
Cryostat disinfection

Disinfection of the cryostat chamber as per protection level 2 as per the Regulation of Biological Substances Act (BioStoffV; GBGI. I S. 50; 1999 S. 2059) and the Technical Regulations on Biological Substances (TRBA 10; 09/1999).

Recommended Disinfection Procedure

Universal Precautions
All specimens can be potentially infectious; because of this universal precautions should always be followed when handling cryotomy specimens and cryostats.

Definition of Disinfection
Disinfection is the destruction of pathogens by physical or chemical means. It is not as fully effective as sterilization. Disinfection destroys most recognized pathogens, but not necessarily all microbial forms, such as bacterial spores.

Disinfection Procedure for the HM 550 Cryostat Series

- Wear appropriate protective clothing: double gloves, gown, mask and protective eyewear.
- Remove all disposable blades and knives from the chamber and disinfect them separately.
- Using a paper towel remove all tissue trimmings and waste material from the cryostat chamber.
- Bring the cryostat chamber to room temperature before beginning the disinfection process.
- Use 3% Sanosil® as the disinfection agent. Spray the solution throughout the chamber, let sit for 20 minutes, drain, and then wipe with absorbent towels.
- Dilute bleach (5%) may be used as an alternative to 3% Sanosil®.
- Spray the chamber surfaces with 70% alcohol. Allow the solution to sit for 10 minutes, drain, and again wipe all surfaces with absorbent towels.

Sanosil® can be ordered by the manufacturer and/or the local dealers in the respective countries or by your respective Thermo Scientific contractual partner (cat. no. 175200).

www.sanosil.ch // 5 l ready-for-use solution

Warning
To guarantee functionality and reliability of the disinfection unit, it is highly recommended to solely use Sanosil®. When using other disinfec-

tion media, Thermo Fisher Scientific Microm International GmbH assumes no liability concerning functionality and disinfection effectiveness.

Appendix B
Certficate

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CERTIFICATE

Inactivation of bacteria and other pathogens by cold disinfection in the cryostat Microm HM550

1. Summary

The cold disinfection procedure in the cryostat Microm HM550 involves fogging of a chemical disinfectant throughout the working space of the cryostat at temperatures down to -20 °C.

The efficacy of microbial inactivation was determined in analogy to the standard methods of the DGHM (German Society for Hygiene and Microbiology) [1] and the European standard EN 13697:2002-01 [2] for quantitative non-porous surface testing for the evaluation of chemical disinfectants with adaptations to the test item. The instrument temperature during the tests was set to -20 °C.

“Sanosil® S010 spezial” (SANOSIL Service GmbH, Farchant, Germany) containing approximately 5 % hydrogen peroxide and 50 mg/L silver nitrate was used as a disinfectant.

By employing a 15 min fogging period (corresponding to 54 g Sanosil®) followed by an additional 35 min contact time, a 99.5 to 99.999 % destruction of vegetative test bacteria was demonstrated. The yeast *Candida albicans* was inactivated by 99.98 %.

Deposition of silver from the disinfectant onto the working space surfaces has an additional long-term bacteriostatic effect [3].

The cold disinfection procedure thus offers a safe and convenient way to significantly reduce microbial contamination in the cryostat working space and, therefore, infection risk.

However, the cold disinfection system cannot replace the safety precautions, regular cleaning and disinfection of the cryostat chamber according to the manufacturer´s instructions.

17 December 2010 Ingo Maier, PhD

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2. Experimental

A detailed description of the experimental conditions is given in a separate test report [4].

2.1 Test instrument

Microm HM550 VPD cryostat, serial number 30883

2.2 Test strains

The following test strains were used in the present study:

Staphylococcus aureus ATCC 6538
Enterococcus hirae ATCC 10541
Pseudomonas aeruginosa ATCC 15442
Candida albicans ATCC10231

The test strains were originally received from the Deutsche Sammlung für Mikroorganismen und Zellkulturen (DSMZ, Braunschweig, Germany) and were kept in the laboratory as frozen stock cultures.

2.3 Disinfectant

Sanosil® S010 spezial, containing approx. 5 % hydrogen peroxide and 50 mg/L silver ion complex according to the supplier, Sanosil Service GmbH, 82490 Farchant, Germany.

2.4 Test method

Suspensions of test organisms were prepared in distilled water containing 0.03 % bovine serum albumin as an additional organic load. 50 µl aliquots of the suspensions were dried onto stainless steel coupons (20 mm diameter) and placed on the left bottom of the cryostat working space. After cooling to -20 °C, the coupons were treated by fogging the cryostat chamber with 54 g of disinfectant during a 15 min time period. After an additional contact period of 35 min at -20 °C, the coupons were transferred into petri dishes containing neutralizing solution and glass beads. The surviving test organisms were rinsed off the coupons on a shaker and cell numbers were determined by plate counting.

Tests were carried out in two parallel experiments with three replicates each.

Reduction factors were determined in comparison to control experiments without treatment with disinfectant. Control experiments on the efficacy of neutralization and the toxicity of the neutralizing solution were also carried out.

3. Results

The following table summarizes the test results. Details are given in a separate test report [4].

Test strain	Mean cell number		Reduction factors[2]	
	Control[1]	Treatment[1]	log_{10}	%
Staphylococcus aureus	9.0×10^6	452	4.3	99.99
Pseudomonas aeruginosa	5.7×10^6	≤ 33	≥ 5.2	≥ 99.999
Enterococcus hirae	1.23×10^6	6.570	2.3	99.5
Candida albicans	2.23×10^6	474	3.7	99.98

[1] mean values from three or six replicates, respectively
[2] average values

4. References

[1] Gebel J, Werner H-P, Kirsch-Altena A, Bansemir K. Standardmethoden der DGHM zur Prüfung chemischer Desinfektionsverfahren. 14 Flächendesinfektion - praxisnaher Versuch. 14.1 Überprüfung der bakteriziden und fungiziden Wirkung auf nicht porösen Oberflächen, mhp Verlag, Wiesbaden, Germany, 2001.

[2] DIN EN 13697:2002-01. Chemical disinfectants and antiseptics - Quantitative non-porous surface test for the evaluation of bactericidal and/or fungicidal activity of chemical disinfectants used in food, industrial, domestic and institutional areas - Test method and requirements without mechanical action (phase 2/step 2).

[3] Monteiro DR, Gorup LF, Takayama AS, Ruvollo-Filho AC, de Camargo ER, Barbosa DB 2009. The growing importance of materials that prevent microbial adhesion: antimicrobial effect of medical devices containing silver. Int. J. Antimicrob. Agents 34(2), 103-110.

[4] Maier I 2010. Kaltdesinfektion im Kryostaten Microm HM550. Prüfung der bakteriziden und fungiziden Wirkung Teil 1 (20.12.2010).

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