

ROTARY MICROTOME
HM 325
INSTRUCTION MANUAL

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:	387820
English:	387821
French:	387822
Spanish:	387823
Italian:	387824

Dear Customer,

Before putting the instrument into operation, please read these operating instructions carefully to familiarize yourself with its proper operation and functions. To avoid risks for the operator and technical damage to the instrument, it must only be used in accordance with its intended use (see part 1-2).

Any other use of the instrument is considered improper! All warranties and guarantees would then be null and void.

Only skilled or specially trained personnel must operate the microtome, i.e. clamping the specimen, trimming and first-cuts, sectioning and transferring sections onto a slide. The listed and marked safety measures as well as the regulations and hygiene measures of your respective lab must strictly be observed.

MICROM serial number:

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

Instruction manual no. 387821

Issued: March 28, 2006

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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: Rotary Microtome
Type reference: HM 325 -2

Notification to Competent Authorities:

These medical devices have been registered with the German authority as "Microtomes" under the EDMA-classification code: 23-06-02

The designated product complies with the laid down regulation:

DIRECTIVE 98/79/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 October 1998 on in vitro diagnostic medical devices

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

DIN EN ISO 14971:2001-03

Medical devices - Application of risk management to medical devices (ISO 14971:2000).

DIN EN ISO 9001:2000

Quality management systems - Requirements (ISO 9001:2000)



Hans Heid
Managing Director



Walldorf, 16 June 2005

PART 1 IMPORTANT INFORMATION**1-1 WARNING SIGNALS AND SYMBOLS**

The installation and routine use of the HM 325 is easy and safe if the instructions in this manual are being observed.

**Note:**

Special instructions regarding operation of the instrument.

**Warning:**

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

**Caution – general danger spot:**

The instruction manual must strictly be observed whenever this symbol is visible on the instrument.

**Hazard of hand injuries:**

Due to moving parts in connection also with the microtome knife, a danger area arises, which might lead to hand injuries in case of non-compliance with the safety features of the microtome and when disregarding the instruction manual.

**Biohazard:**

Warning of biological danger.

**Radioactivity:**

Warning of radioactive danger.

SAFETY PRECAUTIONS AND IMPORTANT INFORMATION

CAUTION!

The operator's safety is affected, when the instrument is not operated in accordance with this instruction manual.

Please observe the following general precautions during operation of this instrument. Failure to comply with these precautions violates safety standards and the intended use of the instrument. MICROM International GmbH is not liable for misuse of the instruments and failure to comply with basic safety requirements.

CARE IN USING MICROTOME KNIFE



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

HAZARD OF RADIOACTIVE RADIATION



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

HAZARD OF INFECTION



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

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.

WASTE DISPOSAL

All debris, waste as well as infectious and radioactive contaminated material from operation must be disposed of in accordance with the respective regulations of the lab. Section waste must be disposed of according to the respective regulations for special waste.

HAZARD OF MALFUNCTION

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

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

DANGER IN EXPLOSIVE ENVIRONMENT

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

1-2 INTENDED USE

The Rotary Microtome HM 325 from MICROM International GmbH is a highly efficient instrument which can be used for paraffin sectioning in biology, medicine and industry.

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.



Note:

This instruction manual is part of the product. Keep it always close to the instrument!

2 INTRODUCTION

2-1 DESCRIPTION ROTARY MICROTOME HM 325

The Rotary Microtome HM 325 from MICROM International GmbH is a highly efficient instrument which can be used for paraffin sectioning in biology, medicine and industry.

The HM 325 will cut sections in a range from 0,5 µm up to 60 µm. For the protection of knife and specimen, the instrument retracts the specimen at the end of the cut.

Forward and backward travel is carried out by the coarse feed wheel. This way, specimen and knife edge distance can be adjusted quickly.

An additional trimming function with two defined steps permits the fine adjustment up to the first cuts and results in larger section thicknesses when trimming.

The knife carriers are designed so the knives can be easily clamped in place and adjusted.

The section counter with LC-display shows the number of the sections made.

Total overview

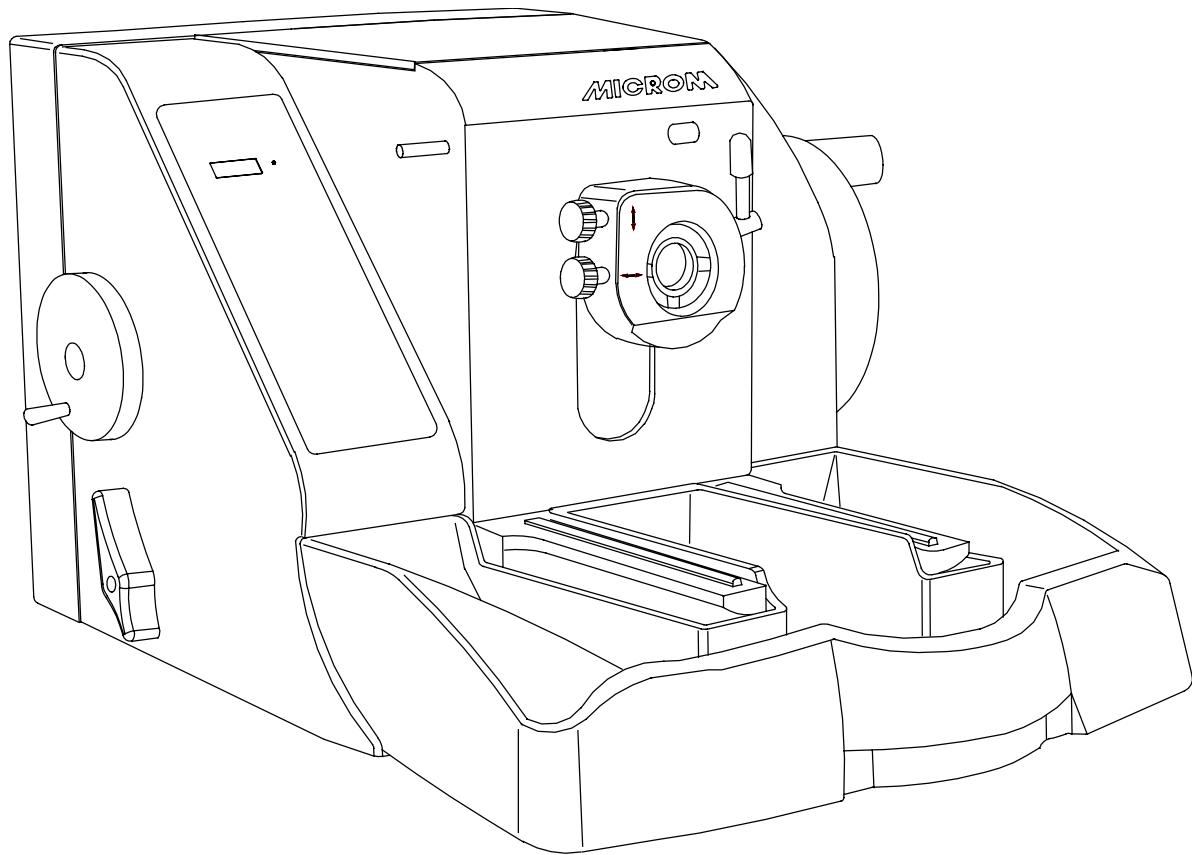


Fig. 1

2-2 ACCESSORIES**2-2-1 STANDARD EQUIPMENT**

The microtome HM 325 is supplied with the following accessories:

- 1 Hex head wrench 6 mm
- 1 Cover
- 1 Para Gard, 100 ml
- 1 Instruction manual
- 2 Cover plates

2-2-2 ADDITIONAL EQUIPMENT (OPTIONAL)**2-2-2-1 KNIFE CARRIER****Cat. No.**

Standard knife carrier N	705670
Disposable blade carrier E	705640
Disposable blade carrier ER	705650

2-2-2-2 SPECIMEN CLAMPS

Standard specimen clamp	715010
Universal cassette clamp	715020
Adjustable universal cassette clamp	716130
Foil clamp	715030
Sandwich supporting material	176010
Insert for round specimens, Ø 6 mm	715070
Insert for round specimens, Ø 15 mm	715080
Insert for round specimens, Ø 19 mm	715280
Insert for round specimens, Ø 25 mm	715090
V-insert	715100
V-distance piece	715320

2-2-2-3 OPTICAL ACCESSORIES**Cat. no.:**

Large field magnifier, 220 V	760160
Large field magnifier, 120 V	760170
Stereomicroscope Stemi 2000	755210
Adapter for Stemi 2000	532090
KL 1500 with ring illumination	
230 V, 50 - 60 Hz	760280
120 V, 50 - 60 Hz	760290

2-2-2-4 MICROTOME KNIVES

Steel knives, type c	
12 cm	152010
16 cm	152020
18,5 cm	152270
22 cm	152030
Steel knives, type d	
12 cm	152060
16 cm	152070
22 cm	152080
Tungsten carbide knife, 16 cm, d	152120
Knife cases	
12 cm	152220
16 cm	152230
18,5 cm	152280
22 cm	152240
Disposable blades for paraffin	
SEC 35	152200
SEC 35e	152210

2-2-2-5 ADDITIONAL ACCESSORIES

Fast freezing unit K 34

100 V/50 - 60 Hz

115 V/60 Hz

230 V/50 Hz

240 V/50 Hz

Section transfer system STS

100 V/50 - 60 Hz

115 V/60 Hz

230 V/50 Hz

240 V/50 Hz

Lubricating oil, 100 ml

350110

Lubricating oil, 250 ml

350120

Paraffin repellent, PARA GARD, 100 ml

350170

2-3

TECHNICAL SPECIFICATIONS HM 325

Microtome:	Section thickness range 0,5 - 60 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 - 60 µm
	Retraction during return travel approx. 60 µm
	Horiz. feed range .....max. 28 mm
	Vertical specimen stroke .....max. 64 mm
	Trimming stage 1 10 µm
	Trimming stage 2 30 µm
Section counter:	Battery powered, four-digit LC-display with reset .....4-digit
Specimen size:	Standard .....55 x 50 mm
Specimen orientation:	x - and y - axes: universal 8°
	z - axis: up to 360°
Cutting drive:	..... manual by means of handwheel, right side
Coarse feed:	..... manual by means of handwheel, left side
Storage temperature range:	..... -20°C up to +50°C
Operating conditions:	..... +5°C to +35°C (at max. rel. humidity of 60%)
	..... altitude up to 2000 m M.S.L.
	..... for indoor use only
Floor loading requirements:	..... 98 kg
Dimensions:	..... 420x490x280 mm (wide/deep/high)
Weight:	..... 23 kg

3 OPERATING INSTRUCTIONS

3-1 SETTING UP THE MICROTOME



Note:

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

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

- Cut through the bands around the carton.
- Open the carton.
- Remove the accessories.
- On the lower rear side of the instrument, there is a recessed grip to lift or carry the microtome.
- Lift the microtome out of the carton.



Note:

Do not use the handwheel handles to lift or carry the instrument.

- Place the microtome on a stable and vibration free table, as sectioning can be influenced by nearby instruments which generate vibrations.
- Handwheel and coarse feed wheel must be free and accessible in a comfortable way.
- Remove the separately packed section waste tray and install it at the base plate from the front side.
- In the rear part of the instrument, there are sliding feet for an easy moving of the microtome.
- Slightly lift the base at the front end only and slide the microtome.



Note:

Remove the section waste tray to move or carry the instrument. The section waste tray can be pulled out of its proper position.

- Before starting section, instrument, knife carrier and section waste tray should be treated with a commercially available paraffin repellent.



Note:

This medium considerably reduces the adhesive force of paraffin sections on the individual parts (see part 2-2-2-5, optional accessories).

3-2 CUTTING MOVEMENT AND RETRACTION

The cutting movement of the microtome is generated by turning the handwheel.

- To start the cutting movement, turn the handwheel.
- As the specimen moves down, sectioning is carried out (cutting movement, fig. 6.2).
- Continue turning the handwheel to bring the specimen back up (fig. 6.4).
- To protect the knife and specimen during return travel, the specimen is retracted (R).
- If desired, the function <retraction> can be turned off.

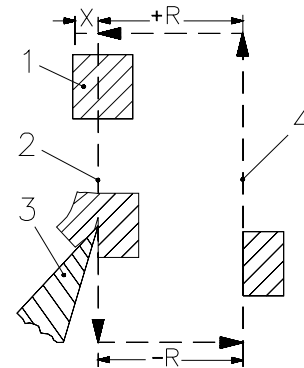


Fig. 3

X=selected section thickness
 1=specimen
 2=cutting movement
 3=knife
 4=return travel
 R=retraction

3-3 LOCKING AND UNLOCKING THE HANDWHEEL

The handwheel is integrated into the housing. The position of the handle corresponds to the vertical position of the specimen.

- Turn the lever downwards in the direction of the arrow, to loosen the handwheel lock.
- Turn the lever upwards, to lock the handwheel.

The handwheel can be locked in any position.



Warning:

For your personal safety, the handwheel should be locked in the upper range of the vertical movement when changing specimens.

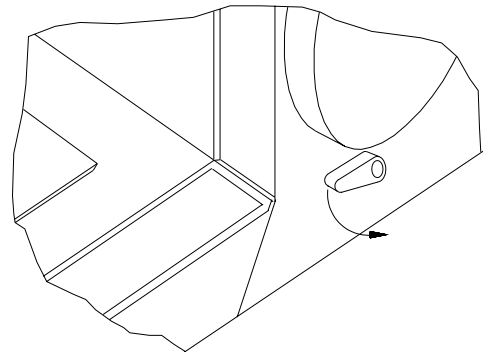


Fig. 4

3-4 SECTION THICKNESS SETTING

- The selected section thickness is set on the turning knob (fig. 5.1) on the right or left side.
- The setting is indexed. Intermediate values can also be set.
- The selected value is readable on the window (fig. 5.3).
- In case the turning knobs on the right and left side are not used, they can be pulled off.

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

Range	Graduation
up 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 60 μm	5 μm



Warning!

When the setting is changed from larger to smaller section thicknesses, the next section will still be done at the previous value, if the setting was changed in the upper position of the cutting process. Therefore, when changing the section thickness, always use the lower position of the cutting process, then set the thickness.

3-5 SECTION COUNTER

The microtome has a battery-powered section counter to add up the sections produced (fig. 5.2). After each downward movement of the specimen holder, the number on the section counter rises by 1.

- The counter can be reset to zero by means of the RESET-knob (fig. 5.4) at any time.

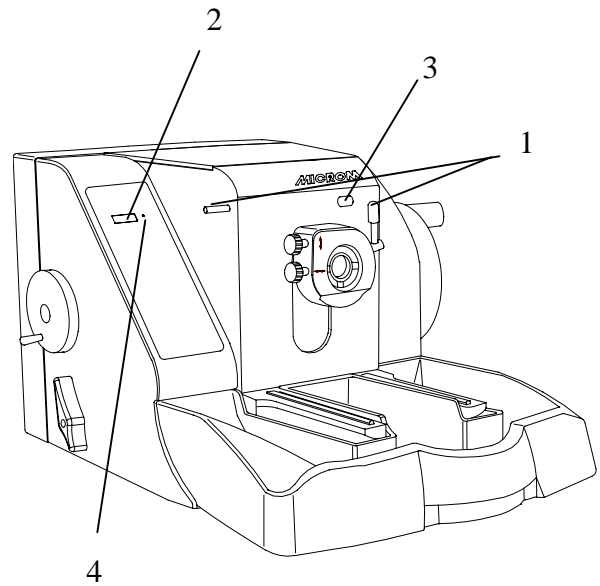


Fig. 5

3-6 SPECIMEN FEED

3-6-1 COARSE FEED

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

- By means of the coarse feed wheel (fig. 6.1) the specimen holder can be moved horizontally backwards and forwards.
- When the front end position of the specimen feed is reached, a resistance can be noticed and when the handwheel for the cutting drive is activated an acoustic signal can be heard.



Warning:

Do not continue to advance the specimen after reaching the front end position with the coarse feed wheel or the handwheel. This will damage the mechanical parts.



Warning:

When turning the coarse feed wheel, take note that the specimen and knife edge do not get in contact with each other.



Note:

At the beginning of a sectioning series, it is advisable to use the coarse feed to move the specimen to the back third of the horizontal specimen movement and to move the knife carrier towards the specimen feed.

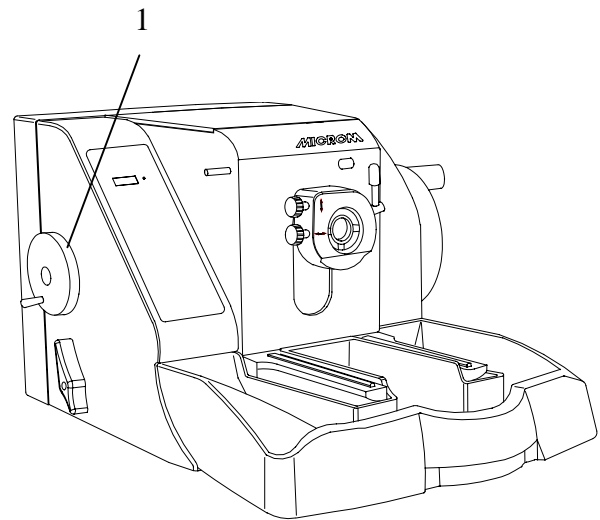


Fig. 6

3-6-2 TRIMMING AND FIRST CUTS

The feed can also be carried out in graduated trimming stages. **Trimming stages of 10 µm and 30 µm** are available.

- For trimming stage 1 (10 µm), turn the trimming lever (fig. 7.1) until a first resistance can be felt and turn the handwheel at the same time.
- For trimming stage 2 (30 µm), completely turn the trimming lever (fig. 7.1).



Warning:

The trimming mechanism can only be activated if the specimen is not in the upper position!

- After the specimen is adjusted approximately to the knife edge, turn the trimming lever (fig. 7.1) to further advance the specimen gradually for the first cuts.

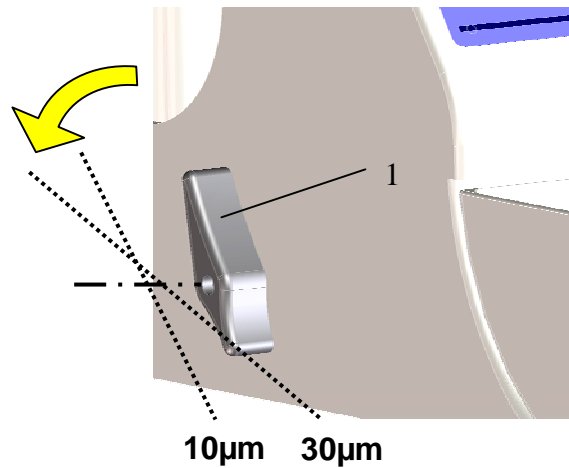


Fig. 7

3-6-3 FINE FEED

- For the fine feed in µm-steps, turn the turning knob (fig. 8.8) on the right side of the instrument housing to the right or left side. The setting can then be read in the window (fig. 8.7).
- The setting can also be adjusted on the left side of the housing (fig. 9.1). A feed knob which is currently not used, can be pulled off.
- The feed of the selected section thickness is carried out automatically in the upper specimen position when turning the handwheel.

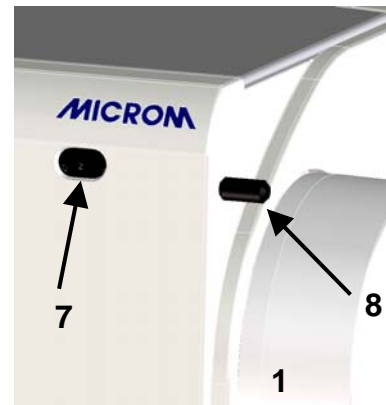


Fig. 8

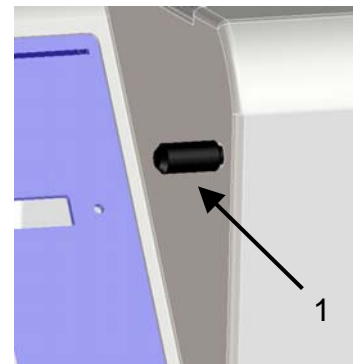


Fig. 9

3-7 ACOUSTIC SIGNAL FOR FRONT END POSITION OF THE SPECIMEN MOVEMENT

- About 1 mm before the front end position of the specimen feed an acoustic signal sounds during each rotation of the handwheel!



Warning:

When the signal sounds, a feed range of no more than 1000 μm is available to finish sectioning. To avoid damaging mechanical parts, set back the specimen holder by means of the coarse feed wheel before starting the next sectioning series.



Note:

Sections should be cut in the back third of the horizontal specimen movement because the mechanical stability of the guide cylinder is best in this area.

3-8 ADAPTERS FOR SPECIMEN CLAMPING

3-8-1 ADAPTER, NON-ORIENTING

This adapter serves for the non-orienting fastening of the specimen clamps directly on the cylinder of the instrument.

3-8-2 SPECIMEN ORIENTATION

- Using the specimen orientation to fasten the specimen clamps on the cylinder head. This allows the specimen to be aligned in relation to the knife.
- To bring the specimen into the desired position, turn the clamping lever (fig. 10.1) towards the front.
- This will loosen the specimen clamp and a rotation of 360° on the cylinder axis (Z axis) is possible.
- With the two orienting screws (fig. 10.2), the specimen clamp can be oriented 8° in each direction on the X axis and Y axis.
- After having oriented the specimen, turn the lever (fig. 10.1) upwards to fix the specimen clamp in its position before starting sectioning.
- When turning the orienting screws (fig. 10.2) a slight resistance can be felt in a specific position.
- This means that the clamp is aligned in a parallel way in relation to the cutting surface.

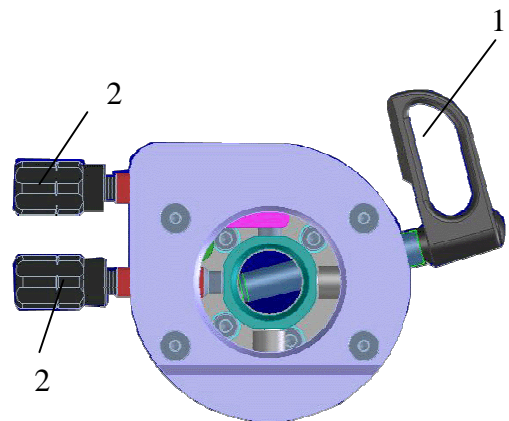


Fig. 10

3-8-3 CHANGING AND/OR CLAMPING SPECIMEN CLAMPS

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

- To change the specimen clamping system, press the clamping lever (fig. 11.1) downwards and pull it sideways.
- Now the specimen clamp can be pulled out to the front and can be replaced with another specimen clamping system.
- Insert the new specimen clamp into the cylinder head so that the clamping lever can be put through the hole of the adapter from the right side all the way through.
- Then align the specimen clamp by means of the orienting screws (fig. 11.2).
- Then press the clamping lever (fig. 11.1) upwards.

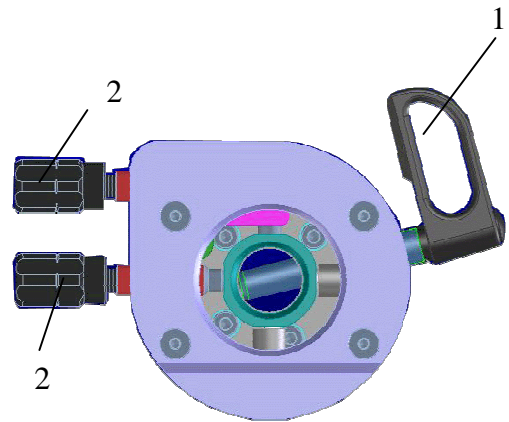


Fig. 11

3-8-4 READJUSTING SPECIMEN CLAMPS

Frequent use of the clamping lever (fig. 12.1) 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 clamp cannot be clamped.

- The clamping lever (fig. 12.1) should be in an almost upright position.
- To determine the clamping position of the clamping lever, adjust the inner screw (fig. 13.1) on the backside of the orienting adapter by means of an Allen key (size 3 mm).
- Turn the Allen key in a clockwise direction if no clamping was achieved at all or if the clamping position of the clamping lever is too high.
- If the clamping position of the clamping lever is too low, turn the Allen key in a counter-clockwise direction.

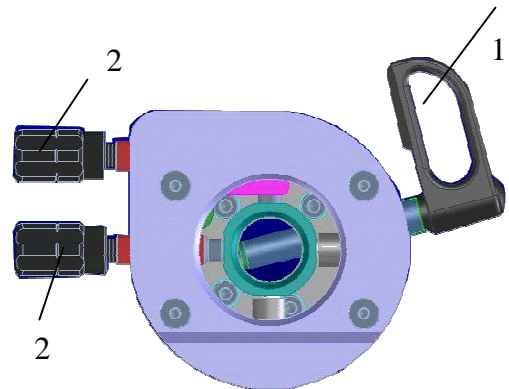


Fig. 12

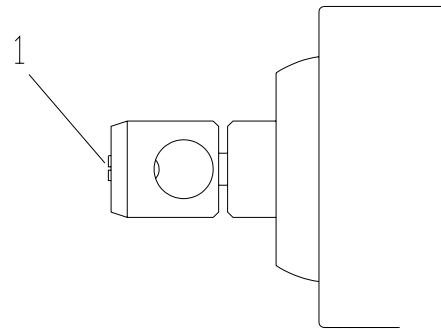


Fig. 13

3-9 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.

3-9-1 UNIVERSAL CASSETTE CLAMP

The universal cassette clamp (fig. 14) represents a quick change system.

- To insert or remove the cassette from between the fixed (fig. 14.1) and movable (fig. 14.2) jaws, pull the lever (fig. 14.3) to the front (in the direction of the arrow).



Note:

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

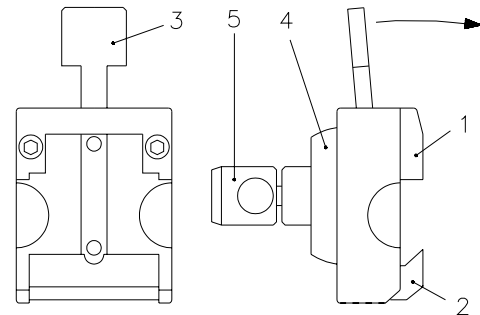


Fig. 14

3-9-2 UNIVERSAL CASSETTE CLAMP, ADJUSTABLE

- To insert and/or remove cassettes between the fixed jaw (fig. 15.1) and the movable jaw (fig. 15.2), move the lever (fig. 15.3) upwards.
- To adjust the size to a cassette size which is not according to the norm, use the nut (fig. 15.4).

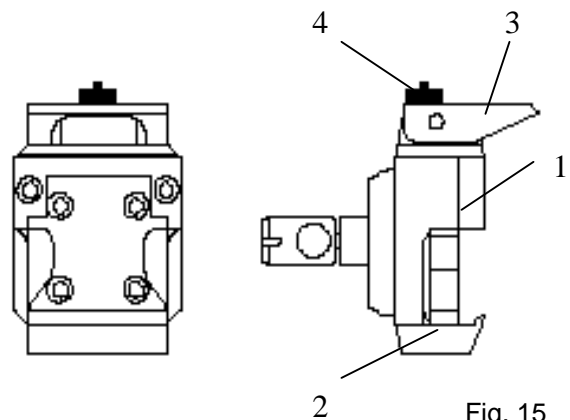


Fig. 15

3-9-2 STANDARD SPECIMEN CLAMP

The standard specimen clamp (fig. 16) is used for rectangular and square paraffin and plastic blocks.

- Insert the specimen against the fixed jaw (fig. 16.2) first.
- Then turn the knob (fig. 16.3) to tighten jaw (fig. 16.1).
- Fig. 16.4 and 16.5 show the orienting adapter, fig. 16.6 indicates the four holes for the fastening screws.



Note:

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

The standard specimen clamp is supplied with two movable jaws, which are different in weight.

- The lightweight jaw is used in addition with inserts for round specimens.
- The heavier jaw is intended to be used together with the standard specimen clamp with no other holding elements.
- To exchange the clamping jaw, unscrew the clamping screw (fig. 16.3) to remove the jaw and replace it with the other one.

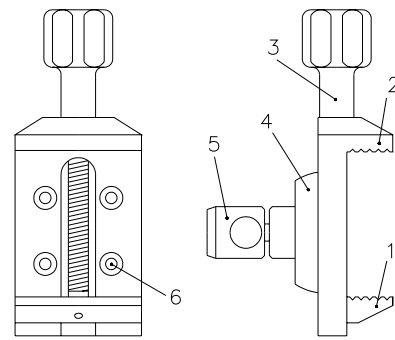


Fig. 16

3-9-3 INSERT FOR ROUND SPECIMEN, V-INSERT AND V-DISTANCE PIECE

To cut round specimens, the insert for round specimens (fig. 17.A) with defined diameters of 6, 15 and 25 mm (special sizes on request) or the V-insert (fig. 17.B) can be clamped into the standard specimen clamp.

- The pin (fig. 17.3), which fits into the lower clamping jaws (fig. 16.1), positions the insert precisely. The two springs (fig. 17.4) make it easy to remove the specimen from the inserts (fig. 17.1 and 17.2).
- To fasten the V-distance piece (fig. 17.C) on the fixed jaw (fig. 16.2) of the standard specimen clamp, the clamping screw (fig. 16.3) must be unscrewed from the spindle. Pull the spindle off the clamp.
- After having inserted the V-distance piece, insert the spindle again as well as the clamping screw (fig. 16.3).

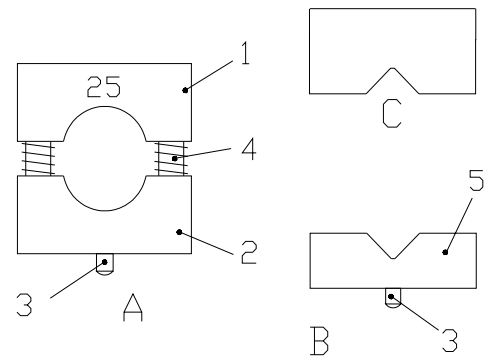


Fig. 17

3-9-4 FOIL CLAMP

The foil clamp (fig. 18) is a clamping system for foils or thin specimens.

- To insert the specimen, loosen the three clamping screws (fig. 18.5) slightly and push the movable jaw (fig. 18.2) sideways against the two springs (fig. 18.3).
- The specimen is kept in place by the springs, however, its position can be changed. Turn the three clamping screws (fig. 18.5) to clamp the specimen tightly.
- When using an orienting adapter with the instrument, first insert the enclosed graduated ring into the orienting adapter by means of the pin. With the graduated ring the orientation in X-/Y-direction is annulled.
- However, it is possible to turn in Z-axis 60° in either direction.
- Then insert the foil clamp.
- According to the various specimens, it might be helpful to use in addition MICROM's sandwich supporting material (cat. no. 176010) on the right and left side between specimen and clamping jaw.

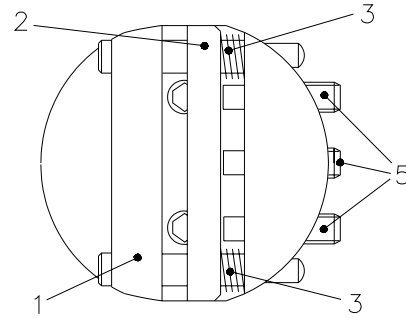


Fig. 18

3-10 KNIFE CARRIERS



Hazard of hand injuries:

Due to moving parts in connection also with the microtome knife, a danger area arises, which might lead to hand injuries in case of non-compliance with the safety features of the microtome and when disregarding the instruction manual.

The knife carriers of the microtome are easy to use, can be moved sideways and are equipped with knife guards for user safety while adjusting knife and specimen.

3-10-1 DISPOSABLE BLADE CARRIER ER

The disposable blade carrier ER is designed to take all commercially available high and low profile blades.

Using low profile blades:

- Insert the blade into the slot behind the clamping plate (fig. 19.5).
- For this, turn the clamping lever (fig. 19.7) towards the front. Swing the bracket with scale (fig. 19.4) to the front.
- Loosen the clamping lever (fig. 19.7) and, if necessary, slightly push the lower part of the clamping plate (fig. 19.5) as well.
- Insert the blade on the rail (fig. 19.3) and push it from the side to the middle.
- Afterwards, return the clamping lever (fig. 19.7) upright, thus locking the blade in position.
- The bracket (fig. 19.4) is provided with a scale.
- After loosening the clamping lever (fig. 19.2) and after having moved the bracket (fig. 19.4) upwards, move the blade together with the entire upper part without having to loosen the blade clamping.
- This way, the entire cutting length of the blade can be used.
- Then tighten the clamping lever (fig. 19.2).
- The lever (fig. 19.2) can be removed by pulling it off towards the side.

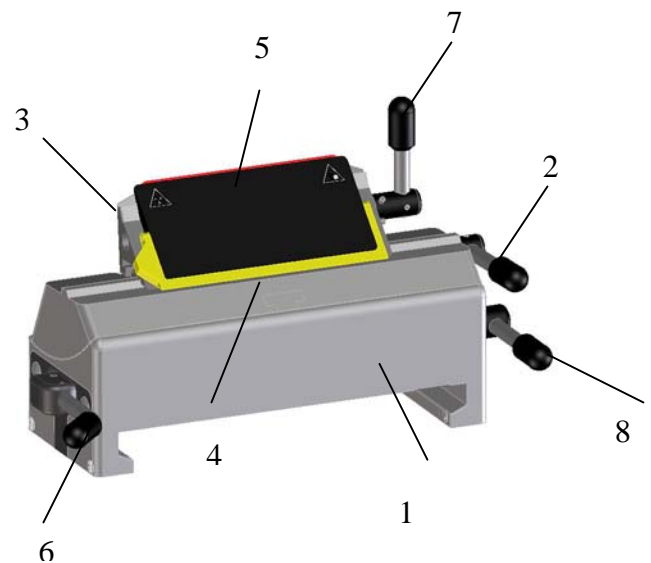


Fig. 19

Using high profile blades:

When using high profile blades, first remove the spacer strip (fig. 19.3).

- For this, turn the clamping lever (fig. 19.7) to the front until the stop.
- Then press the stop pin into the knife carrier and further turn the clamping lever (fig. 19.7).
- Pull off the clamping lever (fig. 19.7) and remove the clamping plate (fig. 19.5).
- Remove the spacer strip (fig. 19.3).
- Insert the clamping plate and clamping lever again.
- Push the stop pin into the knife carrier and turn the lever into an upright position.

Clearance angle adjustment:

- The clearance angle between cutting edge and specimen can be shifted and adjusted to the respective requirements of the tissue to be sectioned.
- Loosen the clamping lever (fig. 19.8) on the right side of the knife carrier and move the upper part (fig. 19.9) of the knife carrier on the base (fig. 19.1).
- The adjusted clearance angle can be read on the scale.
- Then turn the clamping lever (fig. 19.8) upwards to lock in the new clearance angle.
- The clamping lever for the angle adjustment can be pulled off after a correct angle setting to avoid that the angle is "reset" unintendedly.

**Note:**

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

Moving the knife carrier on the console:

- Loosen the clamping lever (fig. 19.6) on the left side of the knife carrier, to move the carrier forwards and backwards on the dovetail guide.
- This allows a rough adjustment of knife to specimen.

Protection against injury:

- A bracket (fig. 19.4) on the clamping plate can be moved upwards over the blade for the protection against injury.

3-10-2 DISPOSABLE BLADE CARRIER E

Inserting the blade:

- The disposable blade carrier E is designed to take all commercially available high and low profile blades.
- Insert the blade (fig. 20.5).
- When using high profile blades, first loosen the two screws (fig. 20.9) and remove the spacer strip (fig. 20.3).
- Turn the clamping lever (fig. 20.7) to the front.
- Swing the bracket with scale (fig. 20.4) to the front.
- Loosen the clamping lever (fig. 20.7) and, if necessary, slightly press the lower part of the clamping plate as well.
- A small gap between rail (fig. 20.3) and clamping plate (fig. 20.5) can be seen.
- Insert the blade on the rail (fig. 20.3) and push it from the side to the middle.
- Afterwards, return the clamping lever (fig. 20.7) upright, thus locking the blade in position.
- The bracket (fig. 20.4) is provided with a scale.
- After loosening the clamping lever (fig. 20.7) and after having moved the bracket (fig. 20.4) upwards, move the blade together with clamping plate (fig. 20.5) according to the scale by means of the knife guard to the left or right side.
- This way, the entire cutting length of the blade can be used. Then press the clamping lever (fig. 20.7) upwards.
- The levers (fig. 20.7 and 20.3) can be removed by pulling them off towards the side.
- The lever (fig. 20.7) can also be used on the left side. This way, the blade can be clamped with the left hand.

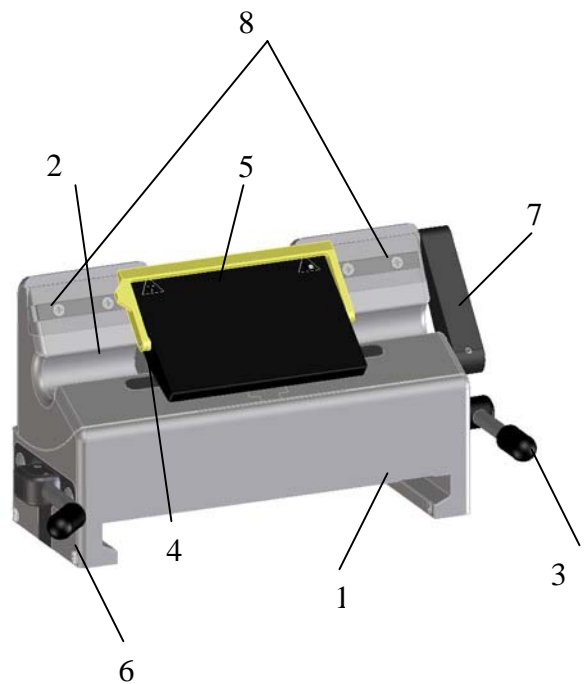


Fig. 20

Clearance angle adjustment:

- The clearance angle between cutting edge and specimen can be shifted and adjusted to the requirements of the tissue to be sectioned.
- Loosen the clamping lever (fig. 20.3) on the right side of the knife carrier and move the upper part of the knife carrier (fig. 20.2) on the base (fig. 20.1).
- The adjusted clearance angle can be read on the scale.
- Then turn the clamping lever (fig. 20.3) upwards to lock in the new clearance angle.



Note:

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

- If the clamping lever (fig. 20.3) is loosened, the upper part of the knife carrier can be moved 1 cm to the left or right side.
- This way, the cutting edge can optimally be used.
- The clamping lever for the angle adjustment can be pulled off after a correct angle setting to avoid that the angle is "reset" unintendedly.

Moving the knife carrier on the console:

- Loosen the clamping lever (fig. 20.6) on the left side of the knife carrier, to move the carrier forwards or backwards on the dovetail guide.
- This allows a rough adjustment of the knife to the specimen.

Protection against injury:

- A bracket (fig. 20.4) on the clamping plate can be moved upwards over the blade for the protection against injury.

3-10-3 KNIFE CARRIER C

Inserting the knife:

- To insert the knife, the clamping screws (fig. 21.3) must be unscrewed slightly so the knife can be pushed in from the side.
- The height of the knife is adjusted with the two knurled nuts (fig. 21.6) and the bar (fig. 21.7).
- If the cutting zone of the knife cannot be used anymore, it can be moved over its entire length to the left and right side by loosening the clamping screws.
- This allows an optimal use of the entire knife edge.



Caution:

When clamping the knife, please tighten the two clamping screws (fig. 21.3) simultaneously.

Clearance angle adjustment:

- The clearance angle between cutting edge and specimen can be shifted and adjusted to the requirements of the tissue to be sectioned.
- Loosen the clamping lever (fig. 21.4) on the right side of the knife carrier and move the upper part of the knife carrier (fig. 21.2) on the base (fig. 21.1).
- The adjusted clearance angle can be read on the side scale.
- Then turn the clamping lever (fig. 21.4) upwards to lock in the new clearance angle.
- The clamping lever for the angle adjustment can be pulled off after a correct angle setting to avoid that the angle is "reset" unintendedly.



Note:

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

- If the clamping lever (fig. 21.4) is loosened, the upper part of the knife carrier can be moved 1 cm to the left or right side.
- This way, the cutting edge can optimally be used.

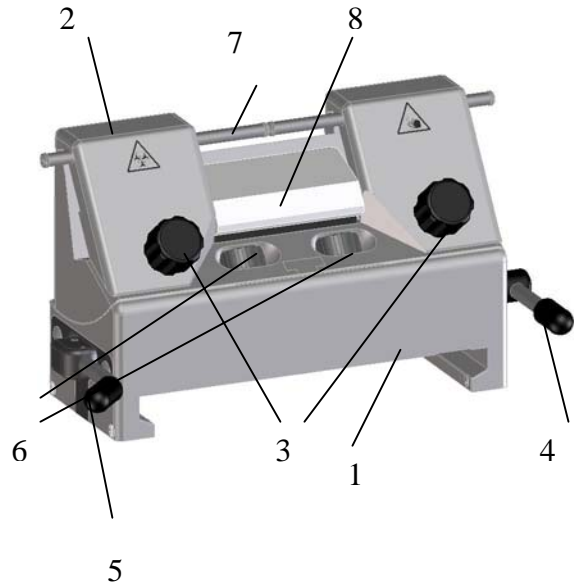


Fig. 21

Moving the knife carrier on the console:

- Loosen the clamping lever (fig. 21.5) on the left side of the knife carrier to move the carrier forwards and backwards on the dovetail guide.
- This allows a rough adjustment of knife and specimen.

Protection against injury:

- The knife carrier is equipped with two knife guards (fig. 21.7) which can be moved sideways.
- These knife guards should be pushed together in the middle while adjusting knife or specimen.
- This reduces the danger of injury considerably.

Central clamping plate:

- The knife is clamped and stabilized in the cutting zone by the central clamping plate (fig. 21.8) - exactly where the highest cutting forces are applied.

Two types of clamping plates are available for the knives:

clamping plate c for c-knives,
clamping plate d for d-knives.

Fig. 22 shows schematically the angles on the cutting edge profiles of c- and d-knives.

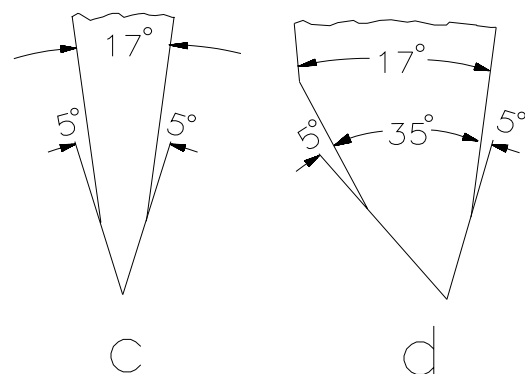


Fig. 22

3-10-4 READJUSTING KNIFE CARRIERS

Frequent use of the clamping levers can lead to the fact that the knife carriers cannot be clamped optimally anymore. If the necessary readjustments are not carried out, it might even be possible that the knife carriers cannot be clamped anymore.

- If the clamping lever does not allow a sufficient clamping, the clamping can be adjusted as follows:
- For this, loosen the set screw (fig. 24.1) on the lower side of the knife carrier.
- Insert a pin into one of the holes of the brass screw (fig. 24.2) and turn the brass screw.
- When the clamping is to be strengthened, turn the brass screw (fig. 24.2) to the right side.
- When the clamping is to be loosened, turn the brass screw to the left side.
- Before inserting the knife carrier again, first tighten the set screw (fig. 24.1).
- Afterwards, push the knife carrier onto the consoles and check the clamping function.
- If necessary, repeat the above-mention process.

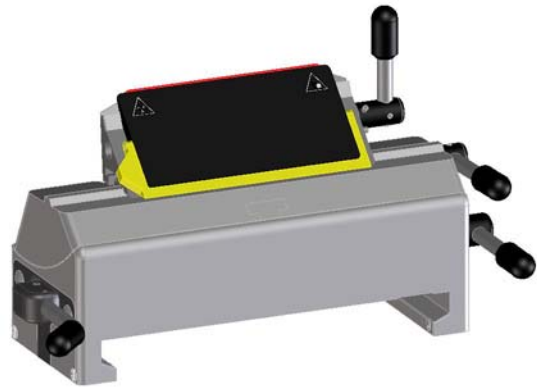


Fig. 23

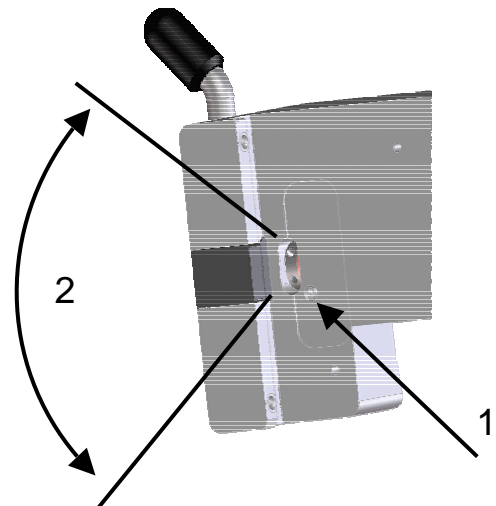


Fig. 24

3-11 SECTION WASTE TRAY WITH INTEGRATED ARM REST

The section waste tray with integrated arm rest can easily be cleaned.

- The section waste tray surrounds the knife carrier area and allows non-tiring working with the microtome.
- It can be easily removed to the front at any time.

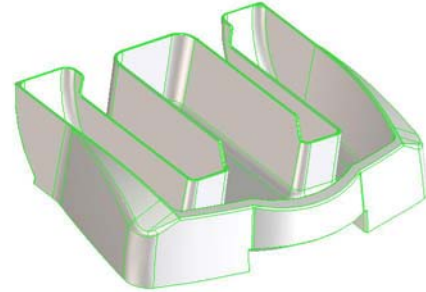


Fig. 25

3-12 LARGE FIELD MAGNIFIER

The large field magnifier (fig. 26.1) is for looking at section production.

- The light is connected to the power outlet with the power cord (fig. 26.2) and turned on and off with the switch (fig. 26.3).



Caution:

Before using the large field magnifier for the first time, please check if the voltage conditions at the installation site comply with the power requirements and frequency mentioned on the supply unit of the magnifier.

Installing the large field magnifier on the microtome:

- Please use the enclosed fastening elements to attach the magnifier to the microtome.
- Remove the cover plate on the upper side of the instrument hood.
- Remove the front plastic caps from the upper side of the housing.
- If there are no drilled holes in the housing, it must be replaced with a new one with drilled holes.
- Fasten the peg (fig. 26.4) to the plate (fig. 26.6) with the screw (fig. 26.7).
- Carefully introduce the four sleeves (fig. 26.8) into the drilled holes with the screws (fig. 26.5).



Warning:

Please note that the sleeves do not fall into the interior of the microtome!



Note:

Make sure the plate (fig. 26.6) is mounted in a way that the peg (fig. 26.4) is closer to the front of the microtome!

- Put the plate (fig. 26.6) on the sleeves and fasten it to the microtome with four screws (fig. 26.5).
- A movable plastic socket that should be put on the peg (fig. 26.4) is on the under side of the magnifier.
- The magnifier can be adjusted forwards and backwards for the most favorable viewing position.
- If the large field magnifier is not used, slightly raise it and turn it sideways on the peg.

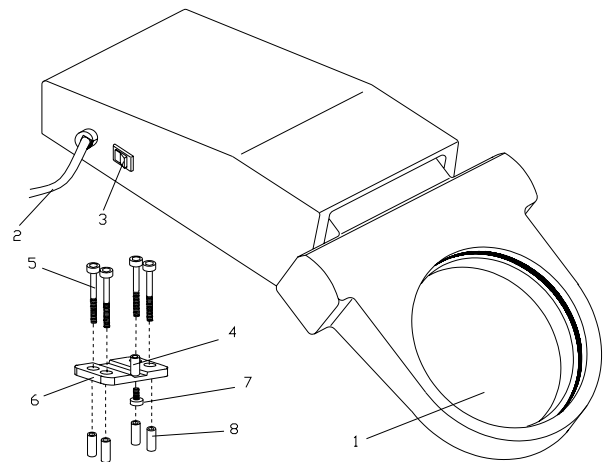


Fig. 26

PART 4 WORKING WITH THE MICROTOME



Hazard of hand injuries:

Due to moving parts in connection also with the microtome knife, a danger area arises, which might lead to hand injuries in case of non-compliance with the safety features of the microtome and when disregarding the instruction manual.

4-1 SECTIONING INSTRUCTIONS

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

Condition of the knife edge:

- Only use a sharp knife!
- If the cutting 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.
- For optimal sectioning, front and back of the knife must be clean.
- Especially paraffin waste must be removed thoroughly!

Setting the cutting angle:

Inclination of the knife in relation to the block surface

Each microtome knife has a so-called facet cut resulting from the fact that when producing a knife or when resharpening the blade, the rear side of knife is increased in order not to cut down the entire knife surface. This way, two facet surfaces are generated on the blade forming a larger angle between themselves compared with the main surfaces of the knife.

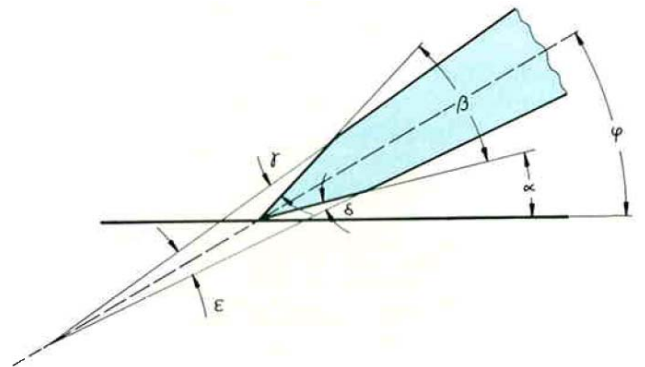


Fig. 27

According to DIN 6581, there are following angles on a microtome knife:

1. clearance angle α
2. wedge angle β
3. upper sharpening angle γ
4. lower sharpening angle δ
5. blade angle ϵ
6. angle of inclination φ

During practical work the angle of inclination is our so-called clearance angle, i.e. the angle between lower facet surface and block surface. The optimal inclination slightly differs for each knife, as the wedge angles as well as especially the facet angles on the individual knives are not absolutely identical.

The knife must never be placed too flat. This way, the blade does not cut into the block at all. Only the rear side slides over the sectioning surface (see opposite figure).

An inclination, which is too steep, is also unfavorable as the knife might vibrate too much while sectioning. The so-called "chatters" appear on the block surface as well as on the sections. These chatters are parallel stripes in relation to the knife edge having negative effects on the microscopical evaluation of sections.

Between these two limit cases, the correct knife inclination must be determined. A clearance angle between facet angle and block surface of approx. 5° is normal.



Caution:

Different microtome producer use different scalings for their clearance angle adjustment, resulting from different calculation bases. The clearance angle might refer to the facet surface or to the angle between knife main surface and block surface. As the facet has a divergence from the knife main surface of approx. 5° , the difference is approx. 5° . Set the correct angle on MICROM instruments at 10° .

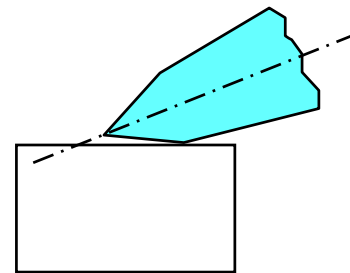


Fig. 28

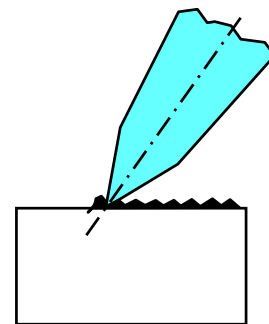


Fig. 29

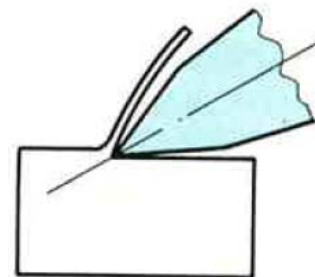


Fig. 30

4-2 HOW TO AVOID MALFUNCTIONS

Specimen preparation:

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

Specimen temperature:

- 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.

Tightening the clamping screws:

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

Selection of the knife:

- Carefully select the required knife material and profile.

Adjustment of the knife:

- Take care to adjust the proper clearance angle of the knife: 5 - 7° for glass knives. For diamond knives ask the knife manufacturer.
- Select a clearance angle adjustment of 5 - 15° according to the facet angle. Typically, adjust an angle of 10 - 12 °.
- Take care to adjust knife height.

Cutting speed:

Take care to select proper cutting speed.

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

Trimming:

- Take care in bringing knife and specimen together.

4-3 POSSIBLE SOURCES OF ERRORS – CAUSE AND REMOVAL

Problem	Cause	Removal
Thick-thin-sections	<ul style="list-style-type: none"> - Blunt knife/blade. - Knife angle, therefore, unfavorable clearance angle. - Insufficient clamping on specimen clamping and/or knife carrier. 	<ul style="list-style-type: none"> - Move knife and/or insert a new one. - Try clearance angle adjustments, until an optimal angle can be found. - Check all screw and clamping connections on specimen clamping and knife carrier. Tighten them, if necessary.
Compressions	<ul style="list-style-type: none"> - Blunt knife/blade. - Specimen too warm. - Unfavorable clearance angle. - Cutting speed too high. 	<ul style="list-style-type: none"> - Move knife and/or insert a new one. - Cool specimen - Try clearance angle adjustments until an optimal angle can be found. - Turn handwheel slower.
"Chatter" on sections	<ul style="list-style-type: none"> - Cutting speed too high. - Unfavourable clearance angle. - Insufficient clamping on specimen clamping and/or knife carrier. 	<ul style="list-style-type: none"> - Turn handwheel slower. - Try clearance angle adjustments until an optimal angle can be found. - Check all screw and clamping connections on specimen clamping and knife carrier. Tighten them, if necessary.
No feed is carried out anymore, and therefore, no sections are produced.	<ul style="list-style-type: none"> - Front end position has been reached. - Coarse feed wheel is blocked. 	<ul style="list-style-type: none"> - Move specimen backwards by turning the coarse feed wheel. - Remove blockade on coarse feed wheel.
Tight handwheel - partly - during the entire movement	<ul style="list-style-type: none"> - Debris and section waste between microtome and base plate. - Dirty link block. 	<ul style="list-style-type: none"> - Remove section waste and clean microtome. - Contact a service technician.

**Note:**

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

PART 5 MAINTENANCE AND CARE

5-1 CLEANING AND CARE

Cleaning and care of the microtome should be carried out daily.

- Lock the handwheel.
- Remove the knife from the knife carrier. Clean it and store it in a knife case!
- Remove section waste by using a dry brush.
- Pull the section waste tray towards the front and dispose of the section waste according to your specific lab regulations.



Caution:

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

- Loosen the clamping lever on the left side of the knife carrier and pull the knife carrier towards the front.
- Clean the operating controls and the surfaces of the knife carrier, especially the space where the knife carrier is installed.
- Clean the consoles, handwheel, coarse feed wheel, specimen clamping system, specimen orientation as well as the base plate and housing.



Note:

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



Warning:

When getting in contact with cleaning agents or paraffin repellents, e.g. Para Gard, the surface of the cover ribbon behind the specimen clamping might be affected. For this reason, please note that the cover ribbon does not get in contact with these agents when cleaning the housing, knife carrier or the base plate.

- Before starting sectioning, instrument, knife carrier and section waste tray should be treated with a commercially available paraffin repellent.



Note:

This medium considerably reduces the adhesive force of paraffin waste on the individual parts of the microtome.

5-2 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.

Battery for the section counter

This battery should be changed by a service technician after 5 years.

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.



Note:

We strongly recommend to not carry out repair by yourself. All warranties and guarantees would then be null and void! Repair work must only be carried out by an authorized service technician.

5-3 REPLACEMENT WORK

- This battery should be replaced by a service technician after 5 years.

PART 6 CONDITIONS FOR THE TRANSPORTATION OF THE INSTRUMENT

6-1 RETURNING THE INSTRUMENT FOR REPAIR OR ROUTINE MAINTENANCE

Repair or maintenance work are normally carried out at the site of installation. If this is not possible for some specific reasons, the instrument can be returned to MICROM. The contact address can be found at the beginning of this instruction manual.

- To guarantee a trouble-free function of the instrument after transportation, please note the below-mentioned measures for transportation preparations.
- In addition, the conditions for storage and transportation as mentioned in part 2-3 must be observed during the entire transportation.



Biohazard:

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

Measures for taking out of operating:

- Lock the handwheel.
- Remove knife or blade and store it in a safe way.
- Remove the section waste tray.

In case the instrument or parts of the instruments are sent to MICROM or to one of its representatives in such a condition that there might be a potential danger of infection, the instrument and/or the part(s) will be returned to the customer in a non-repaired status. Costs for this are to be borne by the customers.

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

- Lock the handwheel.
- Remove knife or blade and store it in a safe way.
- Remove section waste tray.

- To lift the instrument, use the two recessed grip on the lower side of the instrument. During transportation, do not carry the instrument on the handwheel handles. Danger of being injured!
- Pack the instrument into the original packing as it offers best pre-conditions for transportation without damage.



Note:

If the original packing is no longer available, please contact your local MICROM representation.

6-2 DISPOSAL OF THE INSTRUMENT AFTER FINAL SHUTDOWN

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