

INSTRUCTION MANUAL

**MICROTOME CRYOSTAT
HM 500 OM SERIES**

Microtome Cryostat HM 500 OM

MICROM International GmbH
Robert-Bosch-Str. 49

D- 69190 Walldorf

CERTIFICATION

MICROM 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 MICROM 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 MICROM International GmbH. 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. MICROM International GmbH is not liable for any occurring damage.

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

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

This instruction manual is available in the following languages:

	Cat. No.
German:	386 030
English:	386 040
French:	387 280

Microtome Cryostat HM 500 OM

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INTENDED USE

Dear Customer,

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

Only skilled or specially trained personnel must operate the microtome, i.e. clamping the specimen, trimming, sectioning and taking off the sections from the instrument. The listed and marked safety measures as well as the regulations of your respective lab must be strictly observed.

MICROM Ser. No.....

Please check the MICROM Ser. No. on the type plate of your instrument and enter this number here. Questions and service can be handled faster by giving the serial no.

Instruction Manual No. 386040

Issued on November 21, 2000

**MICROM International GmbH
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Intended Use

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OPTION Vacutome

EC Certificate of Conformity

Name and address of the manufacturer: MICROM International GmbH
Robert-Bosch-Straße 49
D-69190 Walldorf

Product designation: Microtome Cryostat
Type reference: HM 500 ?O-M-V?

The designated product complies with the laid down regulations:

73/23/EWG with amendments
89/336/EWG with amendments

The designated product complies with the EC regulations by strictly observing the following norms:

"Guideline of the Council for the alignment of the legal instructions of the member countries on electrical means of production for the use within certain voltage limits"

<u>International Norm</u>	<u>European Norm</u>	<u>German Norm</u>	<u>VDE-classification</u>
IEC 1010-1:1990-09 +A1:1992-09 + A2:1995-06	EN 61010-1:1993 +A2:1995	DIN EN 61010-1:1994-03 +A2:1996-05	VDE 0411 Teil1:1994-03 +A1:1996-05

"Guideline of the Council for the alignment of the legal instructions of the member countries on electro magnetic compatibility"

<u>European Norm</u>	<u>German Norm</u>	<u>VDE-classification</u>
EN 61326:1997 EN 61326:1997/A1:1998	DIN EN 61326:1998-01 DIN EN 61326/A1:1999-05	VDE 0843 Teil 20:1998-01 VDE 0843 Teil 20/A1:1999-05



Hans Heid
Managing Director

Walldorf, 01 July 2002

Microtome Cryostat HM 500 OM

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SAFETY PRECAUTIONS

ATTENTION !

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. MICROM International GmbH 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 safety ground. The instrument is equipped with a three wire ground plug. The power outlet must be connected to the safety ground 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.

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 carrier. Before changing the knife carrier, 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!



Avoid permanent touching of metal parts inside the cryostat microtome chamber. Frostbite at unprotected hands and arms may occur at working temperatures down to -40°C .

HAZARD OF RADIOACTIVE RADIATION



When working with radioactive specimens observe all applicable radiation safety procedures.

HAZARD OF INFECTION



Use the appropriate safety and disinfection measures when working with infectious specimens.

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.

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HAZARD OF BIOLOGICAL DANGER



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.

PART 1 INTRODUCTION

1-1 DESCRIPTION OF HM 500 OM

The cryostat HM 500 OM from MICROM International GmbH is a highly efficient microtome-cryostat for a cutting temperature range down to -40°C . Designed as an upright standing unit with an open-top working area, the instrument allows convenient and ergonomic handling in standing and sitting position.

The cryostat has a cooling system to control the temperature of the working area of the microtome and knife carrier as well as to cool the freezing stations for freezing-on specimens on the specimen stages.

A second cooling system represents the specimen fast cooling and temperature control unit. With this unit, the specimen can be frozen-on very quickly. The desired cutting temperature is also very rapidly achieved after switching over to regulated cooling; independently of the present temperature in the microtome chamber. Another function quickly allows detaching the specimen.

The rustproof microtome has a section thickness range from $0,5\ \mu\text{m}$ to $90\ \mu\text{m}$. For the protection of knife and specimen, the instrument retracts the specimen at the end of the cut. The motorized coarse feed system allows specimen forward and backward travel. This way specimen and knife edge distance can be adjusted quickly. A fast and exact approach of the specimen towards the knife edge is guaranteed by the automatic approach system. An additional trimming function with values from $5\ \mu\text{m}$ to $300\ \mu\text{m}$ permits the fine adjustment up to the first cuts and results in larger section thicknesses when trimming. Three knife carriers are available. The standard knife carrier is designed so the knives can be easily clamped in place and adjusted; the magnetic disposable blade carrier offers plenty of clearance while sectioning, the disposable blade carrier EC takes up high and low profile blades. The corresponding anti-roll guides facilitate taking off sections.

The section counter on the operating panel shows the number of sections made.

In addition, the model HM 500 OM has a motorized cutting drive with three modes of operation and an emergency-stop device, which can be controlled by means of the operating controls or the foot pedal.

Microtome Cryostat HM 500 OM

1 - 2

TECHNICAL SPECIFICATIONS HM 500 OM

Cooling of microtome chamber (at +20°C ambient temp.) temperature range +20°C down to -40°C
 resolution 1°C
 automatic defrosting..... 1 each 24 h

Specimen fast and temperature control temperature range +5°C down to -55°C
 resolution 1°C

Section counter with reset 3-digit

Microtome: Section thickness range 0,5 - 90 µm
 Resolution 0,5 µm for 0,5 - 2 µm
 1 µm for 2 - 10 µm
 2 µm for 10 - 20 µm
 5 µm for 20 - 50 µm
 10 µm for 50 - 90 µm

Trimming thickness range:..... 5 - 300 µm
 Resolution:..... 5 µm for 5 - 10 µm
 10 µm for 10 - 100 µm
 100 µm for 100 - 300 µm

Specimen retraction during return travel..... 40 µm
 Horiz. feed range 28 mm
 Vertical specimen stroke 64 mm
 Coarse feed 800 µm/s
 Specimen fine orientation x/y/z - axes
 z- and y-axes each +/- 8°, z-axis 360°
 Specimen stage size 30, 40, 50, 55, 60 mm
 special sizes upon request

Cutting drive: Modes:..... interval, single and continuous stroke
 Cutting speed: 0,5 - 250 mm/s

Microtome chamber illumination:..... PL-L 18 W 84 4 P

Heated sliding window

Storage

temperature range: -20°C up to +50°C

Operating

temperature range: +5°C bis +40°C (at a max. rel.humidity of 60%)

..... altitude up to 2000 m M.S.L.

..... for indoor use only

Power requirements: 220 V 60 Hz 8,1 A (+/-10%) 1800 VA

(max. configuration): 230 V 50 Hz 7,7 A (+/-10%) 1800 VA

..... 240 V 50 Hz 7,2 A (+/-10%) 1800 VA

..... 100 V 50 Hz 17,8 A (+/-10%) 1800 VA

..... 100 V 60 Hz 17,5 A (+/-10%) 1800 VA

Pollution degree: 2

Overvoltage category: II

Dimensions: 840x1120x780 mm (wide/high/deep)

Weight: 230 V..... 180 kg

110/115 V204 kg

PART 2 OPERATING INSTRUCTIONS

2-1 SETTING UP THE CRYOSTAT

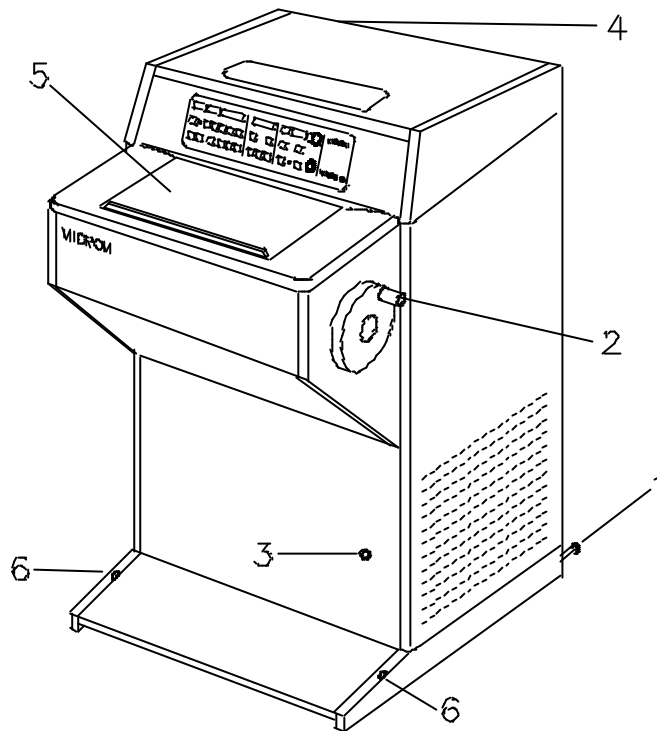


Fig. 1

Unpack the instrument and remove packing as follows:

Loosen and remove the cover of the case, remove the packing material. Loosen the side parts at the bottom and remove them by lifting them over the instrument. To remove the pallet from the instrument, cut off the packing material in the foot area, if necessary. The pedestal of the instrument is equipped with rollers so it can be easily moved to the installation site.

of the instrument (fig. 1.1).

CAUTION! The instrument must only be moved in an upright or slightly tilted (approx. 30°) position.

The installation site must be chosen so that enough ventilation for the cooling system is guaranteed. The distance between wall and rear panel should be approx. 10 - 15 cm. To ensure this, screw in the two enclosed spacers on the lower rear panel

Moreover, the suction areas on either side must be kept free.

Please avoid draught by open doors or by air conditioning systems at the installation site. In addition, the microtome chamber should not be exposed to sunlight.

Both measures reduce the formation of frost and

therefore results in more favourable work conditions. A high air moisture as well as high ambient temperatures reduce the maximum performance of the instrument.

Turn the screws on the front foot ends (fig. 1.6) to fix the instrument. Then install the handwheel handle (fig. 1.2), which is separately packed, and connect the enclosed foot pedal on the socket (fig. 1.3) above the right foot of the pedestal.

2-2 INITIAL TURN-ON

CAUTION! Before switching on the instrument for the first time, please check if the power requirements indicated on the type plate correspond to the power supply voltage being used.

NOTE! If the display shows HELP after turning on, the battery for storing the variable values is used up. (See part 5-2) However, sections can be made with the instrument, but the variable values must be set again.

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. Now connect the plug of the instrument to the power outlet. Then turn on the power switch (fig. 1.4) on the backside of the instrument.

Then close the heated sliding window (fig. 1.5) and cool down the instrument, which will take approx. 2 - 4 hours according to the set BOX-temperature.

2-3 COOLING OF MICROTOME CHAMBER

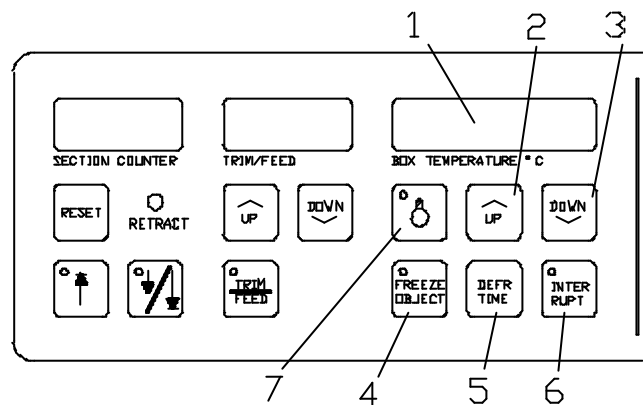


Fig. 2

2-3-1 ACTUAL and SET VALUE OF TEMPERATURE

The cooling of the microtome chamber can be controlled by the corresponding part of the operating controls (fig. 2). The actual temperature of the microtome chamber is shown in °C on the digital display (fig. 2.1). Briefly press the UP- or DOWN-button (fig. 2.2 or 2.3.), the set value of the temperature in the microtome chamber is shown for approx. 2 sec. Afterwards, the display shows again the actual value of the temperature of the microtome chamber.

To change the set value, press permanently the UP-button (fig. 2.2) or DOWN-button (fig. 2.3). The UP-button leads to higher, the DOWN-button to lower temperatures.

The valid range of the set value goes from +20°C down to -40°C. If the UP-button (fig. 2.2) is used beyond the limit of +20°C, the display shows - - - and the temperature control is turned off. Using the DOWN-button (fig. 2.3), the cooling system is turned on again.

2-3-2 The function FREEZE OBJECT

To accelerate freezing-on of a specimen on a specimen stage, choose the function FREEZE OBJECT (fig. 2.4). This way, the additional cooling system for the four front fast freezing stations is turned on for 8 minutes independent of the selected set value and the actual temperature of the microtome chamber. Then, the instrument itself changes to temperature control. To interrupt this process, press again the function FREEZE OBJECT.

To achieve a temperature of -55°C of the fast freezing stations, choose the function FREEZE OBJECT a few minutes before preparing the specimen for sectioning. Consequently, the freezing-on process is accelerated and qualitatively improved.

2-3-3 DEFROSTING the EVAPORATOR

Every 24 hours the evaporator in the upper rear part of the microtome chamber is defrosted. Push the button DEFR (fig. 2.5) and the set defrosting time is shown for approx. 2 seconds on the display (fig. 2.1). It is advisable to set the time of the defrosting process not during routine working time. To change the starting time of defrosting at intervals of 15 minutes, simultaneously press the button DEFR (fig. 2.5) and the button UP or DOWN. Defrosting can only be carried out at the set defrosting time, if the real time is set correctly. The real time can be read on the display (fig. 2.1), if the button FREEZE OBJECT (fig. 2.4) is pushed in addition to the already pressed button DEFR (fig. 2.5).

To correct the real time at intervals of one minute, additionally press the UP- or DOWN-button. After finishing the adjusting process, the display (fig. 2.1) shows the set temperature of the microtome chamber after two more seconds.

If needed, the daily defrosting can be interrupted or cancelled. Press the button INTERRUPT (Fig. 2.6), the LED lights up. If the function INTERRUPT is chosen during the defrosting period, the LED blinks for the rest of the suppressed defrosting process. A cancelled or interrupted defrosting process must be repeated later on, as otherwise the evaporator will cover completely with frost and cannot cool any more.

For this, press the button fig. 2.6 again to turn off the function INTERRUPT (LED is off). The next defrosting process will then be started when the next pre-selected defrosting time is reached. Immediate defrosting can be carried out at any time by pressing the button DEFR (fig. 2.5) together with the button RESET (fig. 4.2).

2-3-4 ILLUMINATION of COOLING CHAMBER

To illuminate the microtome chamber a fluorescent lamp is inside the chamber, which can be turned on and off by means of the button (fig. 2.7). At low temperatures and after longer periods of being turned off, the lamp might flare when turning it on. Used lamps can be changed by the user himself (see 5-3).

2-4 SPECIMEN FAST COOLING and TEMPERATURE CONTROL

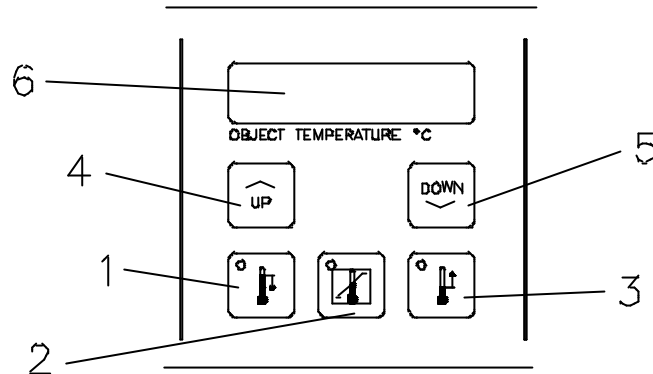


Fig. 3

The specimen fast cooling and temperature control has three functions. If none of the three possible functions were chosen, the display (fig. 3.6) remains blank. As soon as a function is turned on, the display shows the actual value of the specimen temperature. The display turns off after approx. 4 seconds, if no other function is selected after having used the function <detach specimen> (fig. 3.3).

2-4-1 FAST COOLING of a SPECIMEN

Press the button <fast cooling> (fig. 3.1). Then place the specimen together with freezing compound on the specimen stage. Put the specimen stage on one of the fast freezing stations for freezing-on. For solid fast freezing of the specimen, remove the specimen stage together with the specimen and the thickening freezing compound from the fast freezing station and clamp it in the specimen head. The specimen head, which is designed as an evaporator, reaches a temperature of -55°C when using the operating mode <fast cooling>. Fast cooling should be turned on until specimen and freezing compound are frozen evenly. If a manual change to <temperature control> is not made, the instrument changes automatically from <fast cooling> to <temperature control> after 8 minutes.

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2-4-2 TEMPERATURE CONTROL of a SPECIMEN

With the specimen temperature control, an optimal cutting temperature can be set. A specific cutting temperature is required according to fat content and consistency of the specimen (see part 4: Working with the Cryostat).

Press permanently the UP- or DOWN-button (fig. 3.4 or 3.5) to select the desired cutting temperature as set value. Briefly press the UP- or DOWN-button to show the valid set value of the temperature control for approx. 2 seconds. Afterwards, the display (fig. 3.6) shows again the actual value of the specimen temperature. To start the function <temperature control> press the button fig. 3.2.

2-4-3 DETACHING the SPECIMEN

After sectioning is finished, there are two ways to detach the specimen from the specimen stage. One way is to remove the specimen stage from the specimen head and then detach the specimen outside the microtome chamber, the other way is to use the function <detach specimen>. Press the button <detach specimen> (fig. 3.3) to warm up the specimen stage. After a short while the specimen can be removed easily.

If the temperature is higher than $+5^{\circ}\text{C}$, the function <detach specimen> is turned off

Microtome Cryostat HM 500 OM

automatically. Within 2 minutes the display is turned off, if no other function is chosen.

2-5 CUTTING MOVEMENT and SECTION COUNTER

Turn the handwheel in a clockwise direction so the cutting movement is carried out. As the specimen moves down, sections are produced. Continue turning the handwheel clockwise to bring the specimen back up.

To protect the knife and the specimen during return travel, the specimen is retracted electro-mechanically, which is indicated by the LED RETRACT (fig. 4.3) on the operating controls.

The cryostat has a section counter (fig. 4.1) to add up the sections produced. After each downward movement of the specimen holder, the number on the section counter rises by 1. The counter can be re-set to zero by means of the RESET-button (fig. 4.2) at any time.

2-6 SETTING SECTION THICKNESS and TRIMMING THICKNESS

To choose between section thickness and trimming thickness setting, press the button (fig. 4.6).

If the trimming thickness setting is chosen, the LED in button (fig. 4.6) lights up. If the LED does not light up, the section thickness can be set.

The desired section or trimming thickness can be selected via the buttons UP (fig. 4.8) or DOWN (fig. 4.9) and is shown on the display (fig. 4.7).

For the trimming thickness, also values of 100, 200 or 300 μm can be selected. The numbers are shown on the display as 1 H, 2 H or 3 H. The letter "H" stands for hundred.

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

range	graduation
from 0,5 μm to 2 μm	0,5 μm
from 2 μm to 10 μm	1 μm
from 10 μm to 20 μm	2 μm
from 20 μm to 50 μm	5 μm
from 50 μm to 90 μm	10 μm

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The graduation of the trimming thicknesses (which can be pre-selected) is divided into 3 ranges:

range	graduation
from 5 μ m to 10 μ m	5 μ m
from 10 μ m to 100 μ m	10 μ m
from 100 μ m to 300 μ m	100 μ m

If the motor drive for the cutting movement is turned on, the same process is carried out as described above. For the manual mode, the handwheel on the right side of the instrument turns during this process.

CAUTION! Keep the rotating area of the handwheel clear! Keep enough distance to the rotating handwheel handle.

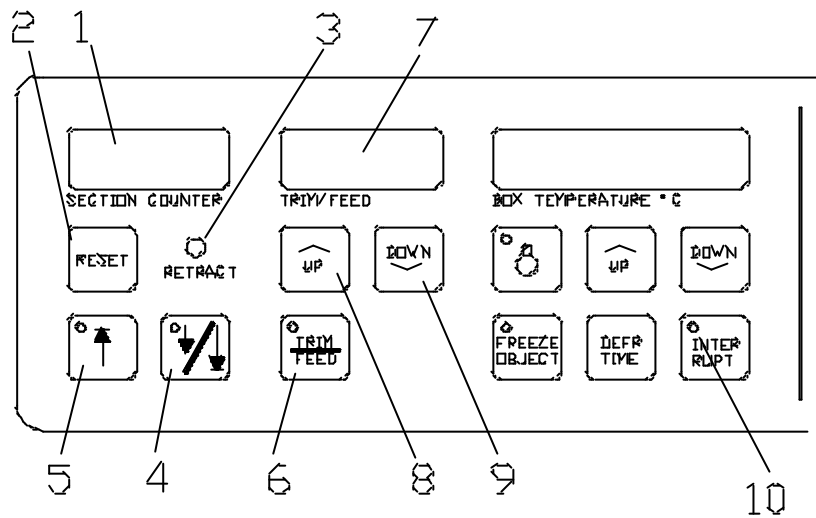


Fig. 4

2-7 SPECIMEN FEED

2-7-1 SPECIMEN COARSE FEED

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

Press the button <coarse feed backwards> (fig. 4.5) to start the return travel of the specimen holder. Pressing the button briefly leads to a short return travel only. Press the button <coarse feed backwards> (fig. 4.5) for more than approx. 2 seconds, the function is carried out continuously. The specimen holder will entirely be retracted. However, the function can be stopped at any time by briefly pressing again the button <coarse feed backwards> (fig. 4.5).

When the back end position is reached, the coarse feed turns off. The LED of the button (fig. 4.5) blinks which means that the specimen holder is at the back end position.

CAUTION! For your personal safety, before activating the coarse feed forwards, move the anti-roll plate onto the blade against possible splintering of the blade. This might be caused by an incorrect coarse feed function.

Press the button <coarse feed forwards> to start a continuous forward travel (fig. 4.4). This continuous forward travel is carried out as long as this button is being pressed. This way of trimming is normally chosen, when there is still some distance between specimen and knife edge.

To carry out a defined, short forward travel, briefly press the button (fig. 4.4). The value for this forward travel was chosen via the operating control and is shown on the display. The continuous forward travel is only carried out, when the button (fig. 4.4) is pressed for a longer time.

CAUTION! With the function <coarse feed forwards> specimen and knife edge are adjusted very quickly. To avoid damages to specimen and knife, the following points are of utmost importance!

When using the function <coarse feed forwards>

- take note that the specimen and knife edge do not come in contact with each other,

-carefully observe the narrowing gap between knife edge and specimen to stop the function <coarse feed forwards> in time before the specimen touches the knife edge.

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 is reached the motorized coarse feed turns off. The LED in button (fig. 4.4) lights up and an acoustic signal sounds. However, the last cut will be finished.

2-7-2 AUTOMATIC APPROACH 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 -30°C. Outside this temperature range, the automatic approach system is blocked (see error code E-06).

Before starting the automatic approach system, place the anti-roll plate onto the blade for your personal safety.

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.

DANGER! 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 -30°C, the automatic approach system can only be applied after the specimen will have adjusted itself to the respective chamber temperature. As a safety measure, place the anti-roll plate onto the blade, otherwise an incorrect approach will be carried out and the blade might splinter.

Use the handwheel to make sure that the most protruding position of the specimen is opposite the knife edge.

Use the buttons (fig. 4.4 and 4.10) to start the automatic approach system.

For this, first press button (fig. 4.4) and then press button (fig. 4.10) while button (fig. 4.4) is still being pressed. The red LED in button (fig. 4.4) lights up.

Then the specimen holder moves forwards until the specimen touches the knife edge.

Immediately afterwards this forward movement of the specimen holder is stopped and moved backwards by a safety distance of 200 µm. The red LED in button (fig. 4.4) goes off.

When passing the next upper reversal point, the specimen holder automatically moves forwards again by 200 µm. The specimen is now in position to start sectioning.

If necessary, the process of the automatic approach can be cancelled by pressing the button (fig. 4.5) or by using the buttons (fig. 4.4 and 4.10) again.

Passing the upper or lower reversal point by turning the handwheel, the automatic approach can also be interrupted.

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.

If the automatic approach is not carried out, an error code is shown on the display (fig. 2.1).

The error code E-05 is shown on the display in case the activating signal for the automatic approach system has already been recognized before the automatic approach system was started. This might be possible, in case a specimen has already been in contact with the knife edge, e.g. by protruding fibers. The error code E-05 is shown for approx. 4 sec. Then the box temperature is shown automatically again.

However, if there is no obvious explanation for the error code E-05, please call a service technician.

The error code E-06 is also shown on the display (fig. 2.1) in case the actual temperature is not between the range of -5°C and -30°C. The error code E-06 is shown for approx. 4 sec. on the display. Then the box temperature is shown automatically again.

NOTE! If the instrument is equipped optionally with a specimen fine orientation, the function of the automatic approach system is technically not possible and cannot be used in this configuration.

2-7-3 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>.

Press button (fig. 4.6) to select the trimming thickness setting (the LED in button, fig. 4.6 lights up). Then press the buttons UP (fig. 4.8) or DOWN (fig. 4.9) to select the desired trimming value.

The pre-selected trimming value is shown on the display (fig. 4.7).

Turn the handwheel in a clockwise direction to carry out the trimming thickness in the upper reversal point of the cutting movement.

2-7-4 FINE FEED

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

Press button (fig. 4.6) to select the section thickness setting (FEED) (LED in button, fig. 4.6 does not light up). Then press the buttons UP (fig. 4.8) or DOWN (fig. 4.9) to set the desired section value.

The pre-selected section thickness is shown on the display (fig. 4.7).

Turn the handwheel in a clockwise direction to feed the specimen at the selected section thickness.

2-8 MOTORIZED CUTTING DRIVE

Sectioning can be carried out either manually by turning the handwheel or by means of a motorized cutting drive. The controlled cutting speed can be set continuously from 0,5 up to 250 mm/s. The cutting speed refers to the cutting window; 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. To activate the functions of the cutting drive, turn on the group switch ON/OFF (fig. 5.14) first.

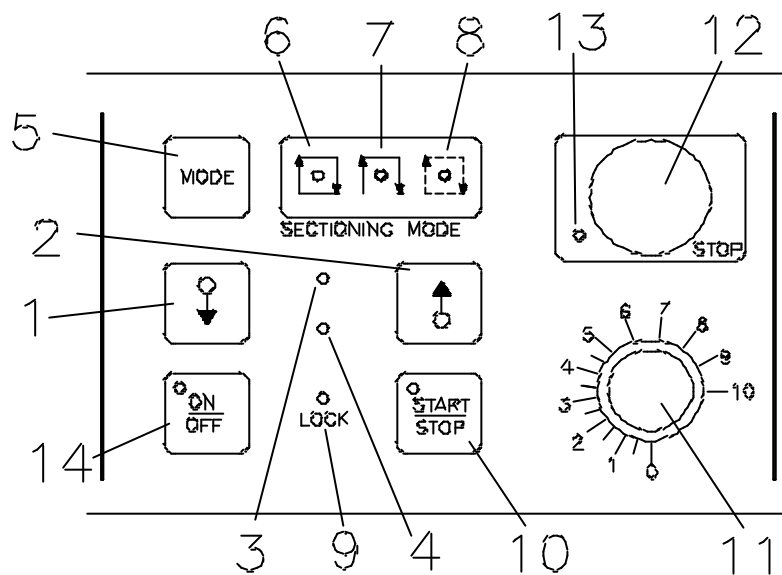


Fig. 5

2-8-1 SETTING CUTTING WINDOW

Turn the handwheel in a clockwise direction so that the lower edge of the specimen is positioned approx. 8 mm above the knife edge. Then briefly press the button <cutting window upper limit> (fig. 5.1). Continue turning the handwheel clockwise to place the upper edge of the specimen just below the knife edge. Briefly press the button <cutting window lower limit> (fig. 5.2) to finish the setting. The green LED (fig. 5.3) confirms the correct setting of the cutting window.

If the red LED (fig. 5.4) lights up, this shows that the cutting window limits have been set incorrectly. In this case, the cutting window limits have been interchanged and must be re-set again with valid upper and lower limits. The cutting window limits cannot be set during retraction (LED RETRACT, fig. 4.3 lights up).

2-8-2 SELECTION of OPERATING MODES

Press the button MODE (fig. 5.5) one or two times to select between the three different operating modes of the cutting drive:

- <Interval stroke> LED (fig. 5.8) lights up.

The cutting drive only moves as long as the button START/STOP (fig. 5.10) or the foot pedal is pressed.

- <Single stroke> LED (fig. 5.7) lights up.

Press the button START/STOP (fig. 5.10) or the foot pedal once, to move the cutting drive to the next lower reversal point.

- <Continuous stroke> LED (fig. 5.6) lights up.

Press the button START/STOP (fig. 5.10) or the foot pedal once to move the cutting drive continuously. To stop the continuous stroke, press the button START/STOP (fig. 5.10) or the foot pedal again. Then the cutting drive stops after reaching the next lower reversal point.

2-8-3 SETTING CUTTING SPEED

The desired cutting speed is set on the potentiometer (fig. 5.11) on the operating controls. The scaling from 0 up to 10 corresponds to a cutting speed of 0,5 up to 250 mm/s. To save time, the return travel speed is enhanced in relation to the cutting speed, especially for slow cutting speeds.

2-8-4 START and STOP of CUTTING DRIVE

The cutting drive can be turned on and off by means of the button START/STOP (fig. 5.10) or the foot pedal.

For this, the functions <handwheel brake> and <emergency stop> must not be activated (see 2-8-5 and 2-8-6).

The course function of the cutting drive results from the selected cutting window, the selected operating mode and the set cutting speed (see 2-8-1, 2-8-2, 2-8-3).

2-8-5 HANDWHEEL BRAKE

To block the handwheel use the function <handwheel brake>. A pin is situated on the rim of the handwheel, which can be pressed backwards. The handwheel is locked in the upper reversal point. The danger of being injured while adjusting specimen and knife is considerably reduced. In addition, the handwheel brake prevents the starting of the motorized cutting drive.

CAUTION! Lock in the handwheel brake, when working on the specimen holder and the knife carrier (LED LOCK (fig. 5.9) lights up).

2-8-6 EMERGENCY STOP

To quickly eliminate danger, the cryostat has a function <emergency stop> (fig. 5.12). Press the red button (fig. 5.12.) on the operating controls to stop immediately the motorized cutting drive. (The LED (fig. 5.13) lights up). Continue sectioning pull out the red button (fig. 5.12). The cutting drive can be started again.

CAUTION! In case danger arises from cutting drive, push the <emergency stop> (fig. 5.12).

2-9 SPECIMEN HOLDING DEVICE and SPECIMEN ORIENTATION

2-9-1 SPECIMEN HOLDING DEVICE USING THE ACTIVE DEEP FREEZING DEVICE

There are several possibilities to freeze-on specimens.

First, decide whether the specimen fast cooling and temperature control should be used or not. Various specimen stages (fig. 10) are available. Round specimen stages can be supplied with a diameter of 30 mm (fig. 8.1) and 40 mm (fig. 8.2) and square specimen stages with a size of 50, 55 and 60 mm (fig. 8.3). Special sizes upon request. Using the specimen fast cooling and temperature control, freeze-on the specimen to a specimen stage (see 2-4-1), which can be inserted into the cooling head of the specimen fast cooling and temperature control. The specimen stages can be used in combination with the fast freezing device on the left side of the microtome chamber (fig. 6.1). Put the specimen together with the freezing compound on the specimen stage at positive temperatures. Then put the specimen stage together with the specimen (fig. 6.3) into one of the four front fast freezing stations (fig. 6.2).

NOTE! The deep freezing device can only be activated if the temperature of the cooling chamber is below -10°C .

The upper side of the freezing station must not be covered by frost or ice. To avoid this, use acetone, ethanol or the like. Moreover, use the four enclosed cover caps to avoid frost or ice built-up.

2-9-2 SPECIMEN HOLDING DEVICE USING A HEAT EXTRACTOR (OPTIONAL EQUIPMENT)

Prepare and freeze the specimen as described in part 2-9-1.

To achieve faster and more even freezing of the specimen use a heat extractor. This way, the specimen is frozen at the same time from above and below, which reduces the formation of artefacts considerably.

The drop device (fig. 7.3) can be moved horizontally on a guide rail (fig. 7.1) and can be moved in a circle by means of a turning knob (fig. 7.2).

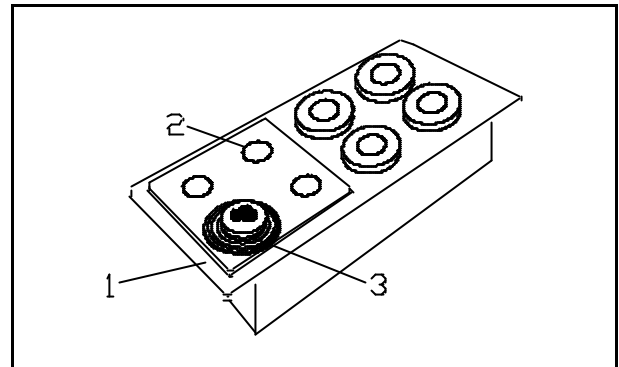


Fig. 6

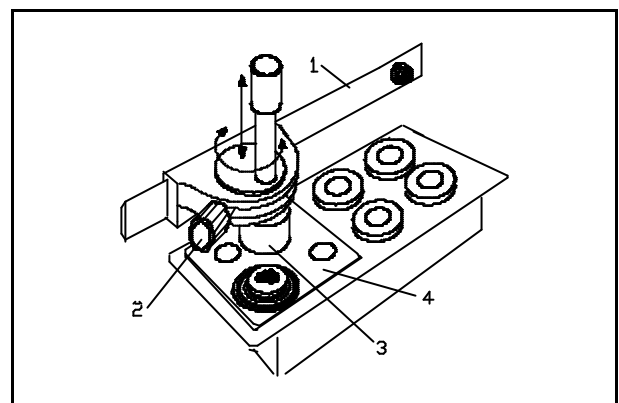


Fig. 7

To pre-cool the heat extractor, move it on the rail to the front and lower it onto the fast freezing plate (fig. 7.4) by turning the knob (fig. 7.2).

When required, position the drop device (fig. 7.3) above the specimen and turn the knob (fig. 7.2) to put the stamp slightly on the specimen.

By further turning the knob, the pressure is increased, which might lead to a deformation of the specimen.

Should the drop device (fig. 7.3) stick to the specimen, loosen it by turning the handle of the drop device to the right side.

2-9-3 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. 8.7). The specimen holder can then be turned approx. 8° in each direction by means of the orienting lever (fig. 8.6). After having adjusted the specimen as desired, fix this position by means of the clamping lever (fig. 8.7).

The orienting lever (fig. 8.6) can also be used to clamp the specimen stage into the orienting specimen holder or to clamp the cooling head (fig. 9.1) when working with the specimen fast cooling and temperature control.

Loosen the clamping screw (fig. 9.4) to insert a specimen stage into the cooling head. Then tighten the clamping screw (fig. 9.4). This way, the specimen stage is pressed against the cooling head. Please note that the front side of the cooling head is always clean.

Slightly loosen the clamping screw (fig. 9.4) so the specimen stage can universally be adjusted on the Z-axis.

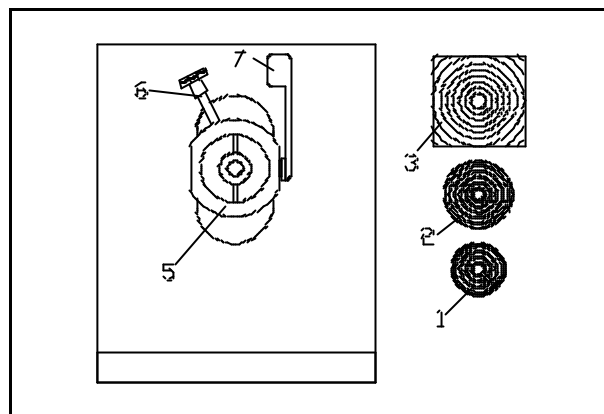


Fig. 8

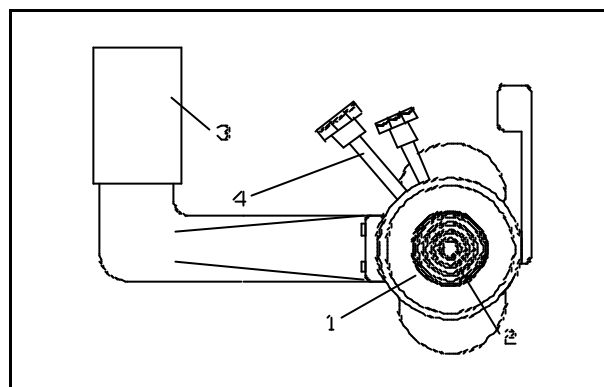


Fig. 9

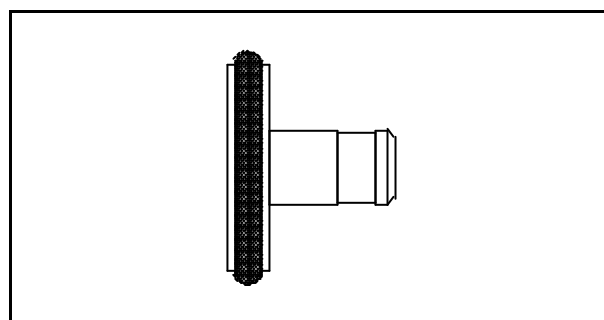


Fig. 10

2-10 KNIFE CARRIERS for CRYOSTAT

2-10-1 STANDARD KNIFE CARRIER with ANTI-ROLL GUIDE

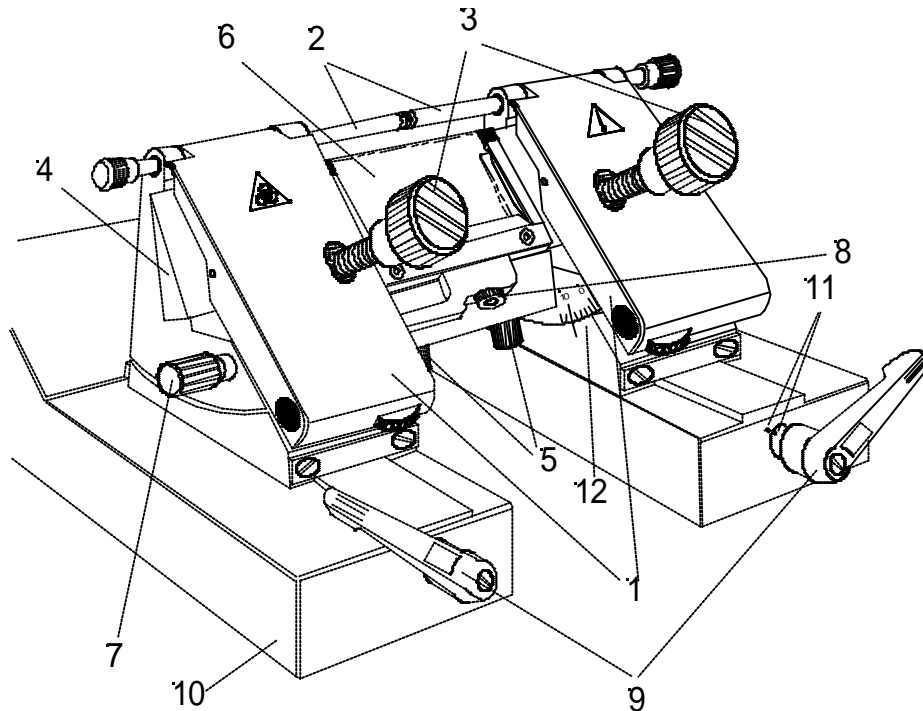


Fig. 11

The standard knife carrier of the cryostat microtome is easy to use. Loosen the clamping screws (fig. 11.3) and flip up the clamping plates (fig. 11.1) to insert the knife. First, slightly move the clamping plates (fig. 11.1) upwards, lift them off and turn them upwards. Fig. 12 shows the standard knife carrier with a clamping plate in upward position.

CAUTION! The knife carrier is equipped with two knife guards (fig. 11.2) which can be moved sideways. These knife guards should be pushed together to the middle while knife or specimen are adjusted. This reduces the danger of injury considerably!

The anti-roll plate (fig. 11.6) is lifted forwards in clockwise direction by means of the turning knob (fig. 11.7).

Now the knife (fig. 11.4) can easily be inserted from the front.

Then, turn the clamping plates (fig. 12.1) downwards. To fasten them, slightly move them downwards.

To put the anti-roll plate (fig. 12.6) against the knife (fig. 12.4) turn the knob (fig. 12.7) in a counter-clockwise direction.

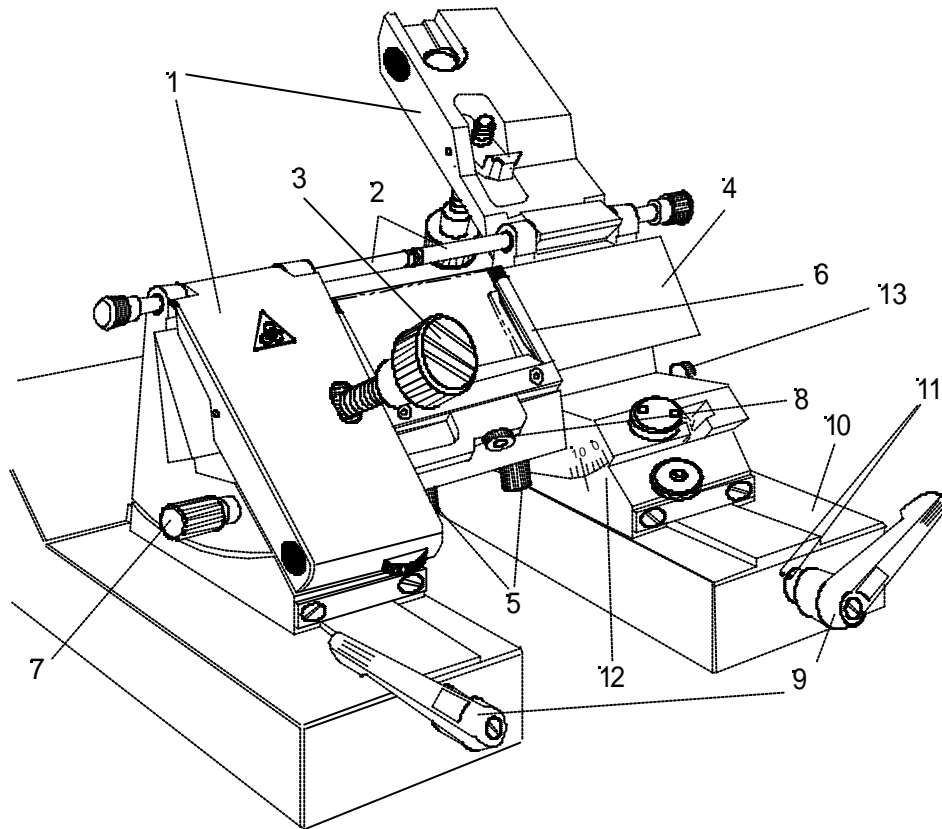


Fig. 12

To adjust the knife edge in relation to the anti-roll guide, use the height adjustment screws (fig. 12.5). Especially note the parallel alignment of knife edge and anti-roll guide edge. The knife edge should correspond to the red marks on the knife carrier. To fix the knife in its position, tighten the clamping screws (fig. 12.3) simultaneously.

The knurled screw (fig. 12.8) on the anti-roll guide allows the fine adjustment of the anti-roll guide in relation to the knife edge.

With the two flat levers (fig. 12.9) the clearance angle can be adjusted and, at the same time, the knife carrier is fixed on the base (fig. 12.10). To move the knife carrier on the guide rails, turn the two flat levers (fig. 12.9) inwards.

Afterwards, move the flat levers outwards to their clamping position.

To change the clearance angle adjustment loosen the clamping screw (fig. 12.13) on the right side of the knife carrier in addition to the already loosened flat levers (fig. 12.9). Tighten clamping screw and flat levers after having re-adjusted the clearance angle.

By experience, usable cuts are only achieved at a clearance angle of 10° or more. The adjusted clearance angle is shown on the scale (fig. 12.12). The dots (fig. 12.11) on the base (fig. 12.10) and on the flat levers (fig. 12.9) show the clamping position. The position of the grips of the flat levers can be adjusted in 30°-steps, by pulling them slightly out and then turning them into a favourable position.

2-10-2 MAGNETIC DISPOSABLE BLADE CARRIER with ANTI-ROLL GUIDE

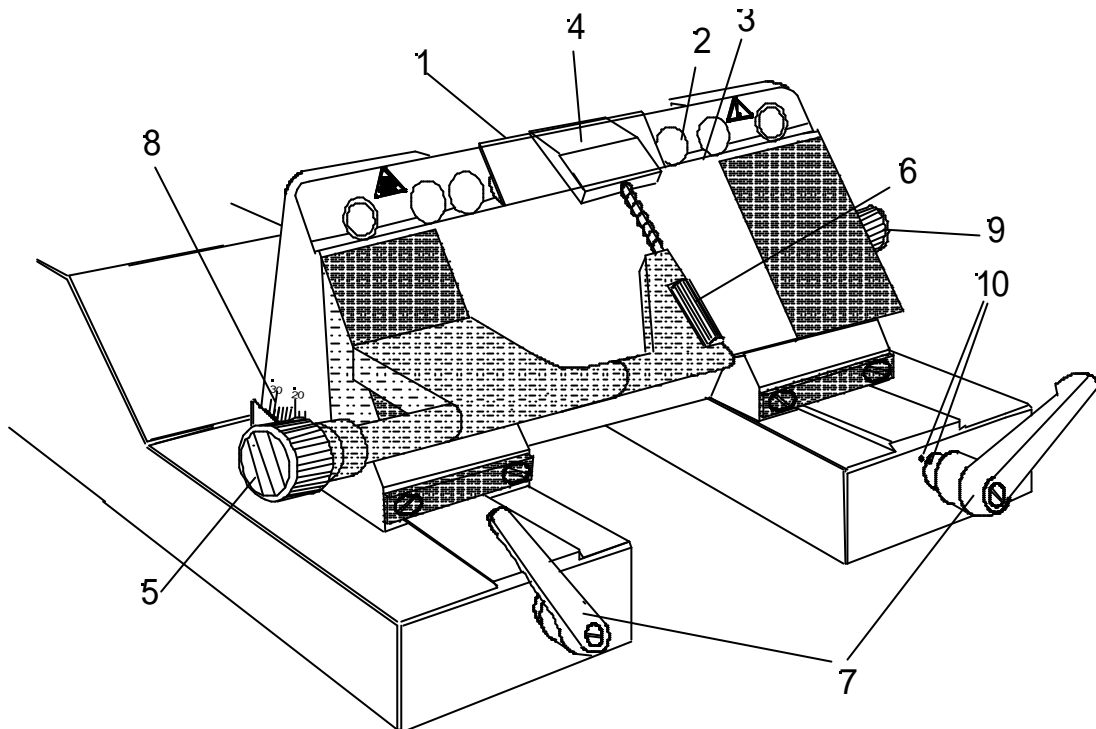


Fig. 13

With the magnetic disposable blade carrier, MICROM blades of 70 x 19 mm and a facet angle of approx. 33° can be clamped.

Insert the blade (fig. 13.1) onto the blade slider (fig. 14.1) and put it on the magnetic surface (fig. 13.2) of the knife carrier from the side. To move the blade sideways, press the blade slider downwards so that the blade is properly put against the ledge (fig. 13.3) of the blade carrier. Then take off the blade slider.

To move the blade to a new position, put on the blade slider (fig. 14.1) onto the blade and shift it. The blade slider must always be put on in a way that the inscription MICROM can be read, which guarantees that the slanted edge (fig. 14.2) of the blade slider shows to the backside of the blade.

Turning the grip (fig. 13.5), the anti-roll plate (fig. 13.4) can be turned forwards and backwards. The knurled screw (fig. 13.6) allows the adjustment of the edge of the anti-roll plate in relation to the blade edge.

With the two flat levers (fig. 13.7) the clearance angle can be adjusted and, at the same time, the knife carrier is fixed on the base. To move the knife carrier on the guide rails, turn the two flat levers (fig. 13.7) inwards. Afterwards, move the flat levers outwards to their clamping position.

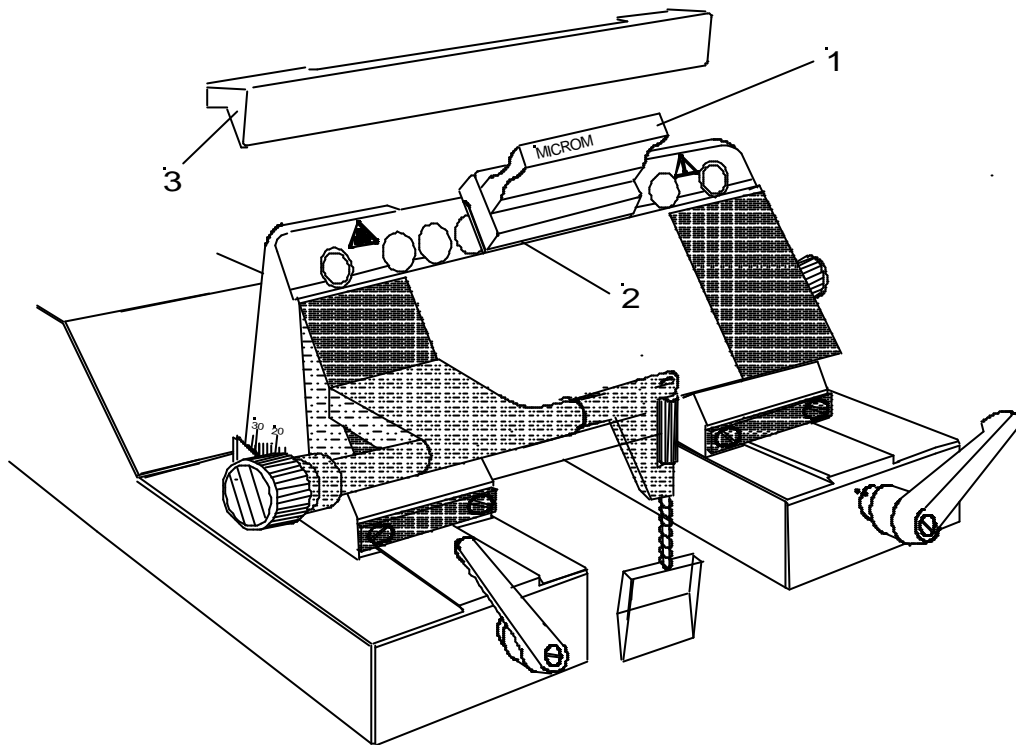


Fig. 14

To change the clearance angle adjustment loosen the clamping screw (fig. 13.9) on the right side of the knife carrier in addition to the already loosened flat levers (fig. 13.7). Tighten clamping screw and flat levers after having re-adjusted the clearance angle.

By experience, usable cuts are only achieved at a clearance angle between 24° and 30° . The adjusted clearance angle is shown on the scale (fig. 13.8).

The dots (fig. 13.10) on the base and on the flat levers show the clamping position. The position of the grips of the flat levers can be adjusted in 30° -steps, by pulling them slightly out and then turning them into a favourable position.

CAUTION! During breaks or while working on the specimen or the specimen holder, the knife guard should be used (fig. 14.3).

2-10-3 DISPOSABLE BLADE CARRIER EC with ANTI-ROLL GUIDE

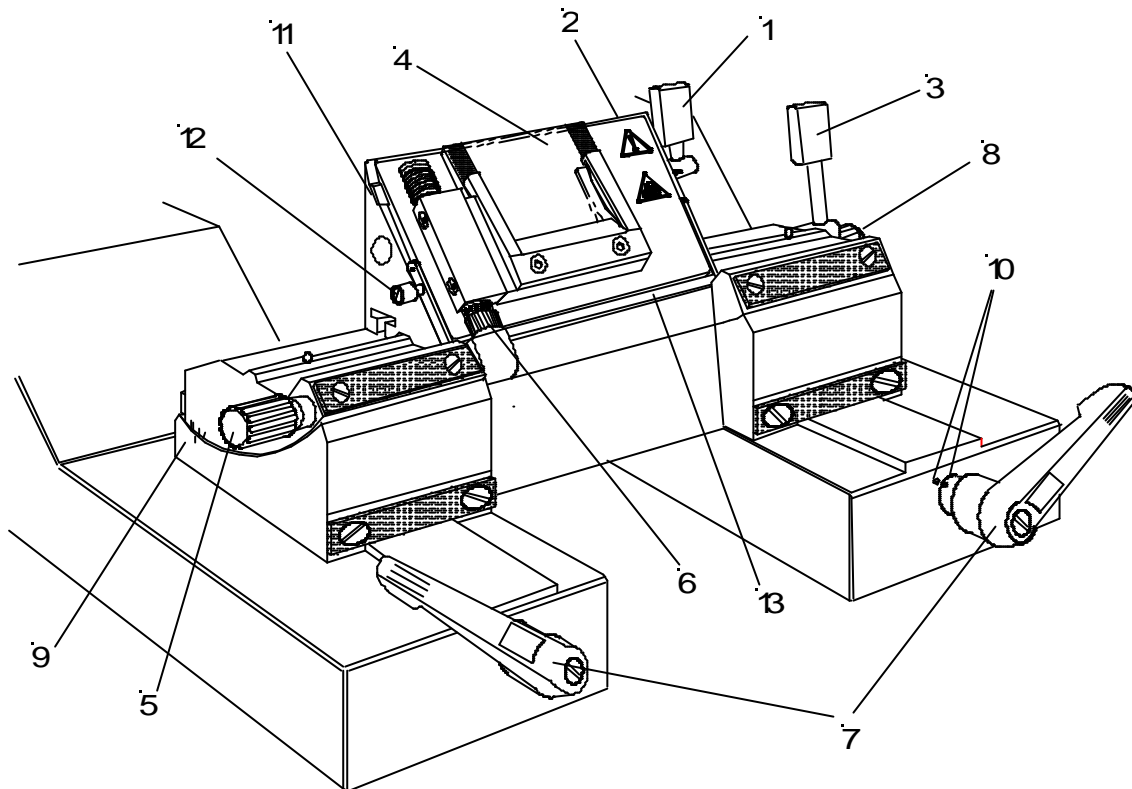


Fig. 15

With the disposable blade carrier EC, all commercially available low profile blades of 80 x 8 mm and a facet angle of approx. 35° as well as high profile blades can be clamped.

Insert the blade into the slot behind the clamping plate (fig. 15.2). When using high profile blades, first loosen the lever (fig. 15.1) and remove the spacer strip (fig. 15.11). The clamping plate can be opened and tightened by means of the small lever (fig. 15.1). For the full use of the blade, the entire clamping plate can be moved sideways by loosening the right lever (fig. 15.3)

Turning the grip (fig. 15.5), the anti-roll plate (fig. 15.4) can be turned forwards and backwards. The knurled screw (fig. 15.6) allows the adjustment of the edge of the anti-roll plate in relation to the blade edge.

With the two flat levers (fig. 15.7) the clearance angle can be adjusted and, at the same time, the knife carrier is fixed on the base. To move the knife carrier on the guide rails, turn the two flat levers (fig. 15.7) inwards. Afterwards, move the flat levers outwards to their clamping position.

To change the clearance angle adjustment loosen the clamping screw (fig. 15.8) on the right side of the knife carrier in addition to the already loosened flat levers (fig. 15.7). Tighten clamping screw and flat levers after having re-adjusted the clearance angle.

By experience, usable cuts are only achieved at a clearance angle of 10° or more. The adjusted clearance angle is shown on the scale (fig. 15.9).

Microtome Cryostat HM 500 OM

The dots (fig. 15.10) on the base and on the flat levers show the clamping position. The position of the grips of the flat levers can be adjusted in 30°-steps, by pulling them slightly out and then turning them into a favourable position.

CAUTION! During breaks or while working on the specimen or the specimen holder, the knife guard should be used (fig. 15.13).

2-11 ACCESSORIES

2-11-1 Standard equipment

The microtome cryostat HM 500 OM is equipped with the following accessories:

	Art. No.
2 specimen stages, 30 mm, round, standard	715110
1 specimen stage, 40 mm, round standard	715120
6 cover caps for freezing stations	402490
1 Allan key, 3 mm	362230
1 Allan key, 5 mm	362260
1 Allan key, 6 mm	362120
1 brush, 12 mm wide	334160
1 cryostat oil no. 407, 100 ml	350040
1 freezing compound, 100 ml	350100
1 handwheel handle	424100
2 spacers	570110
1 foot pedal	640150
1 covering angle with section waste tray and brush shelf	502060
1 centering grip to align the orienting specimen holding device	424210
1 screwdriver	362270
1 instruction manual	386040

Microtome Cryostat HM 500 OM

2-11-2 Additional equipment (optional)

Art. No.

Heat extractor 524500

CO₂-freezing device 765040

Specimen stages:

For cryostat HM 500 and HM 500 M:

ø 30 mm 715110
ø 40 mm 715120
50 x 50 mm 715170
55 x 55 mm 715180
60 x 55 mm 715190

Knife carriers:

Standard knife carrier 705300
Anti-roll guide, complete 565330
Anti-roll plate:
60 mm (standard) 532520
75 mm 532690

Magnetic disposable blade carrier 705230
Anti-roll guide, complete 532740
Anti-roll plate:
35 mm, plate with axis (standard) 532540
50 mm, plate with axis 532550

Disposable blade carrier EC 705450
Anti-roll guide, complete 565790
Anti-roll plate, 38 mm 532770

Specimen clamps for sectioning paraffin:

Standard specimen clamp 546130

Universal cassette clamp 546060

Adapter for standard specimen clamp and
universal cassette clamp 532040

Specimen fine orientation

MICROM International GmbH
Robert-Bosch-Str. 49

D- 69190 Walldorf

Microtome Cryostat HM 500 OM

(not in connection with the automatic approach system)

546140

PART 3 THEORY OF OPERATION OF THE CRYOSTAT

3-1 COOLING OF CHAMBER AND DEFROSTING

The chamber of the cryostat is cooled by a refrigeration machine. In the rear upper area of the microtome chamber is the evaporator which the cold coolant flows through. Due to the heat extraction from the microtome chamber a cooling down to -40°C can be achieved.

On the left side of the microtome chamber there are eight freezing stations to quickly freeze-on specimens onto specimen stages. The front four stations can be cooled down to -55°C by means of a Peltier cooling element. The temperature of the rear four stations are adjusted to the prevailing chamber temperature. Use the heat extractor to accelerate the freezing of the specimen.

The temperature of the microtome chamber can be adjusted continuously down to -40°C . For this, pre-select the desired temperature as set value on the corresponding operating controls.

The actual value of the microtome is constantly measured and sent to the control unit which causes the refrigeration to switch on and off.

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 process, let hot coolant gas flow through a bypass into the evaporator. Set the time of the daily defrosting on the operating controls. The period of the defrosting takes approx. 15 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.

To avoid condensation the sliding window is heated when closed.

3-2 SPECIMEN FAST COOLING 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 -55°C on a specimen stage with the freezing compound. However, freezing-on can also be carried out in one of the front four fast freezing stations with Peltier cooling element (see 2-3-2). 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. After having cut, the specimen can be detached quickly from the specimen stage by the function <detach specimen>. Another possibility to detach the specimen is to remove the specimen stage from the cooling head and warm it up outside the chamber.

The specimen fast cooling and temperature control works with a separate refrigeration unit and an electronic control unit. The coolant flows through the cooling head, which is designed as an evaporator and cools it.

Optimum cooling capacity is given while freezing the specimen onto the specimen stage.

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

To detach the specimen from the specimen stage, let hot coolant gas flow to the specimen stage to achieve quickly temperatures of more than 0°C . The specimen can then be taken off easily.

3-3 MICROTOME WITH RETRACTION

The microtome of this cryostat is a rustproof rotary microtome. The cutting movement is carried out either manually by turning the handwheel or by means of the motorized cutting drive. The rotary movement results in the vertical movement of the cylinder head which carries the specimen holder with the specimen. The specimen is moved up- and downwards close to the knife edge. The knife is clamped securely into the knife carrier.

The section thickness is delivered at the upper reversal point of the vertical movement. The specimen holder together with the specimen moves to the front by the size of the section thickness, which can be selected on the operating controls.

With the downward movement of the specimen, sectioning is carried out. During the return travel, the specimen is drawn back automatically to protect knife and specimen, which means that the knife can be used longer and that the specimen is protected against artefacts.

The number of sections made is indicated on the section counter. After each downward movement of the specimen holder, the number on the section counter increases by 1. The section counter can be re-set to zero at any time.

3-4 SPECIMEN COARSE FEED AND TRIMMING STAGES

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

To move the specimen holder electronically forwards or backwards, use the corresponding buttons on the operating controls.

After the specimen and knife are adjusted, further gradual feed for trimming can be carried out by using the function <trimming>. During each rotation of the handwheel, the selected feed is carried out.

3-5 **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 handwheel 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 0.5 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. Continue sectioning pull out the emergency stop button; the cutting drive can be started again.

The specimen holder can be locked by means of the handwheel brake in the upper position. The handwheel brake should be locked for your personal safety when changing specimens, moving the knife or knife carrier. The cutting drive cannot be inadvertently started, if the handwheel brake is locked.

3-6 **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 -30°C.

Up to now, this procedure has been carried out manually and has been quite time-consuming.

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.

PART 4 WORKING WITH THE CRYOSTAT

4-1 PREPARING THE COOLING CHAMBER

Before sectioning, the microtome chamber should be at a stable temperature around the desired cutting temperature. The specimen fast cooling and temperature control determines only the temperature of the specimen holder and the specimen. The temperature of the knife is determined by the cooling of the microtome chamber.

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 favourable work conditions with a lower frost built-up on the microtome and knife are achieved.

4-2 FREEZING-ON THE SPECIMEN

The specimen is frozen-on to the specimen stage with clinging grooves with a freezing compound.

To freeze-on specimens, use the fast freezing device on the left side of the chamber or the specimen fast cooling and temperature control. The four front fast freezing stations with Peltier system are used for the fast freezing of specimens and the rear four are used for storing them.

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 on the stage and surround it with some freezing compound.

Then insert the specimen stage into one of the four fast freezing stations, which must have been cooled down to -55°C by using the function FREEZE OBJECT. The specimen and freezing compound are quickly frozen evenly.

If the instrument is equipped with a heat extractor (additional equipment) the specimen can be frozen faster and more evenly. Put the 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 artefacts considerably (see 2-9-2).

When working with the specimen fast cooling and temperature control put some freezing compound onto the specimen stage, which should be outside the chamber at a low positive temperature. Put the specimen onto the stage and surround it with some freezing compound. Insert the specimen stage together with the specimen into one of the four front fast freezing stations and freeze it on. It is possible to leave the specimen there until it is frozen evenly (function FREEZE OBJECT must be turned on). However, the specimen can be removed immediately after the freezing-on. Then insert it into the cooling head of the specimen fast cooling and temperature control to have it frozen evenly (function <fast cooling> must be turned on). Then switch over to <temperature control> (see 2-4-2) with the desired cutting temperature.

4-3 TEMPERATURE LIST FOR CRYO-SECTIONING

The optimal cutting temperature of a specimen depends on the respective characteristics of the tissue especially on the fat content. The following table won by experience recommends cutting temperatures for some typical applications:

Range A -10 to -20°C

Liver
Kidney
Spleen
Thyroid
Lymph Node
Uterine Curettings
Tongue
Testicle

Range B -20 to -30°C

Muscle
Breast without fat
Brain
Bone Marrow
Lungs
Intestine
Prostata
Cervix
Uterus
Pancreas
Adrenal
Skin without fat

Range C -30 to -60°C

additional cooling with
liquid nitrogen or dry ice
might be necessary

Adipose
Omentum
Breast with fat
Skin with fat
Cheese
Butter
Industrial Waxes
Soft Rubber

In range C additional cooling with liquid nitrogen or dry-ice might be necessary.

4-4 ORIENTATION AND TRIMMING OF SPECIMEN

Clamp the specimen stage together with the frozen specimen into the specimen holder. Tighten the orienting lever (fig. 8.6) in a clockwise direction. Loosen the clamping lever (fig. 8.7) to have the possibility to adjust the specimen parallel in relation to the cutting edge by means of the orienting lever (fig. 8.6). Then press the clamping lever (fig. 8.7) backwards. With the motorized coarse feed (see 2-7-1) specimen and knife edge 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 (see 2-7-2, automatic approach system).

Then carry out a further gradual feed by pressing the function <trimming>. Turn the handwheel in a clockwise direction or use the motorized cutting drive (see 2-8) 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.

4-5 SECTIONING AND TAKING OFF SECTIONS

For sectioning, pre-select the desired section thickness on the operating controls (see 2-6 setting section thickness and trimming thickness). Put the anti-roll plate against the knife by means of the knob (fig. 11.7). Turn the handwheel in a clockwise direction or use the motorized cutting drive (see 2-8) 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 (fig. 11.7). The section sticks to the knife surface. Transfer the specimen now onto a slide by using a brush or tweezers.

be used only.

4-6 HOW TO AVOID MALFUNCTIONS

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

- Condition of 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 backside 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 correct cutting temperature according to the specimen (see 4-2).
- Select the appropriate freezing compound.

CAUTION! 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 adjustment of 5-15° according to the facet angle of a steel knife, and an angle of 24-30° for magnetic disposable blades.
- Select a proper cutting speed: The harder the material, the slower the cutting speed!
- Take care in bringing knife and specimen together.
- The most protruding point of the specimen must be recognized for optimal operation of the automatic approach system.
- The specimen must not be covered at all or too thick by freezing compound.
- Moreover, the specimen stage as well as the knife edge and the microtome base must have a certain conductivity.
For this reason, the original equipment such as knife carrier and specimen stages should

WORKING WITH THE CRYOSTAT

- The cylinder head 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 -55°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.

NOTE! 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.

MAINTENANCE OF THE CRYOSTAT

PART 5 MAINTENANCE OF THE CRYOSTAT

5-1 SHUTTING-OFF FOR CLEANING

Cleaning of the cryostat depends on how frequently the instrument is used. The more it is used, the more it needs to be cleaned. However, it is recommended to shut the instrument off every 6 - 8 weeks.

This should be done as follows:

- Turn off the main switch; pull the mains plug off.
- Remove or suck off cold section waste.
- Remove the knife from the carrier and put it into a knife case, remove section waste tray, specimen stages and working tools. Loosen and pull out the two clamping levers (fig. 11.9) on the knife carrier and remove the knife carrier upwards. Lift the two side accessory shelves in the front, pull them out of the rear pegs and also remove them.
- Suck off again cold section waste.
- The warming up of the microtome chamber can actively be accelerated by using a hair dryer.
- Disconnect the warm microtome as follows:

CAUTION! Turn the handwheel into the lower position, i.e. the specimen holder is also in the lower reversal point.

Turn out the socket head screw (fig. 16.1) in the middle of the front part of the microtome base plate with the hex head wrench no. 5; then slightly lift the base plate (fig. 16.2) in the front and move it approx. 2 cm to the left side until the clutch on the right side of the microtome is free. Then pull the microtome to the front to loosen it from the rear clamp (fig. 16.4). Turn the microtome to the right side so that the frontside of the microtome faces the right lateral wall of the chamber; now the coded connector (16-lead) on the backside of the microtome can be unplugged. The connector (4-lead) for the automatic approach system must be disconnected as well

Carefully take the microtome out and remove all loose waste immediately by using a brush

- Carefully clean and wash the interior. Open the stopper on the bottom of the microtome chamber. The waste detergent can be collected again at the end of the outlet tube. Insert the stopper after cleaning as otherwise cold air leaks out and the instrument will cover with frost.
- After having finished cleaning and maintaining (see 5-2) install the microtome in reverse order.

CAUTION! The handwheel must be in the lower position when the microtome is introduced into the clutch.

- Insert accessory shelves, accessories and knife carrier into the instrument.
- Connect the mains plug to the power outlet. Turn on the mains switch.
- Close the sliding window.

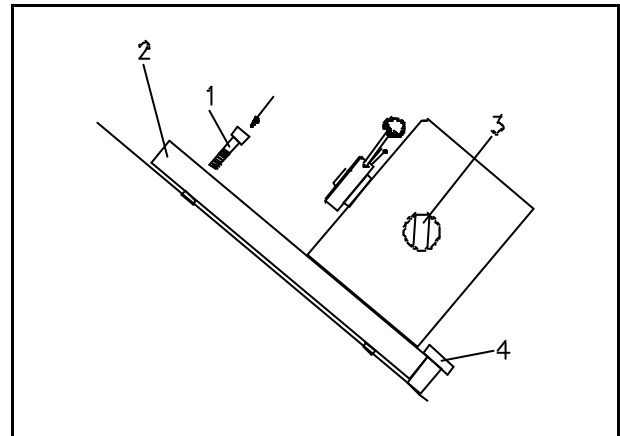


Fig. 16

NOTE! To maintain the cooling power of the instrument, clean the fins of the condenser at least once a year, if necessary more often.

5-2 CLEANING AND CARE OF THE MICROTOME

Carefully clean and dry the disconnected microtome. As there is condensed humidity inside the microtome dry it very carefully. A drying closet at temperatures up to 60°C can be used. Another possibility is to dry it by means of a hair dryer.

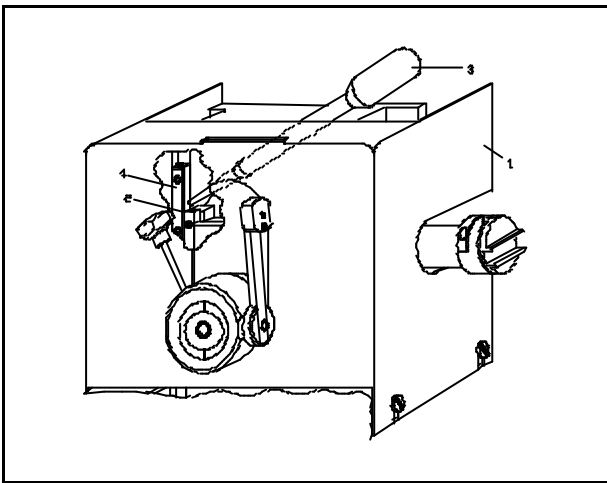


Fig. 17

By means of a pipette (fig. 17.3) the cross roller bearings (fig. 17.4) can be reached from an angle from behind below the housing (fig. 17.1).

Fill the pipette with a small amount of cryostat oil (cat. no. 350040). Put one or two drops into the space (fig. 17.2) of the cross roller bearings. The monobloc should be in the lower position.

Also slightly lubricate the horizontal cylinder guide behind the specimen holder.

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

When turning on the instrument and the display (fig. 2.1) shows the word HELP, the battery for storing values is used up. In this case the battery should be changed also by trained a service technician.

5-3 CHANGING THE FLUORESCENT LAMP

The fluorescent lamp of the cryostat is situated on the upper wall inside the chamber just behind the sliding window.

First turn off the instrument and pull out the mains plug. Open the sliding window and remove the cover from the lamp by loosening the two black knurled nuts. Be sure that you keep the cover in one hand while opening the nuts. Take off the cover. Carefully, pull the lamp to the right side out of the socket. Then pull the lamp downwards out of the clip and take the lamp out of the instrument.

Insert a new lamp in reverse order. Install the cover again by means of the knurled nuts.

NOTE! Only use the lamp type, which was installed in the factory.

**VACUTOME FOR CRYOSTAT
HM 500 OM
STRETCHING AND
SUCTION DEVICE**

INSTRUCTION MANUAL

Vacutome for Cryostat HM 500 Series

MICROM International GmbH
Robert-Bosch-Str. 49

D- 69190 Walldorf

Certification

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.

Errors and omissions excepted. Subject to amendment.

WARRANTY

This MICROM product is warranted against defects in material or 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 MICROM International GmbH. No other warranty is expressed or implied. Unauthorized modification or repair by third party persons will void the warranty.

Validity

This instruction manual will be supplied together with each instrument. Further copies can be ordered at the nearest MICROM sales office by giving the serial number of the cryostat, the number of this instruction manual and the date of issue.

This instruction manual is available in the following languages:

	Cat. No.
German:	387 070
English:	387 080
French:	387 390

Vacutome for Cryostat HM 500 Series

MICROM International GmbH
Robert-Bosch-Str. 49

D- 69190 Walldorf

INTENDED USE

Dear customer,

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

Only skilled or specially trained personnel must work with this instrument. Please observe the listed and marked safety messages as well as the regulations of your respective lab.

Instruction Manual No. 387080

Issued on 21.11.2000

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Microtome Cryostat HM 500 OM

MICROM International GmbH
Robert-Bosch-Str. 49

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SAFETY PRECAUTIONS

CAUTION!!

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. MICROM International GmbH 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 belonging to this Vacutome must be connected with the safety ground. The instrument is equipped with a three wire ground plug. The power outlet must be connected to the safety ground 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.

CARE IN USING MICROTOME BLADE



If possible, the specimen should be clamped in before the blade is inserted into the blade carrier. Before changing the blade carrier, always remove the blade! Never try to catch a dropping blade! Be careful when sectioning and/or removing sections.

HAZARD OF FROSTBITE

Avoid permanent touching of metal parts inside the cryostat microtome chamber. Frostbite at unprotected hands and arms may occur at working temperatures down to -40°C.

HAZARD OF RADIOACTIVE RADIATION

When working with radioactive specimens observe all applicable radiation safety procedures.

HAZARD OF INFECTION

Use appropriate safety and disinfection measures when working with infectious specimens.

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.

HAZARD OF BIOLOGICAL DANGER



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.

PART 1 INTRODUCTION

1-1 DESCRIPTION OF THE VACUTOME

The unit consists either of a special magnetic disposable blade carrier MV or of a disposable blade carrier EV both of which are equipped with a vacuum anti-roll hood for the stretching and/or suction process.

Furthermore, the system is equipped with a filter including a reusable insert as well as five disposable filter bags.

In addition, the Vacutome comprises a vacuum generating aggregate with its control elements.

Stretching or disposing of is controlled by the cutting window. The power of the required suction flow can be set via an operating knob.

1-2 TECHNICAL SPECIFICATIONS

Max. specimen size:	28 mm
Max. section thickness to be disposed of:	80 μ m
Max. section thickness to be stretched:	80 μ m
Min. section thickness to be stretched:	1 μ m
Cryostat blades for magnetic disposable blade carrier MV:	60 x 19 mm
Low profile blades for disposable blade carrier EV:	80 x 8 mm
High profile blades for disposable blade carrier EV:	76 x 14 mm
Clearance angle adjustment for magnetic disposable blade carrier MV:	27° - 32°
Clearance angle adjustment for disposable blade carrier EV:	10° - 12°
Operating temperature range of the cooling chamber:	from -5°C up to -40°C
Volume of disposable filter:	0,27 l
Volume of reusable filter:	0,27 l
Power requirements:	supply via cryostat according to the respective power supply version
Operating temperature range:	+5°C to +40°C (at max. 60% rel. humidity of the air) altitude up to 2000 m M.S.L.

PART 2 OPERATING INSTRUCTIONS

2-1 INITIAL TURN-ON

CAUTION! Before turning on the cryostat for the first time, please check if the power requirements indicated on the type plate correspond to the power supply voltage being used.

After having inserted one filter type, connect the connecting branch of the filter housing with the connecting bow (fig. 7.5) leading to the blade carrier.

Further information on the initial turn-on of a cryostat can be obtained from the enclosed instruction manual Microtome-Cryostat HM 500 OM.

To start working with the Vacutome, first mount the blade carrier onto the consoles and clamp it by means of the two clamping levers (fig. 2.7).

Cool the cryostat chamber down to the desired temperature.

Wait approx. 1,5 h, before starting cutting. During this time, the blade carrier adjusts itself to the cooling chamber temperature.

Meanwhile, place either the reusable filter (fig. 7.6) or a disposable filter bag (fig. 7.3) into the housing of the filter.

For this, unscrew the screw-type cap (fig. 7.4) from the filter housing (fig. 7.2) and mount the desired filter insert into the screw-type cap (fig. 7.4).

2-2 SETTING THE VACUUM FOR STRETCHING SECTIONS AND DISPOSING OF SECTION WASTE

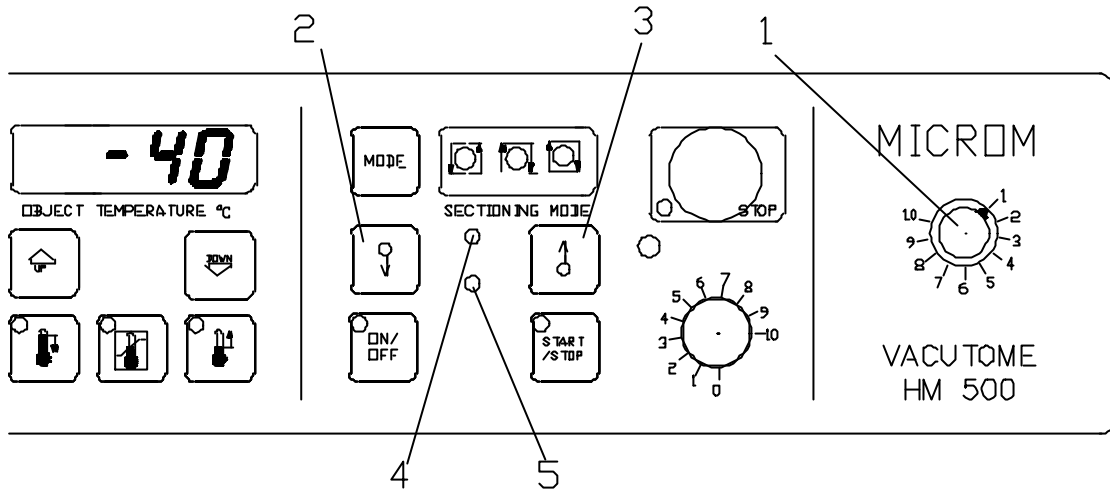


Fig. 1

The suction power of the required vacuum can be selected from 1 - 10 on the operating knob (fig. 1.1). The user sets the desired value depending on the desired function (stretching or suction process), section thickness and size of the specimen.

cryostat clockwise to place the upper edge of the specimen just below the knife edge.

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.

The cutting window as well as the suction window is set as follows:

Turn the handwheel in a clockwise direction so that the lower edge of the specimen is positioned approx. 8 mm above the knife edge. Then briefly press the button <cutting window upper limit> (fig. 1.2) on the cryostat panel. Continue turning the handwheel of the

Briefly press the button <cutting window lower limit> (fig. 1.3) on the cryostat panel to finish the setting.

The green LED (fig. 1.4) on the cryostat panel confirms the correct setting of the cutting and/or suction window.

Vacutome for Cryostat HM 500 Series

If the red LED (fig. 1.5) lights up, this shows that the cutting window limits have been set incorrectly. In this case, the cutting/suction window limits have been interchanged and must be re-set again with valid upper and lower limits. The cutting/suction window limits cannot be set during retraction (LED RETRACT on cryostat panel lights up).

2-3 BLADE CARRIERS

2-3-1 MAGNETIC DISPOSABLE BLADE CARRIER MV

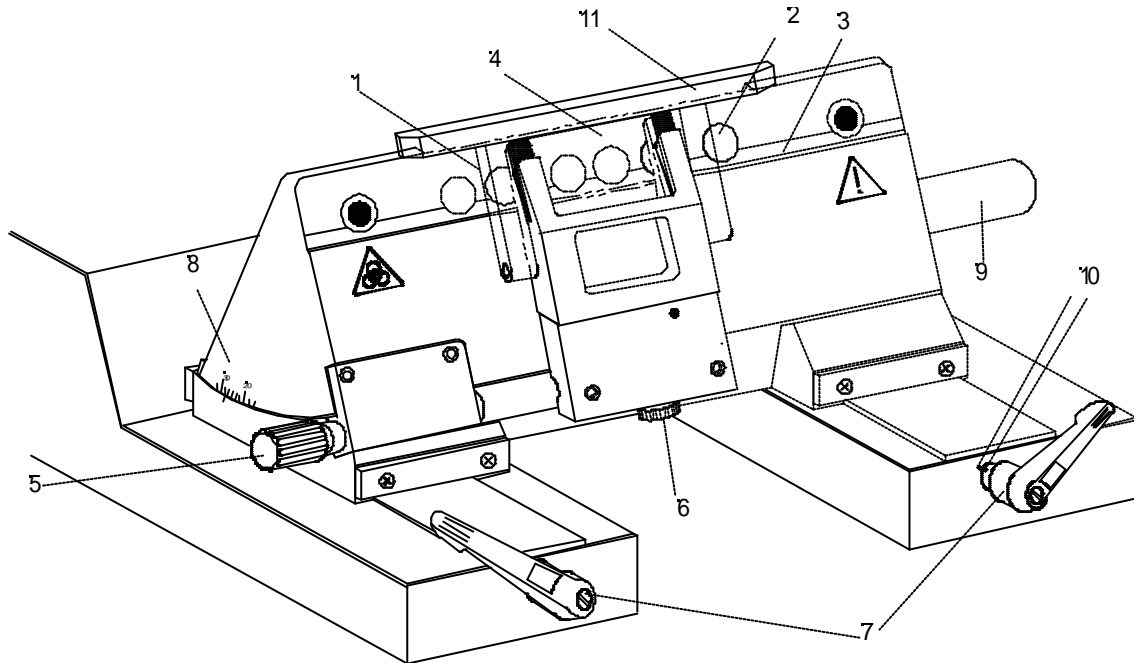


Fig. 2

With the magnetic disposable blade carrier MV, MICROM blades of 60 x 19 mm and a facet angle of approx. 33° can be clamped.

Insert the blade (fig. 2.1) onto the blade slider (fig. 3.2) and put it on the magnetic surface (fig. 2.2) of the blade carrier from the side. To move the blade sideways, press the blade slider downwards so that the blade is properly put against the ledge (fig. 2.3) of the blade carrier. Then take off the blade slider.

To move the blade to a new position, put on the blade slider (fig. 3.2) onto the blade and shift it. The blade slider must always be put on in a way that the inscription MICROM can be read, which guarantees that the slanted edge (fig. 3.5) of the blade slider shows to the backside of the blade.

Turning the grip (fig. 2.5) to move the vacuum anti-roll hood (fig. 2.4) forwards and backwards.

The knurled screw (fig. 2.6) allows the adjustment of the edge of the vacuum anti-roll hood in relation to the blade edge.

A closed vacuum anti-roll hood (fig. 2.4) and a suitable vacuum (see part 2-2) generate stretching or suction effects. For this, the closed vacuum anti-roll hood (fig. 2.4) slightly tilts the underneath flap thus opening a suction slot (fig. 3.9).

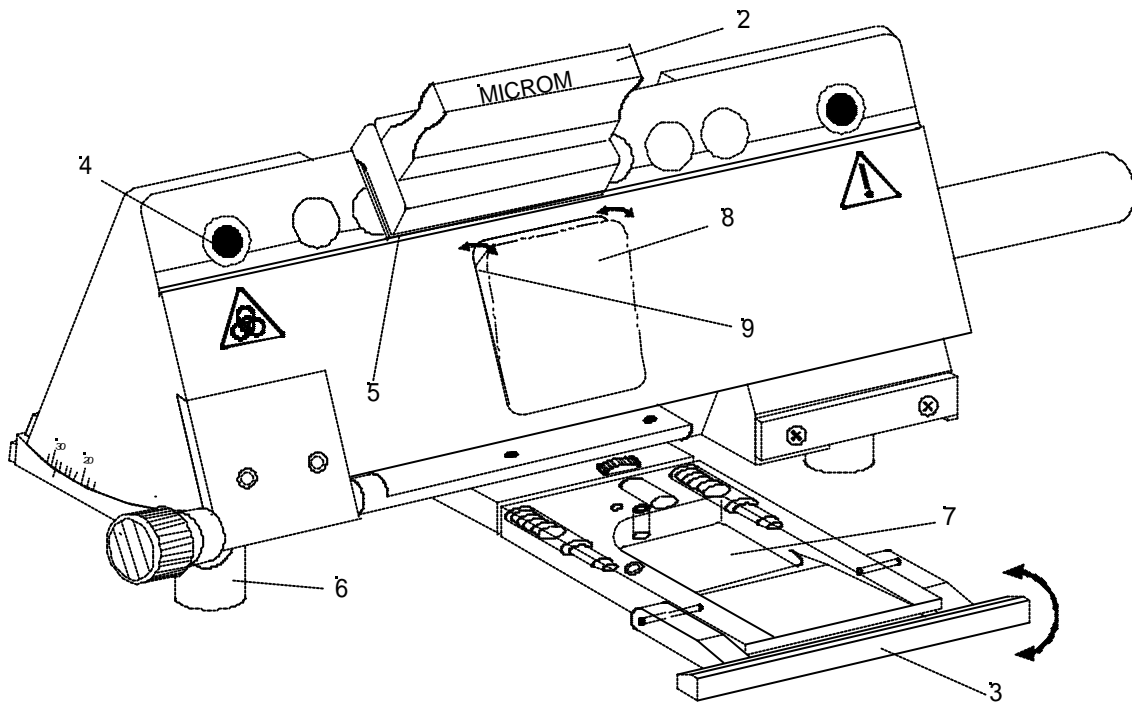


Fig. 3

Lift the vacuum anti-roll hood (fig. 3.7), the flap beneath (fig. 3.8) falls back in place and the slot (fig. 3.9) gets closed.

With the two flat levers (fig. 2.7) the clearance angle can be adjusted and, at the same time, the knife carrier is fixed on the base. To move the knife carrier on the guide rails, turn the two flat levers (fig. 2.7) inwards. Afterwards, move the flat levers outwards to their clamping position.

To change the clearance angle adjustment, loosen the clamping screw on the right side of the blade carrier underneath the connection piece (fig. 2.9) in addition to the already loosened flat levers (fig. 2.7). Tighten clamping screw and flat levers after having re-adjusted the clearance angle.

By experience, usable cuts are only achieved at a clearance angle between 24° and 30°. The adjusted clearance angle is shown on the scale (fig. 2.8).

The dots (fig. 2.10) on the base and on the flat levers show the clamping position. The

position of the grips of the flat levers can be adjusted in 30°-steps, by pulling them slightly out and then turning them into a favourable position.

During breaks or while working on the specimen or the specimen holder, the knife guard (fig. 3.3) should be used.

2-3-2 DISPOSABLE BLADE CARRIER EV

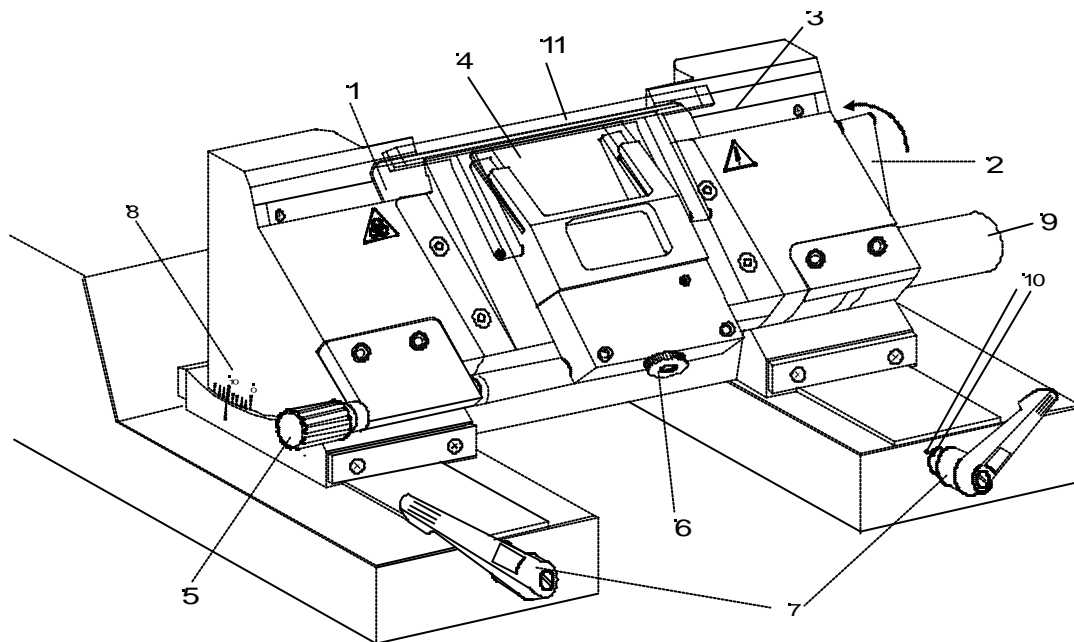


Fig. 4

With the disposable blade carrier EV, all commercially available low profile blades of 80 x 8 mm and a facet angle of approx. 35° as well as high profile blades of 76 x 14 mm can be clamped.

Insert the blade into the slot behind the clamping plate. When using high profile blades, first loosen the lever (fig. 4.2) and remove the spacer strip. The blade is clamped by means of a clamping plate, which is placed on the rear part of the blade carrier. This plate can be opened and tightened by means of the small lever (fig. 4.2).

Turning the grip (fig. 4.5), the vacuum anti-roll hood (fig. 4.4) can be turned forwards and backwards.

The knurled screw (fig. 4.6) allows the adjustment of the edge of the vacuum anti-roll hood (fig. 4.4) in relation to the blade edge.

A closed vacuum anti-roll hood (fig. 2.4) and a suitable suction vacuum (see part 2-2) generate stretching or suction effects.

For this, the closed vacuum anti-roll hood (fig. 4.4) slightly tilts the underneath flap (fig. 5.6) thus opening a suction slot (fig. 5.7).

Lift the vacuum anti-roll hood (fig. 5.4), the flap (fig. 5.6) beneath falls back in place and the slot (fig. 5.7) gets closed.

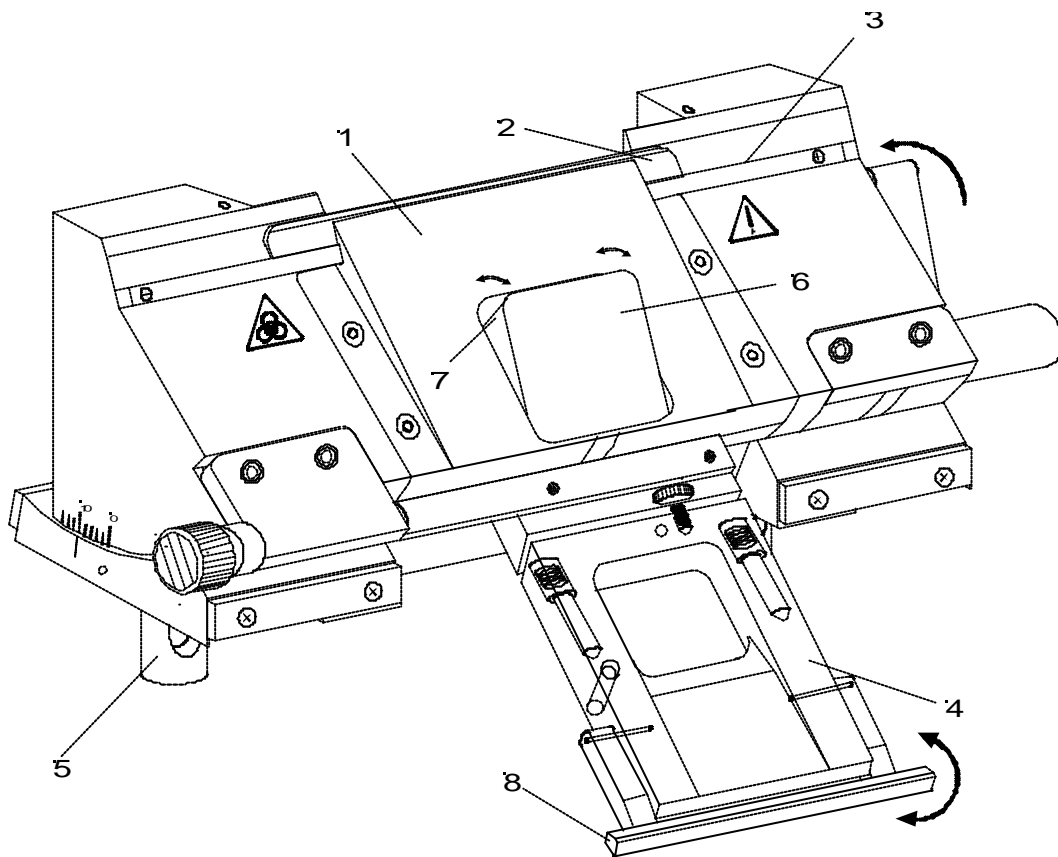


Fig. 5

With the two flat levers (fig. 4.7) the clearance angle can be adjusted and, at the same time, the knife carrier is fixed on the base. To move the blade carrier on the guide rails, turn the two flat levers (fig. 4.7) inwards. Afterwards, move the flat levers (fig. 4.7) outwards to their clamping position.

To change the clearance angle adjustment loosen the clamping screw, which is placed on the right side of the blade carrier below the connecting piece (fig. 4.9). The flat levers (fig. 4.7) must have already been loosened. Tighten clamping screw and flat levers after having re-adjusted the clearance angle.

By experience, usable cuts are only achieved at a clearance angle of 10° or more. The adjusted clearance angle is shown on the scale (fig. 4.8).

The dots (fig. 4.10) on the base and on the flat levers show the clamping position. The position of the grips of the flat levers can be adjusted in 30° -steps, by pulling them slightly out and then turning them into a favourable position.

2-4 ACCESSORIES

2-4-1 STANDARD EQUIPMENT

The Vacutome for the microtome cryostat HM 500 series is supplied with the following accessories:

	Cat. No.
1 Blade carrier (type as ordered)	
1 Reusable filter insert	468050
5 Disposable paper bags	281030 /1 piece
1 Cleaning hose	570230

2-4-2 ADDITIONAL EQUIPMENT (OPTIONAL)

Magnetic disposable blade carrier MV	705550
Disposable blade carrier EV	705570

PART 3 THEORY OF OPERATION

The Vacutome includes a special blade carrier with which a vacuum can be applied just below the blade edge for stretching sections or the disposal of section waste. For this, the blade carrier features a slot that can be opened and closed by means of the vacuum anti-roll hood through an inserted flap.

A vacuum pump, installed in the cryostat, generates the vacuum needed for the suction. A filter system is placed between vacuum pump and blade carrier. This system can either be equipped with a reusable filter or a disposable paper bag.

The suction force of the vacuum can be changed by means of an electronic control. Moreover, the set vacuum is only effective during the cutting window due to an in-line valve.

3-1 STRETCHING SECTIONS

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.

3-2 DISPOSING OF SECTION WASTE

The Vacutome with special blade carrier is also highly suitable for the disposal of debris. For this, the vacuum anti-roll hood is used as described in part 3-1. Close the vacuum anti-roll hood to open the slot on the blade carrier by means of the flap.

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 tubings into the filter system.

Collected section waste can now easily be removed.

PART 4 WORKING WITH THE VACUTOME

4-1 PREPARING THE VACUTOME

First insert the blade carrier onto the consoles as already described in part 2-1 and clamp it with the clamping levers. Select a clearance angle of approx. 28 - 30°.

Insert the blade onto the blade carrier. Put it on the magnetic surface of the magnetic disposable blade carrier MV from the side.

NOTE! To move the blade sideways, press the blade slider downwards so that the blade is properly put against the ledge of the blade carrier.

When using the disposable blade carrier EV, insert the blade between front and rear clamping plate and tighten it via the clamping lever on the right side of the instrument.

Clamp the specimen stage together with the frozen specimen into the specimen holder and tighten it via the orienting lever.

After having adjusted the specimen, set the cutting window limits.

Please note that the lower limit of the cutting window corresponds with the upper edge of the specimen.

4-2 ORIENTATION AND TRIMMING OF SPECIMENS

With the clamping lever loose, you have the possibility to adjust the specimen parallel in relation to the cutting edge via the orienting lever.

(See part 2-9-2 and part 4-4, Instruction Manual of Microtome Cryostat HM 500 OM).

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.

4-3 SECTIONING AND TAKING OFF SECTIONS

For sectioning, pre-select the desired section thickness on the turning knob of the microtome.

In addition, set the desired vacuum on the operating knob.

Put the vacuum anti-roll hood (fig. 2.4) against the blade by means of the lever (fig. 2.5) Turn the handwheel in a clockwise direction or use the motorized cutting drive (see part 2-8, Instruction Manual Microtome Cryostat HM 500 OM) 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.

Vacutome for Cryostat HM 500 Series

MICROM International GmbH
Robert-Bosch-Str. 49

D- 69190 Walldorf

4-4 HOW TO AVOID MALFUNCTIONS

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

- Condition of blade edge, probably move it horizontally to the left or right side.
- Check adjustment of vacuum anti-roll hood and correct it, if necessary.
- Carefully remove frost from front- and backside of the blade and from the anti-roll hood (i.e. with ethanol, acetone or the like).
- Tighten all clamping screws and clamping levers on the blade carrier and specimen holder.
- Select the correct cutting temperature according to the specimen (see part 4-2, Instruction Manual Microtome Cryostat HM 500 OM).
- Select the appropriate freezing compound.

CAUTION! If the specimen was frozen with liquid nitrogen, the specimen must adapt itself to the cutting temperature.

- Select a suitable clearance angle. When using a magnetic disposable blade carrier MV select a clearance angle between 24° and 30°. For high and low profile blades the clearance angle must be between 5° and 15°.
- Select a proper cutting speed:
The harder the material, the slower the cutting speed.
- Take care in bringing knife and specimen together.

- Make sure that the filter is changed or cleaned regularly allowing a perfect airflow.
- Exactly adjust the cutting and suction window to the specimen size, to avoid inadvertent disposal of good sections.
- Keep the area around the flap tidy for optimal functionality.
- Set the suction vacuum according to the specimen and the selected section thickness.

For optimal sectioning, the blade and vacuum anti-roll hood as well as the flap must be cleaned of waste. Only use a sharp blade and exactly adjust the vacuum anti-roll hood in relation to the blade edge.

PART 5 MAINTENANCE OF THE VACUTOME

5-1 SHUTTING-OFF FOR CLEANING

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

This should be done as follows:

- Turn off the mains switch. Pull the mains plug off.
- Remove or dispose of cold section waste.
- Remove filter housing from connecting bow and clean it. Remove the filter. Clean it with appropriate cleaners or dispose of the paper bag.
- Remove the blade from the blade carrier and store it in safe place. Remove section waste tray, specimen stages and working tools. Loosen and pull out the two clamping levers (fig. 2.7) on the blade carrier and remove the blade carrier upwards. Lift the two side accessory shelves in the front, pull them out of the rear pegs and also remove them.
- Again dispose of cold section waste.
- The warming up of the microtome chamber can actively be accelerated by using a hair dryer.
- Disconnect the warm microtome as follows:

CAUTION! Turn the handwheel handle into the lower position, i.e. the specimen holder is also in the lower reversal point.

Turn out the socket head screw (fig. 6.1) in the middle of the front part of the microtome base plate with the hex head wrench no. 5. Then slightly lift the base plate (fig. 6.2) in the front and move it approx. 2 cm to the left side until the clutch on the right side of the microtome is free. Then pull the microtome to the front to loosen it from the rear clamp (fig. 6.4). Turn the microtome to the right side so that the front side of the microtome faces the right lateral wall of the chamber. Now the coded connector on the rear side of the microtome can be unplugged. Carefully take the microtome out and remove all loose waste immediately by using a brush.

- Carefully clean and wash the interior. Open the stopper on the bottom of the microtome chamber. The waste detergent can be collected afterwards at the end of the outlet tube (lower, right front side of the instrument). Insert the stopper after cleaning as otherwise cold air leaks out and the instrument will cover with frost.
- After having finished cleaning and maintaining (see 5-2), install the microtome in reverse order.

CAUTION! The handwheel handle must be in the lower position when the microtome is engaged into the clutch.

- Insert accessory shelves, accessories and blade carrier into the instrument.
- Connect the filter housing first with the tube on the suction side and then via the connecting bow with the blade carrier.
- Connect the mains plug to the power outlet. Turn on the mains switch.
- Close the sliding window.

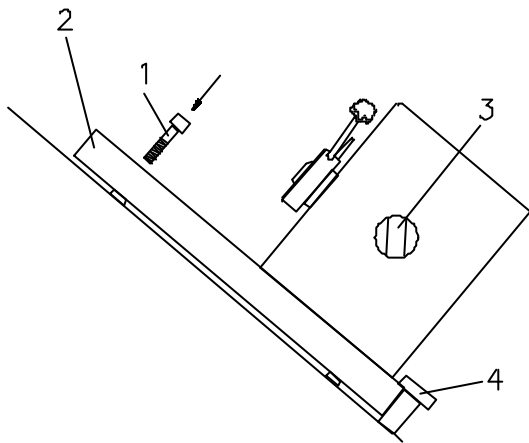


Fig. 6

5-2 CLEANING AND CARE OF THE CRYOSTAT WITH VACUTOME

Carefully clean and dry the disconnected microtome. As there is condensed humidity inside the microtome dry it very carefully. A drying closet at temperatures up to 60°C can be used. Another possibility is to dry it by means of a hair dryer.

Before installing the microtome into the chamber again, use a syringe to lubricate the vertical cross roller bearings on either side of the specimen holder with the cryostat oil no. 407. Also lubricate slightly the horizontal cylinder guide.

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

5 - 3 CHANGING AND CLEANING FILTERS

To change or clean the filters, unscrew the screw-type cap (fig. 7.4) from the housing (fig. 7.2) and remove either the disposable paper bag (fig. 7.3) or the reusable filter (fig. 7.6) from the screw-type cap (fig. 7.2).

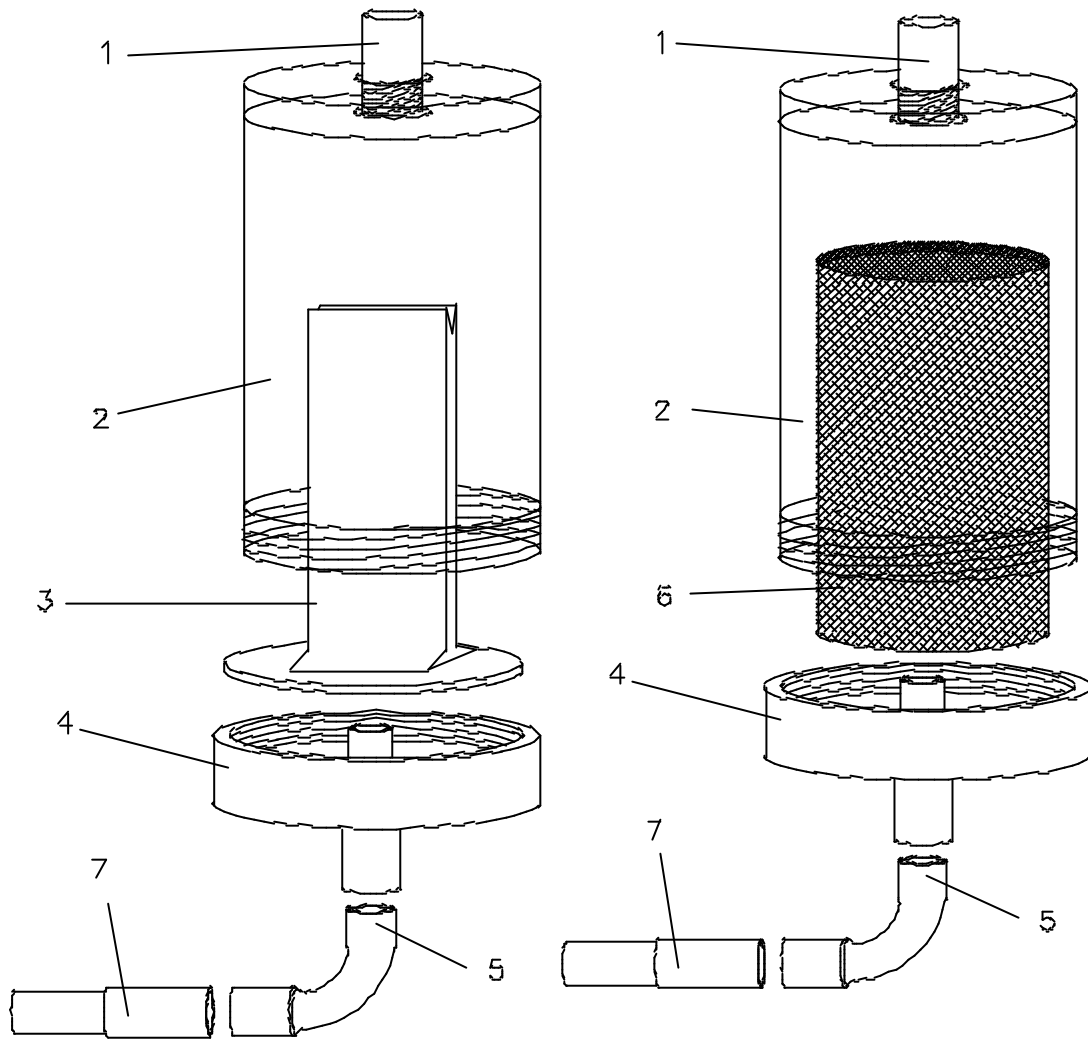
Dispose of the disposable paper bag (fig. 7.3) in a propriate way.

Empty the reusable filter (fig. 7.6) and clean it with appropriate cleaners.

Then insert either a new paper bag or the cleaned reusable filter into the screw-type cap (fig. 7.4).

Note that the disposable paper bag is **not folded up anymore**.

Again screw the screw-type cap onto the housing (fig. 7.2).



- 1 = Connecting piece
- 2 = Housing
- 3 = Disposable filter bag
- 4 = Screw-type cap

- 5 = Connecting bow
- 6 = Reusable filter
- 7 = Connecting piece

Fig. 7