

SLIDING MICROTOME

HM 440 E

INSTRUCTION MANUAL

Sliding Microtome HM 440 E

MICROM International GmbH
Robert-Bosch-Str. 49

D- 69190 Walldorf

CERTIFICATION

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

The instrument complies with applicable international safety regulations.

WARRANTY

This 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:	387 050
English:	387 060
French:	387 698

Sliding Microtome HM 440 E

MICROM International GmbH
Robert-Bosch-Str. 49

D- 69190 Walldorf

INTENDED USE

Dear Customer,

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.

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

MICROM Ser. No.:

Please check the MICROM Ser. No. on the type plate of your instrument and enter this number here.

Instruction Manual No. 387060

Issued on July 31, 2001

**MICROM International GmbH
Robert-Bosch-Strasse 49**

D-69190 Walldorf

**Telefon: (06227) 836-0
Telefax: (06227) 836-111**

Intended Use

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EC Certificate of Conformity

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

Product designation: Sliding Microtome
Type reference: HM 440 E

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

The TÜV Südwest, Akkreditiertes Prüflabor (DATech) Reg. Nr. TTI-GO54/9201, Dudenstr. 28, D- 68167 Mannheim, has checked and certified the product.

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Hans Heid
MANAGING DIRECTOR

Walldorf, 01 July 2002

SAFETY PRECAUTIONS

<u>ATTENTION!</u>

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: VOLTAGE

Never remove instrument covers during operation. Component replacement 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. Unused knives should always be kept in a knife case. Never try to catch a falling knife!! Never check the sharpness of the cutting edge with your fingers. The cutting edge is extremely sharp! Be careful when sectioning and/or removing sections.

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.

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 SLIDING MICROTOME HM 440 E

The Sliding Microtome HM 440 E from MICROM International GmbH is a highly efficient instrument which can be used for paraffin, for very hard and large specimens for routine lab work, research and industry.

The maintenance-free cross roller bearings allow non-tiring working and a smooth sliding movement with optimal stability. The instrument is equipped with two integrated section waste trays, which are placed in front and behind the vertical carrier. This way, section waste is directly collected. Moreover, the instrument can also be equipped with a small tray for liquid waste directly on the specimen clamps.

The HM 440 E will cut sections in a range from 1 to 100 microns. The specimen feed is carried out when the sledge is moved forwards. For the protection of knife and specimen, the instrument retracts the specimen at the end of the cut. If desired, the function <retraction> can be turned off.

The motorized coarse feed system allows the continuous specimen upward and downward travel with three different speed settings. This coarse feed system is controlled by a new multi-purpose button. This way, specimen and knife edge distance can be adjusted quickly.

A trimming function with defined steps from 10 µm to 500 µm permits the fine adjustment up to the first cuts and results in larger section thicknesses when trimming.

The selected section thickness, trimming thickness, section counter, sum of section thicknesses and remaining travel to the upper end position are indicated on the display of the swivelling panel, which is placed on the left side of the microtome.

The knife carrier is designed so the knives can be easily clamped in place and adjusted.

The coaxial specimen orientation allows orientation with one hand.

Microtome:	Section thickness range 1 - 100 µm
	Resolution: 1 µm for 1 - 10 µm
	..... 2 µm for 10 - 20 µm
	..... 5 µm for 20 - 50 µm
	..... 10 µm for 50 - 100 µm
	Trimming thickness range 10 - 500 µm
	Resolution:..... 10 µm for 10 - 100 µm
	..... 20 µm for 100 - 200 µm
	..... 50 µm for 200 - 500 µm
	Specimen retraction in return stroke .....40 µm
	Horizontal knife stroke max. 200 mm
	Vertical feed range max. 40 mm
Section counter:	5 digit LC-display with reset
Sum of section thicknesses:	5 digit LC-display with reset
Remaining travel to upper end position:	5 digit LC-display
Cutting drive:	..... manual sliding movement
Coarse feed:	..... motorized, gradually and continuously
Coarse feed speed:	..... 400, 700 and 1000 µm/s
Feed:	..... automatic by means of sliding movement or
	..... manual by means of multi-purpose button
Specimen size:	..... max. 80 x 60 mm
Specimen orientation:	..... x- and y-axes: universal 8°
Storage temperature range:	..... -20°C to +50°C
Operating temperature range:	..... 0° C - +35°C
Power requirements:	.....220 VAC/50 Hz/40 VA
	.....240 VAC/50 Hz/40 VA
	.....100 VAC/60 Hz/40 VA
	.....115 VAC/60 Hz/40 VA
Dimensions:	..... 380x510x300 mm (wide/deep/high)
Weight:	.....26 kg

PART 2 OPERATING INSTRUCTIONS

2-1 SETTING UP THE MICROTOME

Unpack the microtome and remove the wrapping.

Hollows on the rear and front bottom allow convenient and safe carrying or moving of the instrument.

Sectioning can be influenced by nearby instruments which generate vibrations. For this reason, the microtome should be placed on a stable and vibration free table.

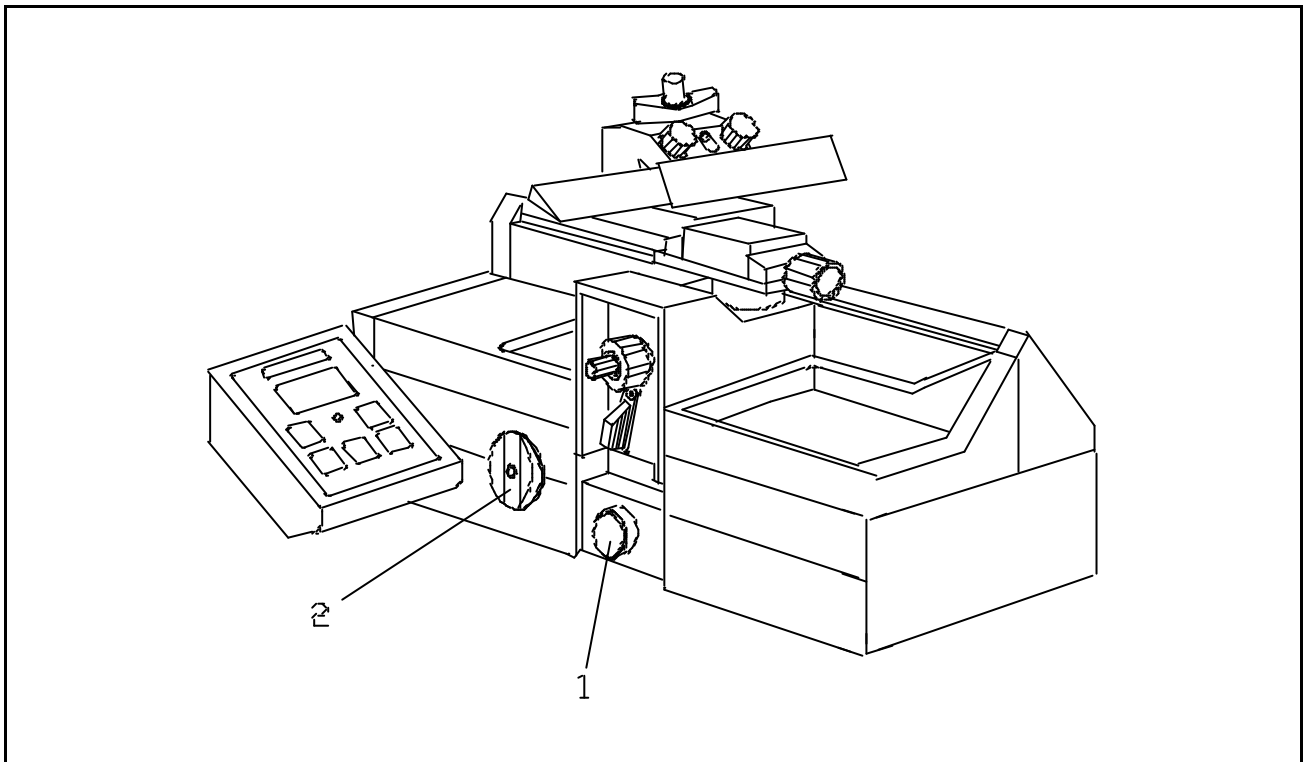


Fig. 1

2-1-1 SAFETY DEVICE FOR TRANSPORTATION

For the protection of the cross roller bearings, the instrument is equipped with a lock for the sledge in the middle of the sliding rail as a safety device for transportation. Before putting the instrument into operation, loosen the lock for the sledge by turning the knob (fig. 2.1) 180°.

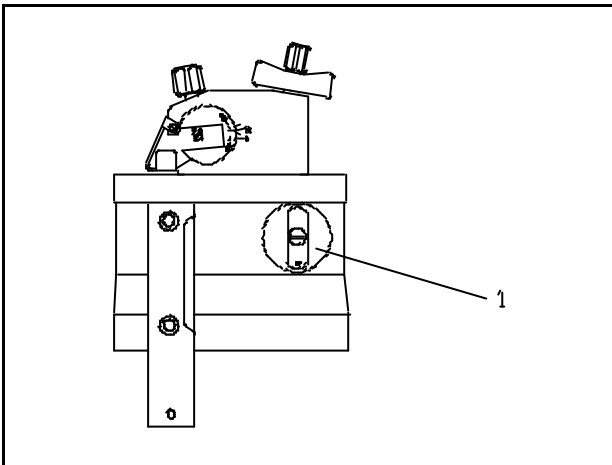


Fig. 2

CAUTION! Whenever moving the instrument lock the sledge by means of the safety device: move the sledge to the middle of the sliding rail. Carefully turn the knob (fig. 2.1) 180° so that the locking position can be felt. Remove knife or blade holder from the knife carrier!

2-2 INITIAL TURN-ON

CAUTION! Before turning 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.

Connect the power cord to the power socket (fig. 3.2) on the back of the instrument. Turn on the power switch (fig. 3.1). Afterwards, FEED and TRIM are shown in the upper line of the display.

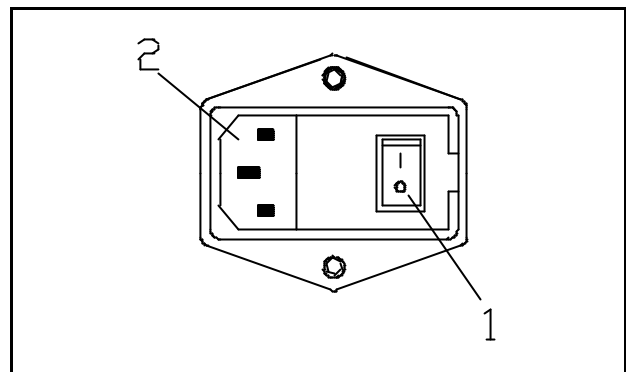


Fig. 3

The insert for the two fuses is placed beside the power switch.
(See 5, exchange of fuses).

The terms shown on the display are available in English, German and French. If desired, the user can change the language. (See 29, selecting the indicated language).

2-3 CUTTING MOVEMENT AND RETRACTION

To start the cutting movement of the microtome, move the sledge horizontally. Sections are produced when moving the sledge forwards. In the front reversal point, the specimen is retracted for the protection of knife and specimen. The specimen remains retracted until the next forward movement of the knife. The yellow LED RETRACTION (fig. 5.6) lights up. If desired, the function <retraction> can be turned off. (See 2-8, turning off the function <retraction>).

2-4 LOCKING THE SLEDGE

NOTE! Due to outside influences (vibrations, table inclination) the sledge might start moving because of the smoothness of the cross roller bearings.

The sledge should be locked for the user's personal safety, e.g. new specimens are clamped into position, knives are exchanged, the instrument is cleaned or other adjustment processes are carried out.

Move the sledge to the rear end position. Lock it by turning the knob (fig. 2.1) 180°. The sledge can be unlocked by turning the knob (fig. 2.1) again 180°.

2-5 SETTING SECTION THICKNESS AND TRIMMING THICKNESS

The required section and trimming thicknesses are set by means of the control knob (fig. 1.1), which is situated on the left side of the operating panel.

To choose between section thickness and trimming thickness, press the operating knob (fig. 1.1). A marking (fig. 5.1) in the first line of the display shows which cutting thickness is selected.

When the instrument is turned on again, the values, which were chosen when the instrument was turned off, are shown again.

When turning the operating knob, slight resistances can be felt. The selected values are shown in the second line on the display (fig. 5.1) of the operating panel.

FEED = selected section thickness

TRIM = selected trimming thickness

The graduation of the section thicknesses is divided into 4 ranges:

range	graduation
from 1µm to 10µm	1µm
from 10µm to 20µm	2µm
from 20µm to 50µm	5µm
from 50µm to 100µm	10µm

The graduation of the trimming thicknesses is divided into 3 ranges:

range	graduation
from 10µm to 100µm	10µm
from 100µm to 200µm	20µm
from 200µm to 500µm	50µm

2-6 SPECIMEN FEED

2-6-1 COARSE FEED AND SPEED FOR COARSE FEED

For the fast upward and downward travel between specimen and knife edge, the microtome has a coarse feed system with vertical direction, which is controlled by means of the multi-purpose button (fig. 1.2). Press the multi-purpose button at the top (fig. 4.1) to move the specimen holder upwards. To move it downwards, press the multi-purpose button at the bottom (fig. 4.3).

The instrument carries out movements of various lengths according to how long the multi-purpose button at the bottom (fig. 4.3) is pressed. Press the button at the bottom (fig. 4.3) only very briefly and the specimen holder moves downwards by a fixed value of 2 μm . If the button at the bottom (fig. 4.3) is pressed a little bit longer (not longer than 2 seconds), the specimen holder moves downwards as long as the button is being pressed. If the multi-purpose button at the bottom (fig. 4.3) is pressed for more than 2 sec., the specimen holder moves automatically to the lower end position and the motorized coarse feed is turned off. However, this function can be stopped at any time by shortly pressing the multi-purpose button at the bottom once again (fig. 4.3).

For comfortable operation, the downward movement of the coarse feed can also be stopped by pressing the multi-purpose button at the top (fig. 4.1) to release a desired upward movement of the coarse feed immediately.

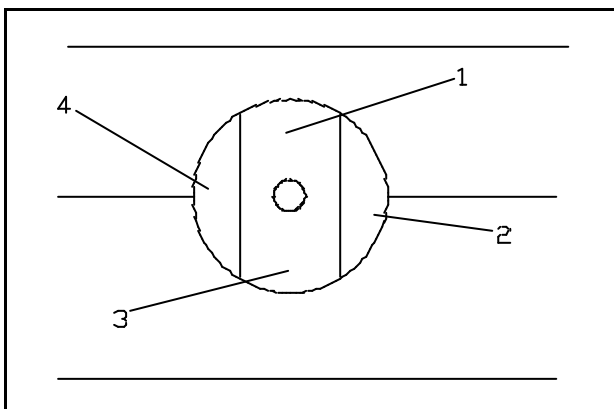


Fig. 4

Three different speeds for the coarse feed are available: 400, 700 and 1000 $\mu\text{m/s}$. The three speed settings are shown on the display (fig. 5.1) as star symbols:

* = 400 $\mu\text{m/s}$, ** = 700 $\mu\text{m/s}$ and *** = 1000 $\mu\text{m/s}$.

To select or change the speed, press button <speed coarse feed> (fig. 5.3) until the required speed is shown in the middle line on the right side of the display (fig. 5.1). When the instrument is turned on, the sign *** is shown automatically on the display. Press the button (fig. 5.3) once and ** is shown on the display. Press the button (fig. 5.3) again and the display shows *. If the button (fig. 5.3) is activated for a third time, the sign *** will be shown on the display again.

CAUTION ! With the function <coarse feed upwards> specimen and knife edge are adjusted very quickly. To avoid damages to specimen and knife, carefully observe this adjustment process.

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 upwards> in time before the specimen touches the knife.

2-6-2 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>.

The function <trimming> can be activated by pressing the multi-purpose button in the front area (fig. 4.2).

Two different feed modes for trimming are available: the automatic and the manual feed mode. If the manual feed is chosen, the lower LED in button (fig. 5.4) lights up and the letter M is shown in the lower line of the display (fig. 5.1). To deliver the pre-selected value, press button (fig. 4.2).

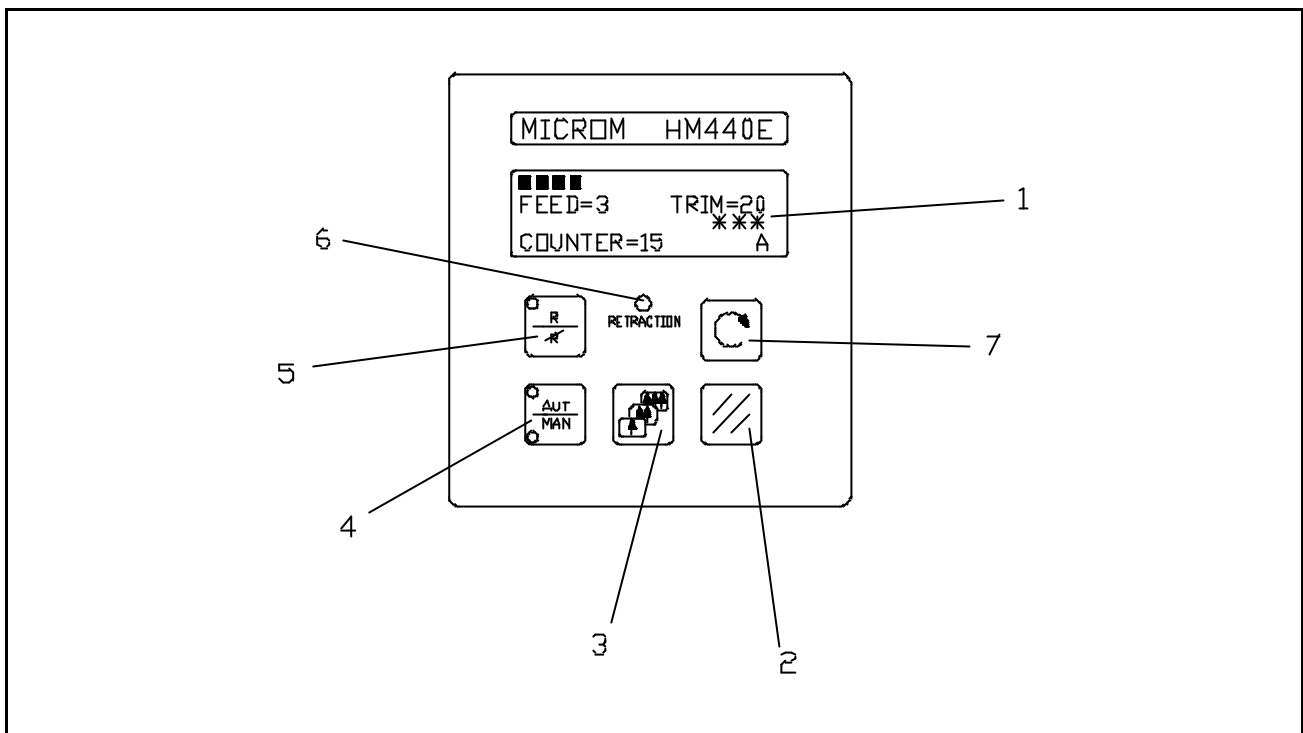


Fig. 5

If the automatic feed mode is chosen, the upper red LED in button (fig. 5.4) lights up and the letter A is shown in the lower line of the display (fig. 5.1). As long as the multi-purpose button in the front (fig. 4.2) is pressed, the trimming thickness, which was pre-selected on the control knob, is delivered always in the rear reversal point of the sliding movement.

2-6-3 FINE FEED, MANUAL

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

The fine feed can be carried out either manually or automatically. The desired feed mode can be selected by pressing the button (fig. 5.4).

If the manual feed mode is activated, the lower red LED in button (fig. 5.4) lights up. Moreover, the letter M is shown in the lower line on the right side of the display (fig. 5.1). To carry out the manual fine feed, press the multi-purpose button in the back area (fig. 4.4).

The feed is carried out any time, when the button (fig. 4.4) is pressed. For sectioning, move the sledge together with the knife behind the specimen, press the multi-purpose button (fig. 4.4) and move the sledge to the front.

2-6-4 FINE FEED, AUTOMATIC

If the automatic fine feed is chosen, the upper red LED in button (fig. 5.4) lights up. If this feed mode is chosen, the letter A is shown in addition in the lower line on the right side of the display (fig. 5.1). The feed of the pre-selected section thickness is automatically carried out in the rear reversal point of the sliding movement, regardless of the position, at which the sledge is moved forwards.

CAUTION! For optimal sections always move the sledge together with the knife to the back over the entire specimen and then move it forwards.

2-7 INDICATION OF CUTTING PROCESSES

Additional information about the sectioning status can be seen in the lower line of the display. Press the <roll button> (fig. 5.7) to call up the various functions one after the other on the display. The following information about the present sectioning position of the instrument can alternatively be seen in the lower line of the display (fig. 5.1):

- number of sections
- sum of section thicknesses
- remaining travel to the upper end position

For this, press button (fig. 5.7) until the required information lights up on the display (fig. 5.1). If no information is required in this line, press button (fig. 5.7) until this line of the display (fig. 5.1) is blank.

2-7-1 SECTION COUNTER

The section counter adds up the number of sections produced. After each forward movement of the sledge, the number on the section counter increases by 1. The counter can be reset to zero by means of the button (fig. 5.2).

2-7-2 SUM OF SECTION THICKNESSES

This value shows the sum in microns of the sections already cut. Trimming values as well as sectioning values are added up. This value can also be reset to zero by means of the button (fig. 5.2).

2-7-3 REMAINING TRAVEL TO UPPER END POSITION

This value shows the distance in microns, which is left for sectioning.

If the specimen holder is in the lower end position, the display shows 40 000 µm. This number decreases the higher the specimen is moved. If no further feed is possible anymore, the lower line of the display switches over automatically to the remaining travel indication, independently which information about the sectioning position was chosen before.

Mistakes during operation might block the feed system, e.g. if the knife is situated by accident above the vertical carrier and this vertical carrier is moved upwards. This way, the knife could be pressed into the specimen.

This can result in a faulty relation between indicated remaining travel to upper end position and actual remaining travel. In this case, the instrument can be calibrated again very easily. Turn off the instrument. Press button (fig. 5.2) and turn on the instrument again while button (fig. 5.2) is still pressed. Then the specimen holder moves to the lower end position. This way, the instrument is calibrated again.

2-8 TURNING OFF THE FUNCTION <RETRACTION>

If desired, the function <retraction> can be turned off.

Press the button (fig. 5.5) to turn on and off the function <retraction>.

If the function <retraction> is activated, this is shown by the red LED in button (fig. 5.5).

2-9 SELECTING THE INDICATED LANGUAGE

The sectioning information on the display can be shown alternatively in three languages. German, English and French are available.

For the selection of one of these languages, turn off the instrument. Then press buttons (fig. 5.2 and 5.4) simultaneously and turn on the power switch of the instrument with still pressed buttons (fig. 5.2 and 5.4). Then LANGUAGE DEUTSCH lights up on the display (fig. 5.1). To select another language, press button (fig. 5.7) once or twice until the desired language is shown on the display. To confirm the desired language, press the button (fig. 5.2) and turn off the instrument on the power switch. Wait a few seconds and then turn on the instrument again. The display (fig. 5.1) now shows the terms in the desired language.

If the originally desired language was skipped over, turn off the instrument and repeat above described process.

If the button (fig. 5.7) is pressed more than twice passing the language selection process, the user has entered the service-routine-program. This program can only be operated by trained service technicians. To terminate this program, turn off the power switch of the instrument.

2-10 SPECIMEN CLAMPING

To clamp specimens, different specimen clamping systems are available. With the orienting adapter it is simple to align the specimen properly in relation to the knife.

If liquids are used for cutting, a small tray can be mounted underneath the specimen clamps to avoid that the liquid waste gets into the vertical guide and the feed mechanism.

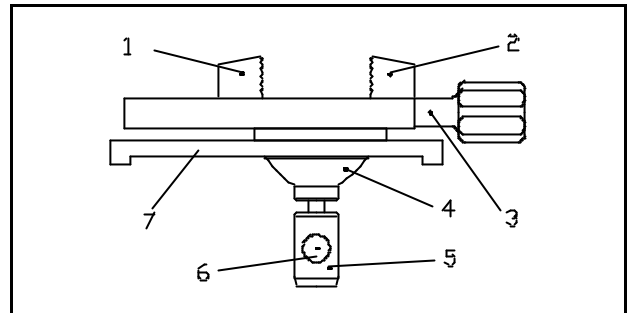


Fig. 6

2-10-1 WASTE TRAY FOR LIQUIDS

When working with buffer solutions or manipulating with ice on specimens, the dripping water can be collected by the waste tray for liquids (fig. 6.7). The dripping water then flows through the slots into the front or rear section waste trays.

The waste tray for liquids (fig. 6.7) can be used in combination with the standard specimen clamp (fig. 6) and the universal cassette clamp (fig. 8) as well.

If the waste tray for liquids should be used together with the standard specimen clamp, the user himself is able to mount the tray.

For this, unscrew the orienting adapter of the standard specimen clamp (fig. 6.4 and fig. 6.5), remove the ring. Then mount the waste tray for liquids with the O-ring and the narrow ring, which are supplied together with the waste tray for liquids, between orienting adapter and specimen clamp.

If a universal cassette clamp should be upgraded, this clamp must be exchanged completely against a new one with already mounted waste tray for liquids.

NOTE! For the stability of the specimen, do not let it project over the clamping jaws too much.

2-10-2 STANDARD SPECIMEN CLAMP, 45 x 80 mm

The standard specimen clamp (fig. 6) is used for rectangular and square paraffin blocks.

Insert the specimen against the fixed front jaw (fig. 6.2). Then turn the knob (fig. 6.3) to tighten the movable jaw (fig. 6.1). Fig. 6.4 and 6.5 show the orienting adapter.

2-10-3 UNIVERSAL CASSETTE CLAMP

The universal cassette clamp (fig. 8) represents a quick change system.

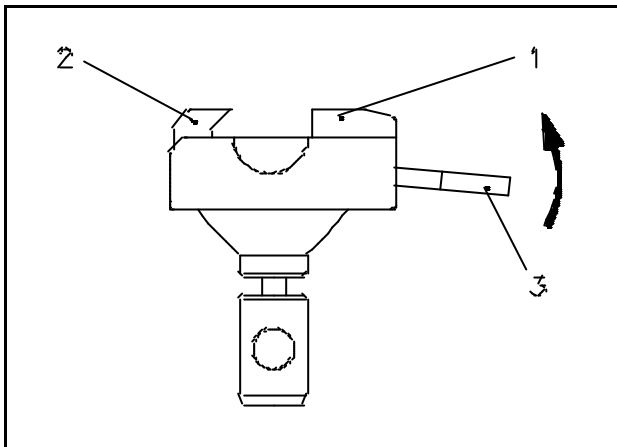


Fig. 8

To insert or remove the cassette from the fixed (fig. 8.1) and movable (fig. 8.2) jaws, press the lever (fig. 8.3) upwards.

CAUTION! To achieve optimal clamping keep the locating surface of the cassette free of paraffin.

2-11 ORIENTING THE SPECIMEN

The specimen clamp with orienting adapter is mounted into the vertical carrier (fig. 9.1). This way, the specimen can be aligned in relation to the cutting edge.

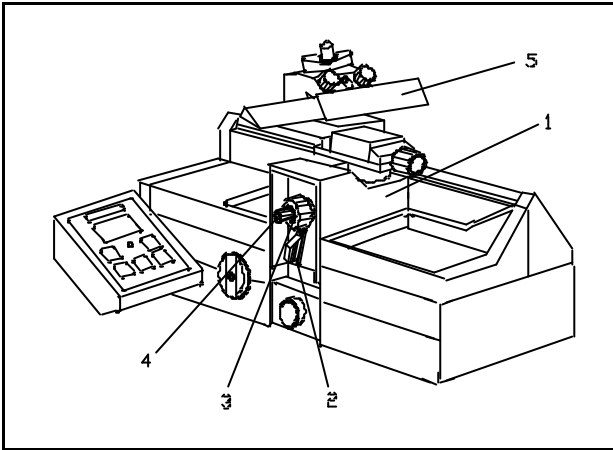


Fig. 9

To bring the specimen into the desired position, turn the clamping lever on the left side of the instrument (fig. 9.2) backwards. The clamping of the specimen clamp is now loosened.

With the two coaxial adjusting screws (fig. 9.3 and 9.4) the specimen clamp can be oriented 8° in each direction on the X-axis and Y-axis.

Then turn the clamping lever (fig. 9.2) forwards to fix the specimen holder in its new position.

2-11-1 CHANGING AND/OR CLAMPING SPECIMEN CLAMPS

The available specimen clamps are all clamped or removed in the same way.

To change a specimen clamp, turn the clamping lever (fig. 9.2) backwards to loosen it and pull it off sideways. Now the specimen clamp can be taken off upwards and can be replaced with another one.

Insert the new specimen clamp into the vertical carrier so that the clamping lever can be put through the hole of the adapter from the left side all the way through. Align the specimen clamp with the two adjusting screws. Then turn the clamping lever (fig. 9.2) to the front to tighten it.

2-11-2 READJUSTING SPECIMEN CLAMPS

Frequent use of the clamping lever (fig. 9.2) can lead to the fact that the specimen clamps cannot be clamped optimally anymore. If the necessary readjustments are not carried out, it might even be possible that the specimen clamps cannot be clamped anymore by means of the clamping lever. The clamping lever (fig. 9.2) should be in an almost vertical downward position. To determine the clamping position of the clamping lever, loosen the screw (fig. 10.2) on the orienting adapter (fig. 10.3) using an allen key (size 1,5). Then insert a small pin into the hole on the link (fig. 10.1). This pin guarantees that the adapter part (fig. 10.3) can be turned without turning the link.

Turn the adapter part (fig. 10.3) in a clockwise direction if no clamping was achieved at all or if the lever can be pressed too far forwards.

Turn the adapter part (fig. 10.3) in a counter-clockwise direction, if the lever can be pressed too far backwards.

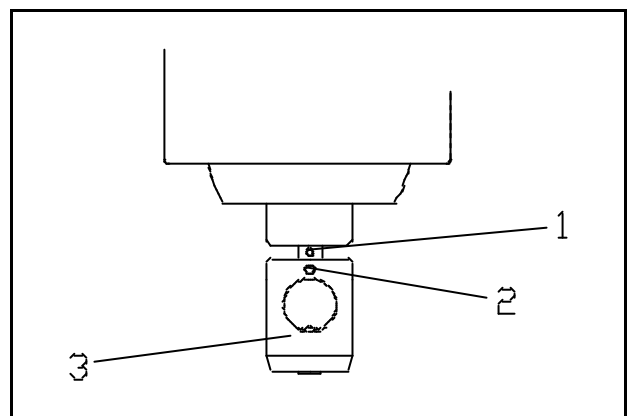


Fig. 10

2-12 KNIFE CARRIER

The knife carrier of the microtome is easy to use and equipped with a knife guard for user safety while adjusting knife and specimen.

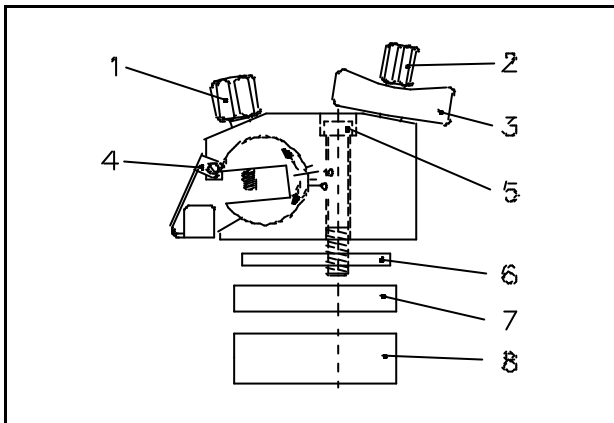


Fig. 11

NOTE! While working on the knife carrier, it should be locked with the safety lock (fig. 2.1) in the back of the sliding rail.

a) Inserting the knife

To insert the knife, the two clamping screws (fig. 11.1) must be unscrewed slightly until the knife can be pushed in from the side. Then tighten the two clamping screws to fix the knife in its position. To achieve utmost stability for smaller knives, the right clamping screw should then be inserted in the middle hole.

b) Clearance angle adjustment

The clearance angle between cutting edge and specimen can be adjusted very easily to the respective requirements of the tissue to be sectioned without loosening the clamping of the knife. For this, use the two coaxial screws (fig. 11.2 and fig. 11.3), which are positioned on the upper side of the knife carrier. Loosen the clamping screw (fig. 11.3) by turning in a counter-clockwise direction to adjust the clearance angle by means of the set screw (fig. 11.2). The adjusted clearance angle is readable on the scale on the right side of the knife carrier. Then tighten the screw (fig. 11.3) in a clockwise direction to fix the adjusted clearance angle.

NOTE! By experience, usable cuts are only achieved at a clearance angle of 10° or more.

c) Protection against injury

The knife carrier is equipped with a knife guard (fig. 11.4) which should be used while knife or specimen are adjusted.

d) Moving the knife sideways

If the cutting edge of the knife is blunt, loosen the clamping screws (fig. 11.1) and move the knife to the left or right side.

e) Moving the knife carrier

If required, the knife carrier can be moved into various positions.

Slightly loosen the screw (fig. 11.5) by means of a hex head wrench 6 mm. This way, the knife carrier can be moved forwards or backwards to the new desired position. Afterwards, tighten the screw (fig. 11.5).

To move the knife carrier into another lateral position, loosen the screw (fig. 11.5) and move the knife carrier backwards out of the guiding groove and take off the knife carrier upwards. A guide block underneath the knife carrier is now visible. This guide block can be moved 180°. Move the guide block by 180° to achieve a new lateral position of the knife carrier. Then insert the knife carrier again and tighten the screw (fig. 11.5).

f) Diagonal positioning of knife

After loosening the adjusting screw of the knife carrier (fig. 11.5) by means of a hex head wrench 6 mm, the knife can be adjusted diagonally according to the tissue to be sectioned. This is called "angle cut".

g) Knife profile

Knives with profile c and d are available. Fig. 12 shows schematically the angles on the cutting edge profiles of c- and d-knives.

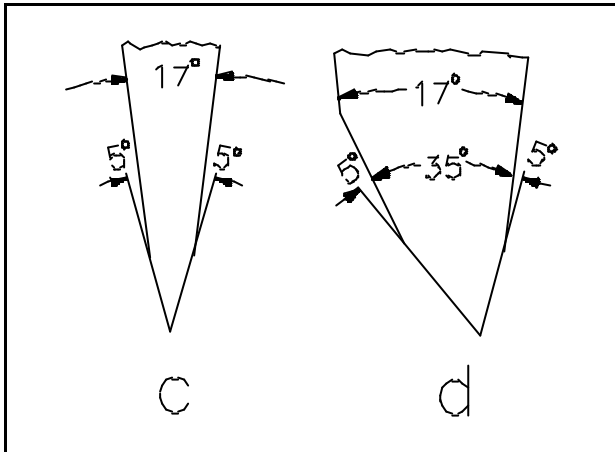


Fig. 12

2-12-1 BLADE HOLDER FOR DISPOSABLE BLADES

Two different types of disposable blades are available: low profile blades (height: 8 mm) and high profile blades (height: 14 mm). When using disposable blades, a blade holder together with a disposable blade (fig. 13) is clamped into the knife carrier. (See 2-14-1, additional equipment).

a) Inserting the blade

Insert the blade holder into the knife carrier from the left side and tighten the two clamping screws on the knife carrier. The clamping lever on the blade holder (fig. 13.1) can be positioned in two ways: 0 = loosened, 1 = clamped. (Fig. 13, see X).

To insert the blade, turn the clamping lever to 0. Please note that locating and clamping surfaces are clean!!

To clamp the blade, turn the clamping lever to 1.

b) Clearance angle adjustment

The clearance angle between blade and specimen must be adjusted in the same way the clearance angle between knife and specimen is adjusted.

c) Protection against injury

The knife carrier of the instrument is equipped with a knife guard (fig. 9.5) which can be moved sideways. This knife guard should be used while knife and specimen are adjusted. This reduces the danger of injury considerably!

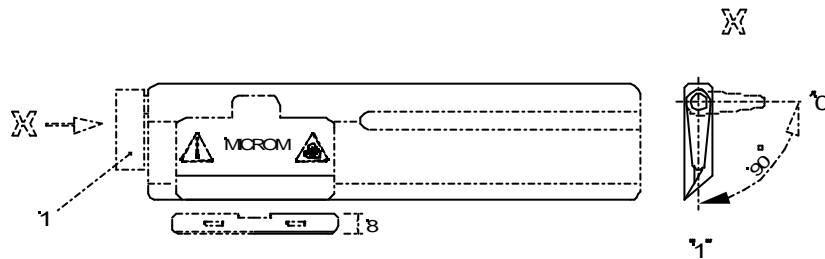


Fig. 13

2-13 STANDARD EQUIPMENT

The microtome HM 440 E is supplied with the following accessories:

- 1 hex head wrench 5 mm
- 1 hex head wrench 6 mm
- 1 cover
- 1 instruction manual

2-14 ADDITIONAL EQUIPMENT (OPTIONAL)

2-14-1 DISPOSABLE BLADE HOLDER

Cat. No.

Blade holder with eccentric fast clamping

- for low profile blades

705200

- for high profile blades

705340

Case for disposable blade holder

Cat. no. 705200 and 705340

152160

Blade holder with allen key

- for one low profile blade

705430

- for two low profile blades

705440

2-14-2 SPECIMEN CLAMPS

Universal cassette clamp

715500

Universal cassette clamp with waste tray

715490

Standard specimen clamp, 45 x 80 mm

715480

Standard specimen clamp, 45 x 80 mm
with waste tray

715470

Waste tray

502140

2-14-3 HEIGHT ADJUSTMENT PLATES

5 mm

448070

10 mm

440400

20 mm

440410

2-14-4 MICROTOME KNIVES

Steel knives, type c

12 cm	152010
16 cm	152020
18,5 cm	152270
22 cm	152030
25 cm	152040
30 cm	152050

Steel knives, type d

Cat. no.

12 cm	152060
16 cm	152070
22 cm	152080
25 cm	152090
30 cm	152100

Tungsten carbide knife, 16 cm, d

152120

Knife cases

12 cm	152220
16 cm	152230
18,5 cm	152280
22 cm	152240
25 cm	152250
30 cm	152260

Disposable blades for paraffin

S 35, 50 pieces in dispenser	152170
R 35, 50 pieces in dispenser	152370

2-14-5 ADDITIONAL ACCESSORIES

Fast freezing unit K 400	770040
Oil for slideways, 100 ml	350010
Oil for slideways, 250 ml	350020
Oil for slideways, 500 ml	350030
Para Gard (paraffin repellent), 100 ml	350170

PART 3 THEORY OF OPERATION

3-1 CUTTING MOVEMENT

To start the cutting movement of the microtome, move the sledge together with the knife carrier forwards and backwards. Knives or blades are available for sectioning.

As the sledge moves forwards, sectioning is carried out (cutting movement). To protect knife and specimen, the specimen is drawn back (retracted) automatically when the sledge moves backwards. If desired, the function <retraction> can be turned off.

Section thickness feed can be carried out either manually or automatically.

The selected section thickness or trim thickness is delivered in the rear reversal point of the sliding movement in automatic mode.

The number of the sections made can be shown on the section counter on the display. After each forward movement of the sledge, the number on the section counter increases by 1. The sum of the sections carried out can also be seen on the display. For this, trimming values and sectioning values are added up. Section counter and sum of section thicknesses can be reset to zero at any time by means of the RESET-button.

Moreover, the remaining travel to the upper end position can also be shown on the display. The remaining travel, which is available for sectioning, is shown in microns. This number decreases, the higher the specimen is moved. (See 2-7, indication of cutting processes).

3-2 SPECIMEN COARSE FEED AND TRIMMING FUNCTION

After changing the specimen or 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.

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

3-3 SPECIMEN CLAMPING SYSTEM AND SPECIMEN ORIENTATION

According to the form and size of the specimens, different specimen clamping systems are available to carry the specimen. It is very easy to align the specimen to the knife, using the orienting adapter.

3-4 KNIFE CARRIER

The knife carrier is easy to use and allows the microtome knives to be clamped and adjusted as needed. Depending on application, knives or disposable blades can be used.

3-5 MICROTOME WITH FAST FREEZING UNIT

The fast freezing unit K 400 allows frozen sectioning with the specimen temperature as low as -45°C.

PART 4 WORKING WITH THE MICROTOME

4-1 PREPARATION AND ORIENTATION

Before sectioning, the specimens must be prepared appropriately and embedded in suitable media. Cassettes as well as different forms for round and rectangular specimens can be used for embedding.

With the orienting adapter, the specimen can easily be oriented to the knife. (See 2-11, orienting the specimen).

4-2 COARSE FEED AND TRIMMING FUNCTION

To adjust approximately the space between specimen and cutting edge, use the coarse feed or the trimming function. Continue this to start trimming the specimen, thus achieving the level of interest. Any waste should be wiped away in a forward direction with a brush.

4-3 SECTIONING INSTRUCTIONS

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

4-3-1 CONDITION OF THE KNIFE EDGE

Only use a sharp knife! If the knife edge is blunt, move the knife horizontally either to the right or left side to continue working with the sharp area of the cutting edge, or have the knife resharpened.

4-3-2 CLEAN KNIFE SURFACES

For optimal sectioning, front and back of the knife must be clean. Especially, paraffin waste must be removed thoroughly!!

4-4 HOW TO AVOID MALFUNCTIONS

4-4-1 PREPARATION OF THE SPECIMEN

When preparing specimens, be sure that a suitable embedding medium, fixation, dehydration and infiltration time are chosen.

4-4-2 TEMPERATURE OF THE SPECIMEN

Sectioning is carried out at ambient temperature (excluding frozen sections). If the temperature is too high, the paraffin softens. Therefore, avoid heating paraffin specimens by direct exposure to sunlight or other near sources of heat.

4-4-3 TIGHTENING THE CLAMPING SCREWS

Tighten all clamping screws and clamping levers on the knife carrier, specimen holder and specimen orientation.

4-4-4 SELECTION OF THE KNIFE

Carefully select the required knife material and profile.

4-4-5 ADJUSTMENT OF THE KNIFE

Take care to adjust the proper clearance angle of the knife.

Select a clearance angle adjustment of 5 - 15° according to the facet angle. Typically, adjust an angle of 10 - 12°.

4-4-6 CUTTING SPEED

Take care to select proper cutting speed.

General Rule: The harder the material, the slower the cutting speed!!

4-4-7 TRIMMING

Take care in bringing the knife and specimen together.

PART 5 MAINTENANCE

Annual routine maintenance

To secure section quality and functioning of the microtome, it is recommended that a routine maintenance be performed by a trained service technician once a year.

Service contract

MICROM offers a service contract which guarantees that your instrument is always in perfect condition. For more information, please contact the nearest MICROM sales office.

Exchange of fuses

The two mains fuses are installed on the back of the instrument beside the power switch (fig. 14.1). To exchange the two fuses, turn off the power switch of the instrument and unplug the instrument. Open the small cover (fig. 14.2) of the fuse holders from the right side (see arrow) by means of a flat screw driver. Pull out the fuse holders, each of which is marked with an arrow, and exchange the fuses against new ones.

Rating of fuses:

For power requirements 220-240 V:

- 2 fuses 315 mA slow-blow

For power requirements 100-120 V:

- 2 fuses 630 mA slow-blow

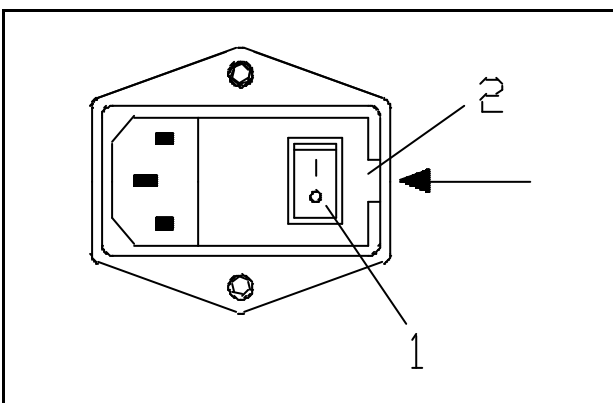


Fig. 14

PART 6 CLEANING AND CARE

Cleaning intervals

Cleaning of the microtome depends on how frequently the microtome is used. For optimal sectioning, the instrument must be free of section waste, especially the guides and clamping mechanism.

Cleaning agents

Mild household cleaners can be used to clean the microtome. Do not use aggressive cleaners or solvents, as the paint and plastic parts can be affected.

NOTE! Before starting cutting, instrument, knife carrier and section waste trays should be treated with a commercially available paraffin repellent, e.g. Para Gard. (See 2-14-5, additional accessories).

Care

Remove the knife from the knife carrier. Clean it and keep it in a knife case.

CAUTION! Never put the knife with the cutting edge upward on the table.

Clean the operating controls and the surfaces of the knife carrier, especially the space where the knife carrier is installed.

The maintenance-free cross roller bearings are covered and protected against dust and section waste and need not to be lubricated or cleaned by the customer.

Clean the specimen clamping system, specimen orientation, housing and vertical carrier.