



**THERMO SCIENTIFIC  
MICROTOME WITH VIBRATING BLADE  
MICROM HM 650 V**

**INSTRUCTION MANUAL**

# Thermo Scientific Microtome with vibrating blade Microm HM 650 V

**CERTIFICATION**

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

The instrument complies with applicable international safety regulations.

**WARRANTY**

This 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 Thermo Fisher Scientific 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. Thermo Fisher Scientific 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 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:	387751
English:	387752
French:	387753
Spanish:	387754

**INTENDED USE**

*Dear Customer,*

Thank you for buying this instrument.

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

The instrument must only be used according to the instructions in this manual. Any other usage is considered to be an improper operating process.

The Microm HM 650 V microtome is a highly efficient microtome with a horizontally oscillating blade for semi manual as well as fully automated sectioning of mainly neuronal tissue.

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

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**Ser. No.:** .....

Please check the 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.

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## SAFETY PRECAUTIONS

### **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. Thermo Fisher Scientific 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 protective earth. The instrument is equipped with a three wire ground plug. The power outlet must be connected to the protective earth and must meet the International Electrotechnical Commission (IEC) regulations.

### CAUTION: MAINS VOLTAGE

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

### DANGER IN EXPLOSIVE ENVIRONMENT

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

### HAZARD OF FROSTBITE

Avoid permanent touching of metal parts of the pre-cooled cooling element as frostbite may occur at unprotected hands and arms.

### HAZARD OF RADIOACTIVE RADIATION



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

## HAZARD OF INFECTION



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

## 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.

## 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.

## CARE IN USING MICROTOME KNIFE



Be careful when inserting the blade and/or knife into the blade and/or knife carrier.

When inserting the chuck into the buffer tray and when fixing the buffer tray on the microtome, always remove the blade and/or knife from the microtome first.

Before changing the knife holder, always remove blade or knife! Unused knives should always be kept in a knife case. Never place the knife with the cutting edge upwards. Never try to catch a dropping knife!! Never check the sharpness of the cutting edge with your fingers. The cutting edge is extremely sharp!

## WASTE DISPOSAL

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



## SAFETY PRECAUTIONS

### WARNING SIGNALS AND SYMBOLS

The installation and routine use of the HM 650 V Series is easy and safe if the instructions in this manual are being observed.



**Note:**

Special instructions regarding operation of the instrument.



**Warning:**

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



**Caution – general danger spot:**

The 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.



**Separate taking back of electrical and electronic instruments in the countries of the European Union:**

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

This product, being an electro and/or electronic instrument, must be treated separately within the waste management process (WEEE).

Thermo Scientific Microtome with vibrating blade Microm HM 650 V

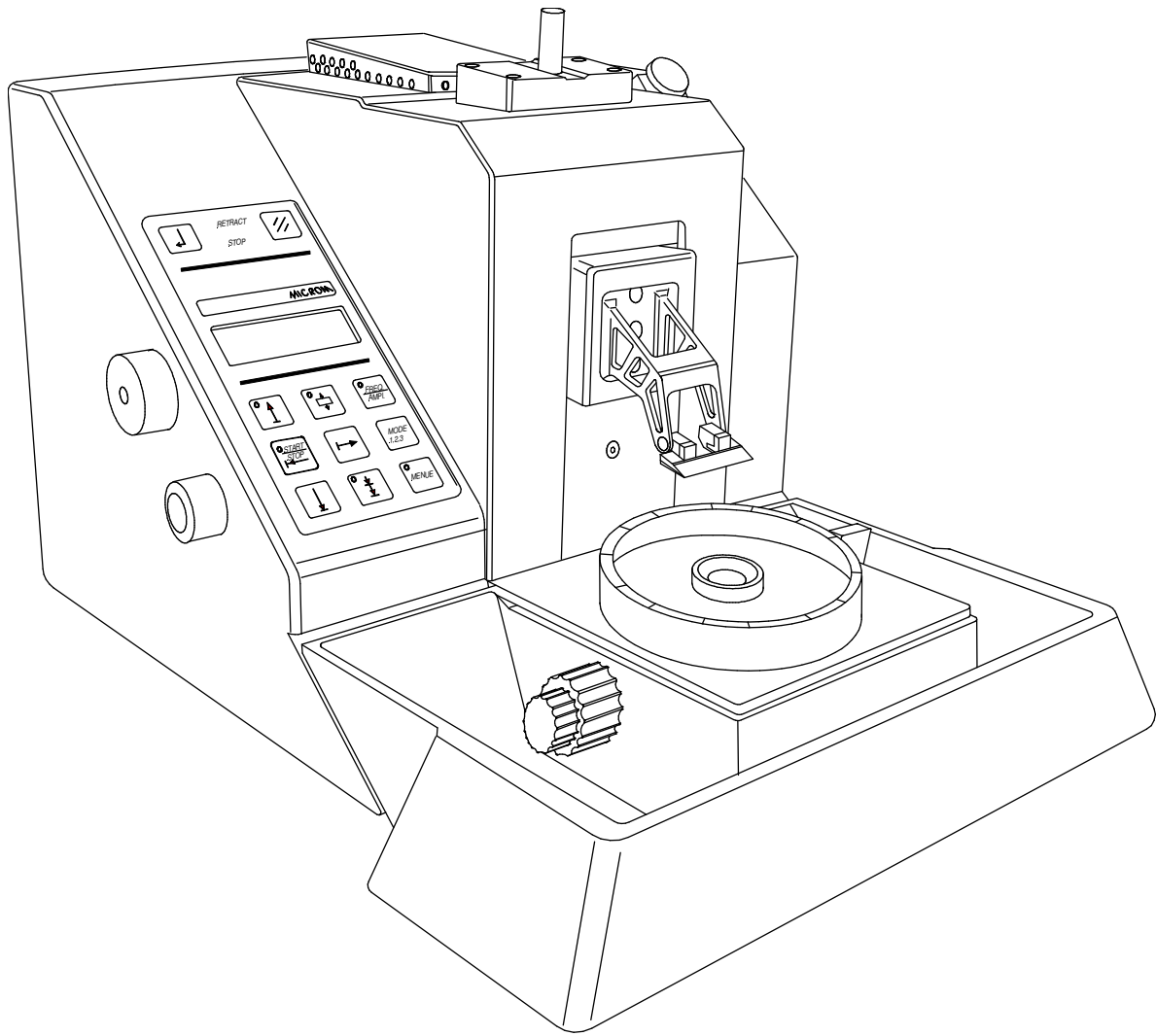


Fig. 1

## PART 1 INTRODUCTION

### 1-1 DESCRIPTION MICROTOME WITH VIBRATING BLADE HM 650 V

The HM 650 V from **Thermo Fisher Scientific Microm International GmbH** is a microtome with horizontally oscillating blade for the semi manual as well as fully automated sectioning of mainly neuronal tissue, such as spinal cord and brain and other specimens.

Both fixed tissue (alcohol, paraformaldehyde and formaldehyde fixation) and freshly extracted tissue can be cut as "living" tissue. It is not necessary to embed the tissue in e.g. paraffin and/or freeze the tissue before cutting it.

With the HM 650 sections can be produced from different materials, which could not have been created by means of a conventional microtome (e.g. sections from foam which cannot be infiltrated).

The user-friendly knife carrier allows for an easy clamping and clearance angle adjustment of the blade.

The clearance angle can be adjusted on the blade seat of the blade carrier by means of a special tool. Due to the three optional adapters of the blade carriers, both razor blades, "single injector" blades and special sapphire knives can be used for sectioning.

Three differently shaped chucks can be used depending on the specimen size.

The chuck is inserted into the central cone of the buffer tray by means of a special tool. The buffer tray is fastened on the microtome by means of an eccentric clamping. The buffer tray is removed from or installed on the microtome while the blade carrier is in its "home" position.

The specimen orientation is placed in the basic part of the microtome. This way, buffer tray including chuck can be oriented in x/y/z-axes.

Both the vertical feed and the retraction movement are realized by only moving the blade carrier. For the protection of the specimen, the microtome is equipped with an automatic, programmable knife retraction. During trimming, the vertical motorized coarse feed with three different settings allows an optimum approach of the knife towards the specimen.

By means of the "memory" function, the blade can automatically be moved towards the specimen at the beginning of the cutting window.

A special, pre-cooled cooling element optimizes the cooling of the buffer solution, amongst all while cutting fresh "living" tissue.

The operating panel with display is solidly integrated on the left side of the microtome. The keyboard is arranged clearly. This allows a safe and user-friendly operation of the microtome.

Both section thicknesses, frequency, amplitude, number of sections, section thickness sum and remaining travel to the front end position, speed of the cutting movement and operation mode are shown on the display of the operating panel.

Basic settings can be altered in the menu, but also complete work settings can be stored and called up again.

A large field magnifier and/or a large field magnifier with cold light source, the histo light guide, a stereomicroscope and the cooling unit CU 65 can easily adapted on the microtome as an option.

User safety is guaranteed via two emergency stop devices (red button, optionally in foot pedal).

## Thermo Scientific Microtome with vibrating blade Microm HM 650 V

**1 - 2**

### TECHNICAL SPECIFICATIONS HM 650 V

Fine and trim section thickness range:	..... 0 - 1500 µm
Resolution of the section thickness range:	for fine sections optionally in ..... 1, 2, 5 or 10 µm-increments for trim sections optionally in .....5, 10, 25 or 50 µm-increments
Cutting frequency:	..... 30 – 100 Hz in 1 Hz-increments
Amplitude:	..... 0,1 – 1,2 mm in 0,1 mm-increments
Cutting speed:	..... 0 – 5 mm/s in 0,1 mm-increments
Speed of return travel:	.....5 mm/s
horizontal cutting range:	.....41 mm
vertical cutting range:	.....max. 25 mm
Retraction of the blade:	..... 0 – 1000 µm in 100 µm-increments
Section counter:	5-digit LC-display, can be reset
Section thickness sum:	5-digit LC-display, can be reset
Remaining travel to front end position:	5-digit LC-display
Max. specimen size:	.....approx. Ø 41 mm
Specimen orientation:	..... 8° in x/y-axes, 360° in z-axis
Cutting drive:	..... motorized, electronically controlled
Operating modes:	..... semi manual, single, continuous stroke
Coarse feed:	..... motorized, gradual and continuous
Speed for coarse feed:	..... can be selected: 400, 800 and 1200 µm/s
Transportation & storage conditions	
Storage temperature range:	-20°C up to +50°C
Operating conditions:	..... +5°C up to +40°C (at a max. rel. humidity of 60%) ..... altitude up to 2000 m M.S.L. ..... for indoor use only
Sound pressure:	..... 59 dB(A) ..... measured with 1 m distance to the instrument ..... floor loading requirements: 135 kg/m <sup>2</sup>
Power requirements:	..... 220...230 V/0,8 A +/-10%/50...60 Hz ..... 240 V/0,8 A +/-10%/50...60 Hz ..... 100 V/1,6 A +/-10%/50...60 Hz ..... 115 V/1,6 A +/-10%/50...60 Hz
Internal protection:	
Secondary circuits:	
Motor control:	.....1 x T0.5AH
CPU:	.....1 x T0.5AH
Stepping motor:	..... 1 x TT2.5AH
Amplifier:	..... 1 x T1.25AH
Supply of vibration device:	.....4 x T1.6AH
Primary circuits:	
For 100...115 V/50...60 Hz	..... T3.15AH
For 220...240 V/50...60 Hz	..... T1.6AH
Pollution degree:	..... 2
Overvoltage category:	..... II
Dimensions:	..... wide 380 mm, deep 520 mm, high 285 mm
Weight:	.....42 kg

## PART 2 OPERATING INSTRUCTIONS

### 2-1 SETTING UP THE MICROTOME

- First remove the accessories from the carton.
- Then lift the microtome out of the carton and remove the packing.
- The recessed grips on the front and rear side of the base plate are used to lift or carry the instrument.



**Warning**

The transportations protections (fig. 2.1) for the integrated knife carrier must not be used to lift or carry the instrument.

- Choose the installation site so that the power switch (fig. 3.3) for separating the instrument from the power supply is accessible any time.



**Note:**

When setting up the instrument, please note that it must be placed solely on an even non-vibrating surface.

- Now remove the separately packed tray for tools and push it on the base plate from the front.
- For this, slightly lift the instrument on the front recessed grip. The tray for tools can now be pushed below the specimen orientation.
- Then install the optional accessories, e.g. large field magnifier and cold light source (see part 2-1-2).



**Note:**

To move or carry the instrument, remove the integrated tray for tools. It can be pulled off towards the front.



**Note:**

In case the instrument has been supplied without foot pedal (optional accessory), please note that the Interlock plug is inserted in the socket for the foot pedal (fig. 3.1). If this plug is not inserted, the emergency stop is activated and the corresponding LED (fig. 20.4) lights up.

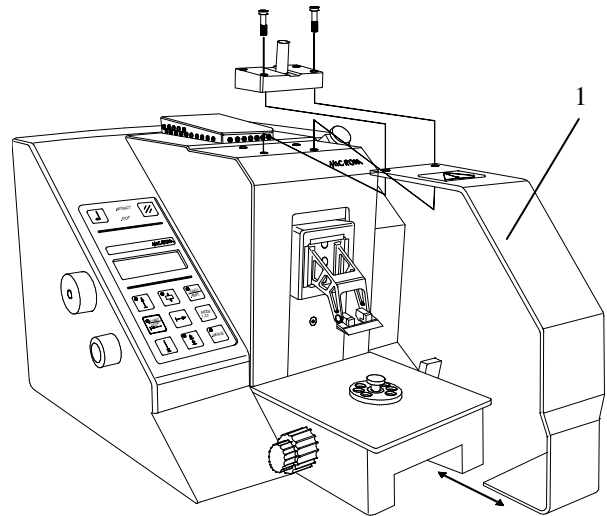


Fig. 2

**2-1-1 STANDARD EQUIPMENT**

The HM 650 V is supplied with the following standard equipment:

Basic unit (w/o large field magnifier and cold light source)

Blade carrier with adapter R

Knife protection for blade adapter R

Cooling element for buffer solution (2 pcs.)

Standard buffer tray

Chuck F (3 pcs.)

Tray for tools

Hexagon head wrench

Tongs for chuck

Setting lever for clearance angle adjustment

Base plate for large field magnifier incl. four screws

Interlock plug for foot pedal socket

Bubble level (small, round water level)

3 x Hex head wrench (standard tools)

2 x Cover caps

1 Package razor blades

Disposable syringes (20 ml)

Bonding agent (20 ml)

Spare screws for fastening the blade adapter (6 pcs.)

Spare screws for fastening the blade seat (2 pcs.)

1 Dust cover

1 Instruction manual

**2-1-2 ADDITIONAL EQUIPMENT (OPTIONAL)**

	Cat. no.:
Adapter I	152510
Adapter S	152520
Adapter R	152530
Adapter CH	152550
Standard buffer tray	648200
Buffer tray PE	648220
<u>Metal chucks:</u>	
Chuck B (biopsy)	715800
Chuck F (flat)	715810
Chuck K (concave)	715820
Chuck FS	715840
<u>Polyethylene chucks:</u>	
Chuck PES	715850
Chuck PE	715830
Foil clamp	715150
Standard specimen clamp	715130
Cooling element for buffer solution	647010
Cyanacrylat glue	350220
Fork for chuck	419230
Blades	152540
Large field magnifier	
220 – 240 V/50 – 60 Hz	760160
100 – 120 V/50 – 60 Hz	760170
Cold light source KL 200	
230 V/50 – 60 Hz	760307
120 V/50 – 60 Hz	760317
Histology fiber optic light guide for KL 200	705020
Stereomicroscope for the direct adaptation on the basic instrument	755050
Stereomicroscope for swivel arm support	705080
Cooling unit CU 65	
220 – 240 V/50 – 60 Hz	770170
110 – 115 V/50 – 60 Hz	770180

## 2-2 INITIAL TURN-ON



**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.

The below-mentioned sequence of the individual steps during the initial turn-on must strictly be observed!

- Connect the 5-lead plug of the foot pedal cable into the outlet and tighten the swivel nut (fig. 3.1).



**Note:**

If the foot pedal is not connected, the instrument is in the operating mode emergency stop. This way, the cutting drive brake is activated and the cutting drive motor cannot be started. Always connect the foot pedal !! In case the foot pedal is not part of the equipment, make sure that the Interlock plug is inserted in the socket (fig. 3.1).

- Connect the power cord to the power socket (fig. 3.2) on the rear side of the instrument.



**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.



**Note:**

The insert for the two fuses is placed beside the power switch. The fuse for motor supply is placed on the left side of the mains plug unit and secures the supply voltage of the cutting drive.

- Turn on the power switch (fig. 3.3) on the rear part of the instrument.
- Now the blade carrier moves automatically upwards and then into its rear end position – the so-called "home" position. The "home" position is the blade position with the longest distance towards the cutting range. Here the LED in the button UP (fig. 20.10) is flashing.

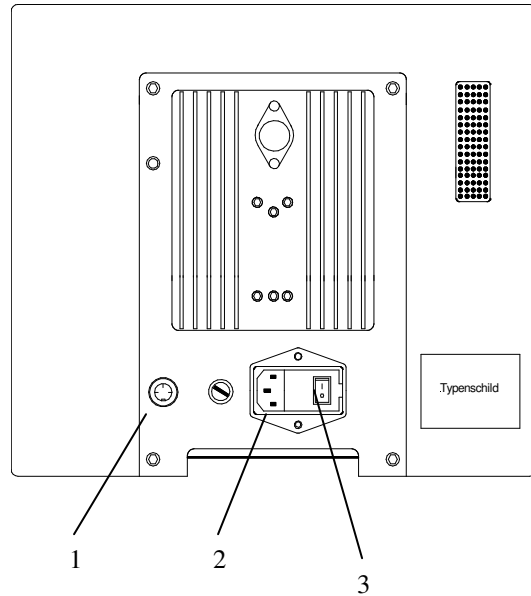


Fig. 3



## 2-3 PREPARATIONS FOR WORKING WITH THE MICROTOME

After having set up the instrument and after the initial turn-on has been carried out, sectioning can be started.

However, the steps described in the following parts must be carried out before actually sectioning.



**Caution:**

The operating sequence of the work steps described in the following parts must strictly be observed.



**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.



**Note:**

The terms shown on the display are available in English, German and French (see part 3-2-3-7).

### 2-3-1 INSERTING THE BUFFER TRAY

After having turned on power switch of the instrument, the blade carrier automatically moves into the so-called "home" position. The LED in the UP button (fig. 20.10) is flashing.

The "home" position is the blade position with the longest distance towards the cutting range. In its "home" position the LED in the UP button (fig. 20.10) is flashing.

During the daily routine press the UP button (fig. 20.10) for more than a second to move the blade carrier into its "home" position.



**Note:**

The blade carrier must be in its "home" position when the buffer tray is placed on the instrument or removed from it.

This way, spilling of buffer solution can be avoided.

- Push the groove of the buffer tray onto the peg-shaped piece of the specimen orientation (fig. 5).



**Note:**

The groove is then in its correct position for pushing it onto the orientation if the eccentric bolt of the buffer tray shows to the right side. When removing the buffer tray from the microtome, the eccentric bolt must also be placed on the right side directly above the clamping lever of the specimen orientation (fig. 4).

- Pull off the grip of the eccentric bolt of the buffer tray (fig. 4).
- When the eccentric bolt is pulled off, completely insert the buffer tray onto the specimen orientation.
- Turn the eccentric bolt in a clockwise or in a counter clockwise direction to fix the buffer tray on the specimen orientation.
- However, the buffer tray can be moved by 330° in z-axis. In x/y-axes it can be aligned together with the specimen orientation 8° in each direction (see 2-3-5).
- Now the cooled buffer solution and the cooling element can be inserted into the buffer tray.



**Caution:**

Microtome blades are extremely sharp. When removing the buffer tray after sectioning, always remove the blade from the blade carrier first.

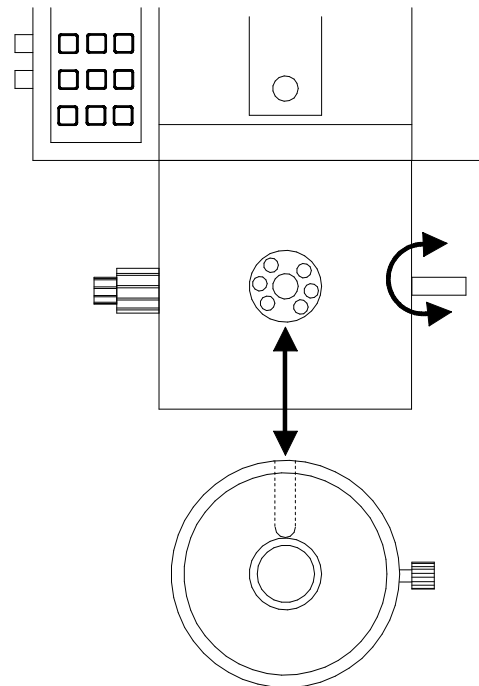


Fig. 4

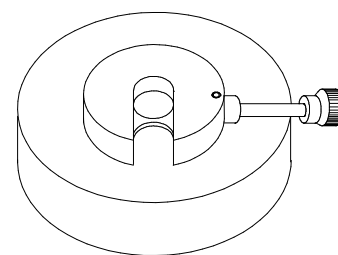


Fig. 5

### 2-3-1-1 INSERTING THE FOIL CLAMP AND THE STANDARD SPECIMEN CLAMP

The foil clamp (fig. 6, cat. no. 715150) as well as the standard specimen clamp (fig. 7, cat. no. 715130) can be used for special applications. These specimen clamps are mainly used for industrial specimens, such as foams and plastic materials as well as for botanic tissue, such as very small stems, leaves and roots.

To be able to insert these specimen clamps into the specimen orientation of the base plate (fig. 4), the following work steps must be carried out first:



**Note:**

The following work steps can only be carried out without collisions, if the blade carrier is in its "home" position.

- First turn, loosen and pull off the clamping lever (fig. 19.3).
- Then remove the specimen orientation on the peg-shaped piece (fig. 19.4) from the base plate with an upward movement.
- Afterwards, foil clamp and standard specimen clamp can be inserted into the base plate.



**Note:**

The hole in the peg of the specimen orientation must be aligned according to the guidance of the clamping lever (fig. 19.3). If the clamping lever cannot be inserted into the base plate from the right side or if the grip of the eccentric bolt (when it is clamped) is not in the desired position, the specimen clamp must be re-adjusted. The optimal position of the grip is achieved, if it is in an almost upright position. (Please see part 2-3-1-2).

- Insert the eccentric bolt of the specimen orientation from the right side into the base plate and thus also through the clamping shaft (fig. 7.6) of the corresponding clamp until the stop.

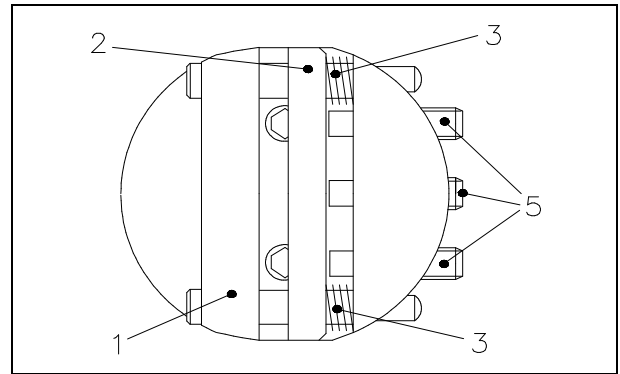


Fig. 6

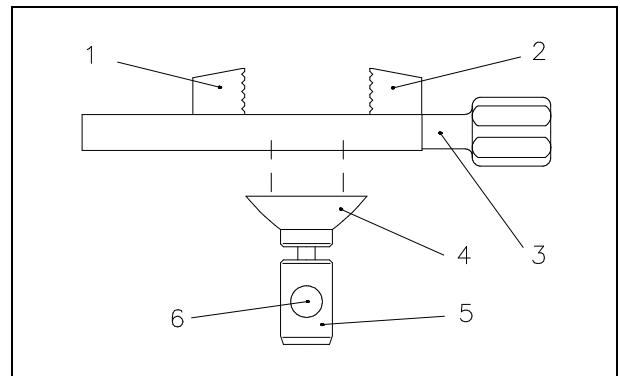


Fig. 7

### Clamping the specimen into the foil clamp:

- To insert the specimen, loosen the three clamping screws (fig. 6.5) slightly and push the movable jaw (fig. 6.2) sideways against the two springs (fig. 6.3).
- The specimen is kept in place by the springs. For a new alignment its position can be altered. Turn the three clamping screws (fig. 6.5) to fix the specimen in its position.



**Note:**

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.

### Clamping the specimen into the standard specimen clamp:

- Insert the specimen against the fixed jaw (fig. 7.2). Then turn the knob (fig. 7.3) to tighten the jaw (fig. 7.1).
- Fig. 7.4 and 7.5 show the orienting adapter.



**Note:**

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

- After having oriented the corresponding specimen clamp (please see part 2-3-5), fix the clamp in its position by turning the eccentric bolt.

### 2-3-1-2 READJUSTING SPECIMEN CLAMPS

Frequent use of the clamping lever 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 anymore by means of the clamping lever.



**Note:**

The clamping lever should be in an almost upright position.

- For this, loosen the screw (fig. 8.2) on the orienting adapter (fig. 8.3) by means of an Allen key (size 1,5).
- Insert a small pin into the hole of the link (fig. 8.1). This pin guarantees that the adapter part (fig. 8.3) can be turned without turning the link.
- Turn the adapter part 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 in a counter-clockwise direction, if the lever can be pressed too far backwards.
- Then insert the specimen clamp again and check the clamping position.
- If necessary, repeat above-mentioned process again.

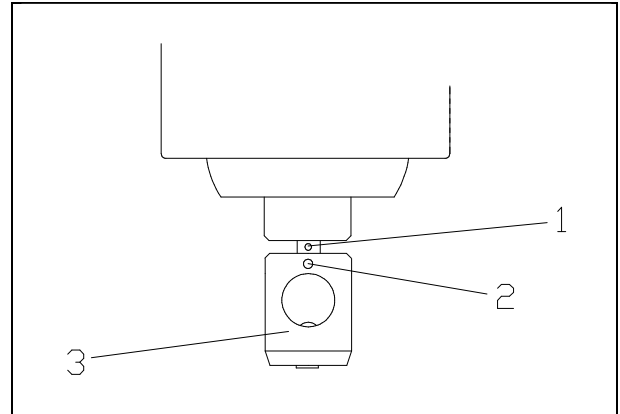


Fig. 8

### 2-3-2 COOLING OF THE BUFFER SOLUTION

A cooling element (fig. 9) is used to cool the buffer solution as well as the tissue specimen inside the buffer tray

However, the cooling element must be placed in the freezer to pre-cool and thus "charge" it.



**Caution:**

Contact with extremely cooled pieces or surfaces might lead to freezer burns on unprotected hands and arm. For this reason, please take appropriate safety measures, e.g. wear protective gloves.



**Note:**

The buffer tray, which is to be used, should be pre-cooled and the cooling element should be at a temperature of  $-20^{\circ}\text{C}$ . The buffer solution should also be at a low temperature (e.g. below  $+5^{\circ}\text{C}$ ).

- Place the pre-cooled cooling element into the buffer tray.
- Fill cooled buffer solution (approx.  $+5^{\circ}\text{C}$ ) into the buffer tray.



**Note:**

We recommend to check the temperature of the buffer solution by means of a suitable thermometer. If the temperature of the buffer solution has risen above  $+5^{\circ}\text{C}$ , the cooling element should be replaced while cutting fresh tissue.

- Now the chuck together with the bonded tissue can be transferred into the buffer tray.



**Note:**

We recommend to fill only 250 ml buffer solution into the tray – not more! Surplus solution can be removed by using the attached syringe.



**Caution:**

Microtome blades are extremely sharp! When removing the cooling element after sectioning, always remove the blade from the blade carrier first.

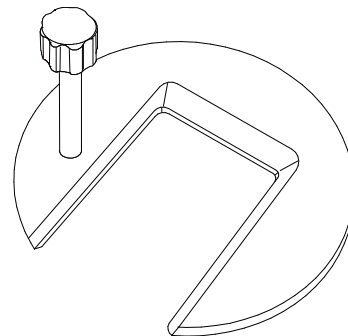
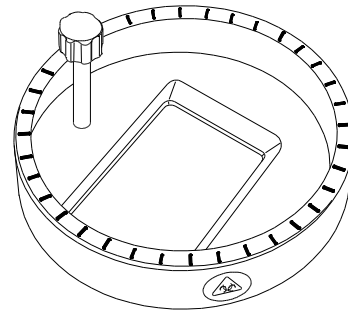


Fig. 9

### 2-3-3 INSERTING THE CHUCK INTO THE BUFFER TRAY

Depending on the application, different chucks can be inserted into the buffer trays. **Chucks made of metal** (B, F, K and FS) as well as **chucks made of Polyethylene** (PES and PE) are available.

#### Metal chucks:



**Note:**

The metal chucks can only be used in combination with the standard buffer tray VN (cat. no. 648200) as the chucks only fit into the central hollow. They are kept in their position via magnetic force.

**Chuck F** (cat. no. 715810) (fig. 10.1) has a flat surface and is used for tissue specimens with an edge length up to approx. 41 mm.

**Chuck B** (cat. no. 715800) (fig. 10.3) has a concave surface with a small, central hollow. This chuck is used for smaller tissue specimens with an edge length of 5 mm.

**Chuck K** (cat. no. 715820) (fig. 10.2) has a concave surface and is used for spherical tissue specimens with an edge length of up to 41 mm.

**Chuck FS** (cat. no. 715850) (fig. 10.4) has a flat surface which rises by 10° in relation to its seat surface in the buffer tray.

#### Polyethylene chucks:



**Note:**

The polyethylene chucks can only be used in combination with the buffer tray PE (cat. no. 715830). Only here, they can be tightened via screws in the central hollow. Thus, they are kept in their position.

**Chuck PE** (cat. no. 715830) (fig. 10.5) has a flat surface and is used for tissue specimens with an edge length of approx. 41 mm.

**Chuck PES** (cat. no. 715850) (fig. 10.6) has a flat surface which rises by 10° in relation to its seat surface in the buffer tray.

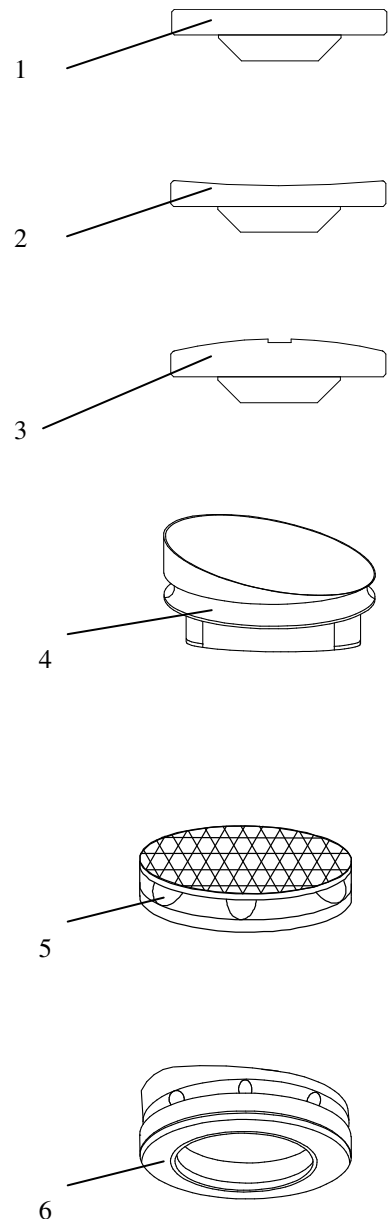


Fig. 10



**Caution:**

General hazard of infection when sectioning fresh tissue! Take appropriate safety measures, e.g. wear a safety mask, protective gloves and cloths.

- If necessary, the specimen must be grossed to the desired size before fastening it with bonding agent.
- Fasten grossed tissue, if possible in the centre of the chuck by using a small amount of bonding agent.



**Warning:**

If possible, do not cut the bonding agent as the blade might be damaged resulting in possible artefacts while sectioning!



**Caution:**

Please always observe the material safety data sheet of the corresponding bonding agent!

- The metal chucks can be inserted into the central hollow of the standard buffer tray with your hands.
- The Polyethylene chucks can be screwed into the central thread of the buffer tray PE.



**Note:**

The chucks can be inserted into their respective buffer trays by using the chuck fork without touching the inner side of the buffer tray, buffer of the chuck with you hands.

- If the chuck fork is used for inserting a chuck into its respective buffer tray, the chuck fork (fig. 11) must be adapted for the Polyethylene chucks.
- The metal chucks are pushed into the chuck fork (fig. 11.1) with their lateral puncture (fig. 12.1).
- Afterwards, they are inserted into the central hollow of the standard buffer tray VN.

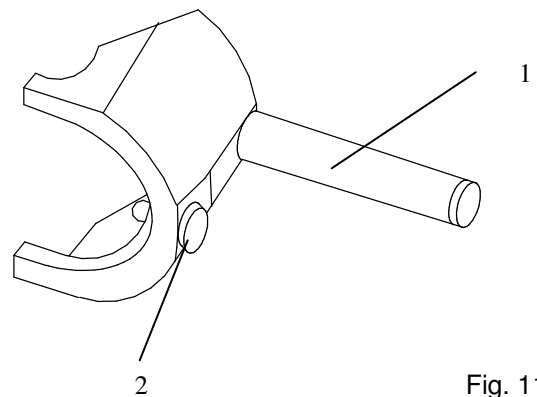


Fig. 11

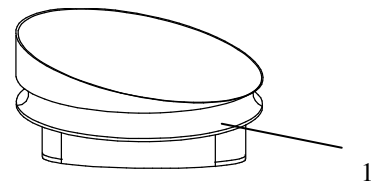


Fig. 12





**Note:**

Remove the O-ring from the metal chucks to be able to insert the chuck fork into the puncture.

- After having inserted the chuck, pull the chuck fork off the puncture to the side.
- To remove the chuck from the buffer tray, insert the chuck fork into the locating groove (recess) of the chuck.
- Lift the grip of the fork until the chuck is placed in its seat in an inclined way.
- Then pull the chuck fork together with the chuck towards the user over the edge of the chuck seat and remove it.
- The polyethylene chucks must be inserted into the chuck fork in a way that the grip finger (fig. 11.2) can be inserted into one of the holes (fig. 13.1) within the puncture of the chuck.

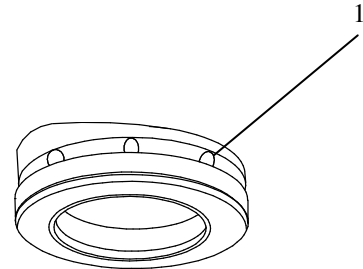


Fig. 13



**Note:**

When using Polyethylene chucks unscrew the so-called grip finger (fig. 11.2) from the small handle of the chuck fork (fig. 11). Then screw it again into the support of the chuck fork.

- Now the Polyethylene chuck can be screwed into the central hollow of the buffer tray PE.
- Afterwards, pull the chuck fork off the puncture of the chuck to the side.
- To be able to remove the Polyethylene chuck via the chuck fork, please proceed in reverse order.

**2-3-4 INSERTING THE BLADE AND SETTING THE CLEARANCE ANGLE**



**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.



**Caution:**

Microtome blades are extremely sharp! For this reason, the danger of being injured is very high while inserting and/or removing the blade. It is highly recommended to use the knife guard (fig. 16) while adjusting the knife and/or specimen. This way, the danger of being injured by the blade can considerably be reduced.

Different blades can be used for sectioning. The standard equipment includes the blade carrier with adapter R for conventional razor blades. The adapter I is designed for the insertion of injector blades and the adapter S for the insertion of sapphire blades (fig. 14).

The blade carrier consists of an upper part (fig. 15.5) and a blade seat (fig. 15.6). They are connected with each other via two fastening screws (fig. 15.2).

The blade seat has an upper (fig. 15.7) and a lower (15.8) clamping jaw. The upper one is referred to as adapter R, I, CH or S.

- First loosen the clamping screws (fig. 15.1) of the seat for the blade by means of the attached Allan key (blue).
- Insert a clean blade, free from oil, between the two clamping jaws (fig. 15.7 and 15.8) from the side into the phase (slot).
- Tighten the clamping screws to fix the blade in its position.



**Note:**

The blade must be inserted and clamped parallel over its entire length in relation to the front edge of the seat for the blade until the stop.

- Press the knife guard and insert it in the direction of the arrow into the opening over the blade seat with the adapter R.

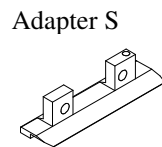
Adapter I



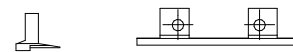
Adapter I



Adapter R



Adapter S



3

Fig. 14

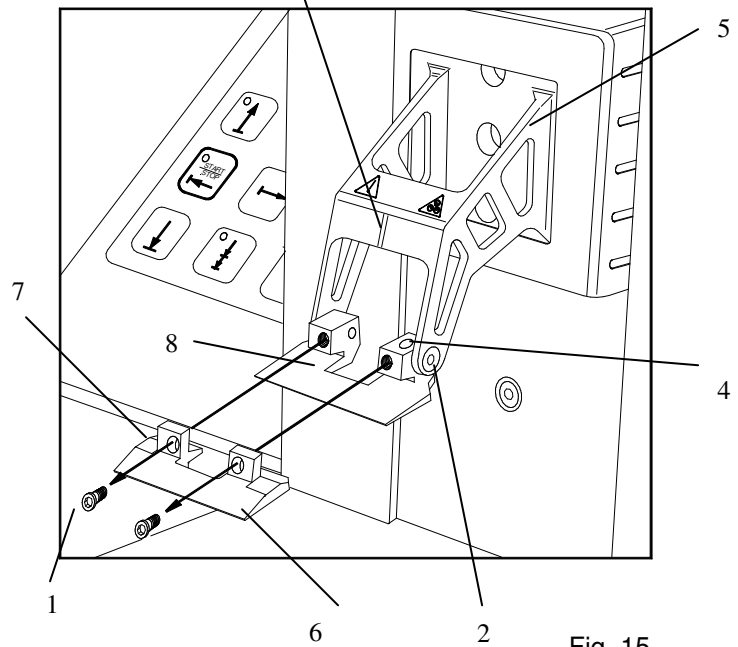


Fig. 15

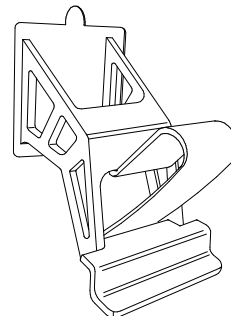


Fig. 16

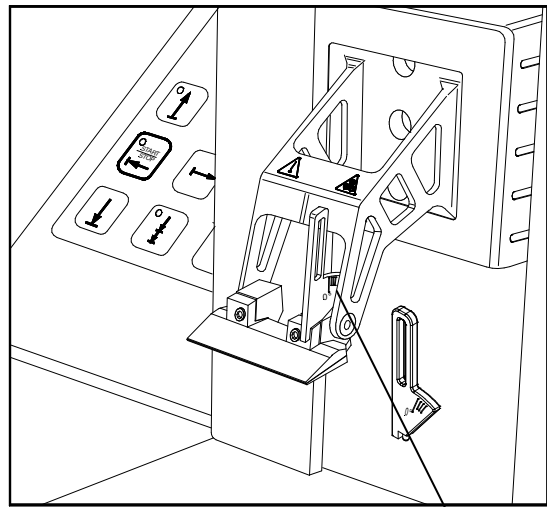
## Thermo Scientific Microtome with vibrating blade Microm HM 650 V

- To adjust the clearance angle, first loosen the fastening screws (fig. 15.2) by means of an Allan key.
- Insert the setting lever (fig. 17.1) into the positioning hole (fig.15.4).
- The clearance angle can be read on the scale of the setting lever. Then tighten the fastening screws.
- The standard angle for razor blades is designated as 0° and can be increased when needed.
- The interval from mark to mark is 3°.



**Note:**

The clearance angle does not have to be readjusted after each changing of blades. However, it is necessary to readjust it in case different blades are used.

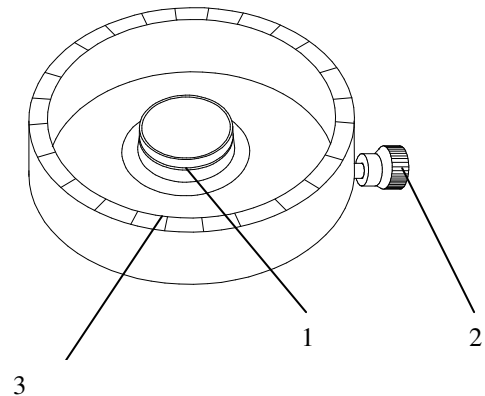


1 Fig. 17

### 2-3-5 ORIENTING A TISSUE SPECIMEN

After having grossed the specimen, bonded it on the chuck and having inserted the chuck into the buffer tray, a specimen can be oriented.

- The chuck can be turned by 360° in the central hollow (fig. 18.1) of the buffer tray via the fork for chucks.
- The buffer tray together with the inserted chuck can be turned by approx. 330°. For this, first turn the grip of the eccentric bolt (fig. 19.3) to loosen it.



**Note:**

The amount of rotation is indicated on the rim of the buffer tray (fig. 18.3). Each mark on the rim corresponds 10°.

A mark (fig. 15.3) in the middle of the upper part of the blade carrier is used as a reference for the orientation.

- While the eccentric bolt is loosened, the buffer tray can be oriented in y direction via the large set screw (fig. 19.1) and in x direction via the small set screw (fig. 19.2)
- This way, the specimen can be oriented by 8°.
- To align the chuck parallel in relation to the cutting plane, the so-called zero positioning, use the attached bubble level (small round water level).

Fig. 18



**Note:**

We recommend to insert the bubble level into the cone of the chuck or directly on the chuck.

- After having oriented, press the eccentric bolt (fig. 19.3) upwards to fix the buffer tray.
- Now sectioning can be started.

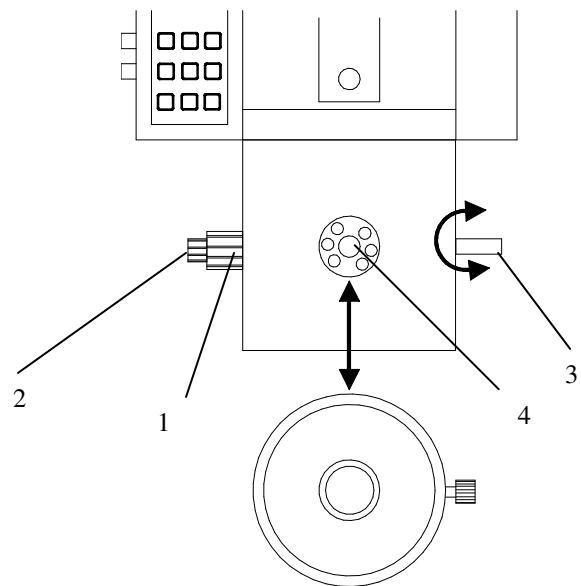


Fig. 19



**Caution:**

Before manipulating on buffer tray and chuck, it is absolutely necessary to first insert the attached knife guard onto the knife carrier.

### PART 3 WORKING WITH THE MICROTOME

After having carried out all preparations as described in part 2-3, the actual sectioning of tissue specimens can be started.

Cutting movement, operating panel and pre-selections of the microtome are explained in the following chapters.



#### 3-1 CUTTING MOVEMENT AND RETRACTION

With this microtome, sections are produced by horizontally oscillating the blade and a simultaneous motorized forward movement of the oscillating blade towards the specimen.

- To approach the blade towards the specimen, keep the DOWN button (fig. 20.14) pressed or release the "memory" function (see part 3-2-1-2). The approach speed can be pre-selected (see part 3-2-3-6).
- The cutting window must be adjusted to the respective specimen size (see part 3-2-1-4).



**Note:**

The zone in which the oscillating blade moves over the specimen and the section is produced, is the so-called cutting window.

- The desired section thickness/es can be pre-selected (see part 3-2-1-9 and 3-2-1-10) or loaded as work settings. As desired, the resolution of the section thickness setting can be pre-selected (see part 3-2-3-3 and 3-2-3-4).
- The desired frequency and/or amplitude can be pre-selected (see part 3-2-1-9 and 3-2-1-10) or loaded as work settings.



**Note:**

The requested frequency and/or amplitude can even be altered during cutting and thus adjusted to the respective tissue.

- Depending on the cutting mode (see part 3-2-1-3), the feed can be released automatically or manually by pressing the start button or by pressing the double arrow button (fig. 20.15) (see part 3-2-1-8).

- The horizontally oscillating cutting movement of the blade is always released via the start button.
- While sectioning, the cutting speed can be adjusted via the small turning knob (fig. 21.1) (see part 3-2-1-6).

**Note:**

The cutting speed must be selected in a way that the tissue is not pushed away by the oscillating blade while cutting, but an even cut is produced.

- During cutting, a cutting process can immediately be interrupted by pressing the "arrow backwards" button (see part 3-2-1-7). After this break, press again the "arrow backwards" button (fig. 20.11) to lead the blade without retraction backwards to the beginning of the cutting window or again press the start button to finish the interrupted section without releasing another feed.
- In case of danger, the cutting process can be stopped by pressing the red emergency stop button (see part 3-2-1-13) or by vigorously stepping onto the foot pedal (optional accessory).
- While cutting, the number of sections and the section sum can be determined and reset (see part 3-2-1-11).
- During the horizontal, non-oscillating return travel of the blade, the pre-set retraction for the protection of the specimen is carried out (see part 3-2-3-5).
- The produced sections are transferred onto a slide by using a brush, an eyelet or a pipette with a larger opening.
- After having finished sectioning, please proceed as described in part 2-3 in reverse order. Carefully remove the blade, then remove all potentially contaminated accessories from the instrument and clean and disinfect them according to your respective lab regulations.

**DISPLAY, OPERATING ELEMENTS  
AND KEYBOARD LAYOUT**

Concerning the function, the keyboard of the operating panel is separated into the menu and operating area. Some of the buttons and operating elements correspond between the two areas and are used both for the operating area and for the menu area.

The white buttons of the operating area are mainly used for the sectioning process.

The gray buttons of the menu area are used for the pre-selection as well as for calling them.

The indication on the LC display for the operating area differs substantially from the indication for the menu area.

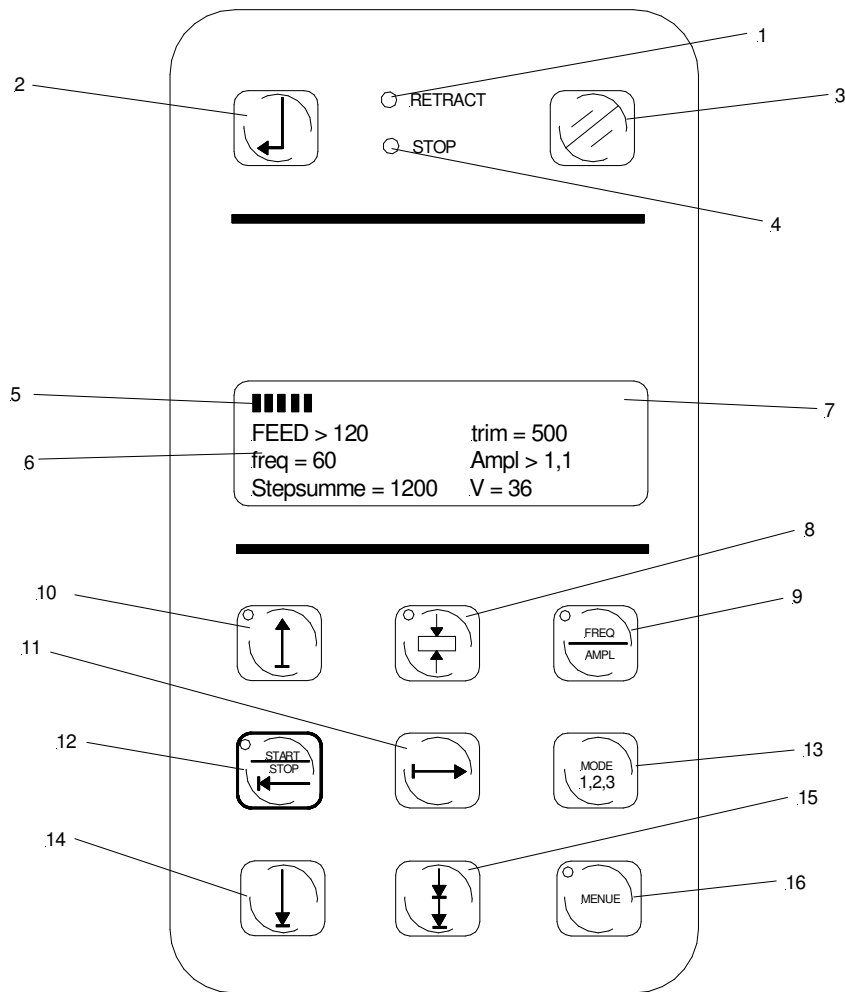


Fig. 20

- 1 = LED indication for blade retraction
- 2 = Enter/Scroll button
- 3 = Reset button (reset for section thickness sum and for section counter)
- 4 = LED emergency stop (lights up when the emergency stop is activated)
- 5 = Marks for section/trim section thickness
- 6 = Frequency, amplitude and setting the values in the memory (menu)
- 7 = Display
- 8 = WIN button (cutting window setting)

- 9 = Activation of frequency/amplitude
- 10 = Upward button for blade carrier (blinks in home position)
- 11 = Break (when WIN button is pressed, backwards)
- 12 = START/STOP button (when WIN button is pressed, forwards)
- 13 = Selection of operating modes
- 14 = Downward button for blade carrier
- 15 = Feed button
- 16 = Open menu/memory



### 3-2-1 DISPLAY, OPERATING ELEMENTS, AND KEYBOARD LAYOUT OF THE OPERATING AREA

The work settings (trim, fine, frequency or amplitude), the current speed V as well as the scroll functions (cutting mode, section sum number or sections and remaining travel of the cutting motor) can be seen on the display in the operating area.

In the operating area, always one value of the four parameters consisting of the frequency, amplitude feed and trim section thickness can be set only (= active). The active parameter is shown in capital letters.

Turn the large turning knob (fig. 21.2) to set the active value.

To alter from the pair feed/trim section thickness to frequency/amplitude press the large turning knob.

e.g.:

FREQUENCY 100 Hz (active/can be set) /  
frequency 100 Hz (not active/cannot be set)



**Note:**

During cutting the parameters frequency, amplitude as well as the section thicknesses are used, regardless if they are shown actively and not actively on the display.

#### LC display in the operating area (fig. 20):

A bar is shown in the upper line above the "feed" section thickness. Its position shows which one of the two section thicknesses will be released. As shown in fig. 20, 120 µm are fed and not the trim section thickness (500 µm).

Press the large turning knob to change between the section thicknesses. The respective active cutting area can be adjusted by turning the turning knob.

Press the Freq./Ampl. button (see part 3-2-1-9) the activation is transferred into the second line to frequency (currently 60 Hz) and/or amplitude (currently 1,1 mm).

Afterwards, press the large turning knob to change the activation between frequency and amplitude.

Moreover a cutting speed of  $V = 36$  (= 3,6 mm/sec.) and a sum of 1200 µm is shown. This is the vertical cutting travel which has been fed since the last reset. Instead of this indication, the number of sections, remaining travel of the vertical cutting stroke and the cutting mode can be shown.



**Keyboard layout:**

The buttons of the operating area are on the right side directly beside the small turning knob (fig. 21.1). These buttons are used to set the cutting speed.

For this reason, all buttons which are necessary for the cutting movements are arranged on the right side of the small turning knob around the Start/Stop button (fig. 20.12).



**Note:**

While cutting, the small turning knob (fig. 21.1) is operated by means of the index finger of the left hand.

Simultaneously, the thumb can reach all buttons for the blade movement.

The retraction LED (20.1) as well as the LED for the emergency stop (fig. 20.4) must also be assigned to the operating area.

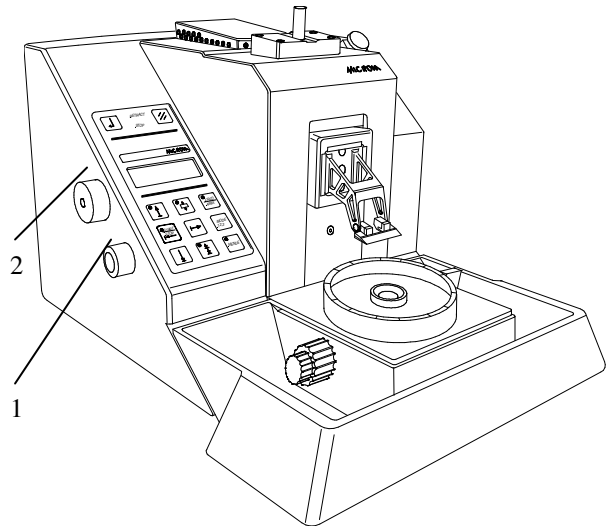


Fig. 21

### 3-2-1-1 BLADE DOWNWARDS TOWARDS THE SPECIMEN

("DOWN" button, fig. 20.14)

Continuously press this button to move the blade downwards – towards the specimen.

The blade stops immediately, if the button is no longer being pressed.

For this reason, this button is used for the approach of the blade towards the specimen.



**Note:**

The entire vertical feed range, from the upper to the lower end position is 25 mm. The remaining cutting travel can be called on the display by using the "Scroll/Enter" button (fig. 20.2) (see part 3-2-1-11).

The vertical blade speed for the approach and distance of the blade towards the specimen can be pre-selected (see part 3-2-3-6).



**Note:**

The vertical approach speed is set to 1,2 mm/s in our factory. Carefully observe the narrowing gap between blade edge and specimen to avoid damaging the blade or the specimen.

### 3-2-1-2 BLADE UPWARDS

("UP" button, fig. 20.10, red LED)

Via this button, the knife carrier is moved vertically upwards. This way, the blade carrier moves away from the specimen.

When this button is tapped on only briefly, the blade moves 2  $\mu\text{m}$  upwards. If this button is pressed shorter than one second the blade carrier only moves for the time the button is pressed.

When the button is pressed longer than one second, the blade automatically moves into its so-called "home" position. This is the upper and rear end position of the blade (see part 3-2-1-2).



**Note:**

While the blade carrier moves vertically upwards, the LED in this button lights up. In the "home" position, the LED of this button is blinking.

If the UP button is pressed again during this automatic movement of the blade into its "home" position, the movement of the blade stops immediately.

After having reached the "home" position, the LED is blinking. If this button is then pressed once more, the blade automatically moves towards the specimen, i.e. to the beginning of the cutting window (= memory function).



**Note:**

The blade is automatically moved downwards until the maximum filling level of the buffer. However, the cooling element can still be inserted into the buffer solution!

### 3-2-1-3 SELECTING THE MODES OF OPERATION

("Mode 1,2,3" button, fig. 20.13)

**Three different modes of operation are available:**

Mode 1: Semimanual sectioning (Inter)

Mode 2: Single cut (Singl.)

Mode 3: Continuous sectioning (Cont.)



**Note:**

The current mode of operation can be called on the display via the "Scroll/Enter" button (fig. 20.2). After having activated the button (fig. 20.13), the selected sectioning mode is also shown.

**"Semimanual" sectioning mode:**

- To feed the specimen, first press the "feed" button (= double arrow) (fig. 20.15).
- Then press the "Start/Stop" button (fig. 20.12) to release the cutting movement of the blade with the selected amplitude, frequency and speed towards the specimen.
- At the end of the cutting window the blade stops.
- Press the "backward" button (fig. 20.11) (see part 3-2-1-7) to move the blade backwards to the beginning of the cutting window. In doing so, the pre-selected retraction of the blade is carried out automatically (see part 3-2-3-5).
- If the "backward" button (see part 3-2-1-7) or the "Start/Stop" button is pressed once more within the cutting window, the blade stops without vibrating (= break function).

**"Single cut" sectioning mode:**

- In this cutting mode, press the "Start/Stop" button (fig. 20.12) to release an automatic feed and afterwards the cutting movement will be carried out until the end of the cutting window.
- After having reached the cutting window, the blade automatically moves to the beginning of the cutting window without vibrating. In doing so, the pre-selected retraction of the blade is carried out automatically (see part 3-2-3-5).
- At the beginning of the cutting window, the blade stops in this sectioning mode and by pressing the "Start/Stop" button (fig. 20.12)

once more another cut is carried out completely.

- If the "backward" button (see part 3-2-1-7) is pressed within the cutting window, the blade stops without vibrating (= break function).
- Again press the "Start/Stop" button to continue this cut without another feed to the end of the cutting window or again press the "backward" button to move the blade with a retraction of 40 µm to the beginning of the cutting window

**"Continuous" sectioning mode:**

- To release the feed as well as the sectioning process as in the single cut mode, press the "Start/Stop" button.
- In this cutting mode, the blade also moves backwards without vibrating, after having reached the end of the cutting window to the beginning of the cutting window.
- However, automatic feed is carried out and further sections are completely produced until the "Start/Stop" button is pressed for a second time.
- If the "Start/Stop" button is pressed during the cutting movement, the current cut will be carried out completely. Then the blade moves to the beginning of the cutting window and stops there.
- If the "backward" button is pressed within the cutting window, the blade stops without vibrating (= break function).

To finish this cut without further feed either press the "Start/Stop" button or again press the backward button to move the blade with a retraction of 40 µm to the beginning of the cutting window.

### 3-2-1-4 SETTING THE CUTTING WINDOW

(Cutting window button = WIN button), fig. 20.8, LED green)

With this button, the horizontal cutting window is limited to the approximate specimen size. This programmable cutting window can be set within the entire cutting window.

#### Standard setting:

- 1. To program the cutting window, first press the WIN button (fig. 20.8).
- 2. Now press the "Start/Stop" button (= forward button, fig. 20.12) or backward button (fig. 20.11), to move the blade to the desired beginning or end of the cutting window.
- After having pressed the WIN button the first time, the opposite message is shown on the display for the "window edge 1".
- 3. After having pressed the WIN button (fig. 20.8) for a second time, the opposite message is shown on the display for the "window edge 2".
- 4. Now press the Start/Stop button or backward button to move the blade over the specimen to the desired end of the cutting window.
- 5. When the button is pressed for a third time, the cutting window is programmed.
- The blade moves automatically to the new programmed beginning of the cutting window.

Window edge 1  
Set with the  
WIN-key or  
omit with ENTER

Window edge 2  
Set with the  
WIN-key or  
omit with ENTER



#### Note:

It is not necessary to start with the beginning of the cutting window. The instrument is able to detect the smaller value (mm) as the beginning and the larger value (mm) as the end of the cutting window.

**Optional setting:**

- In case the beginning or the end of the cutting window should be altered during a cutting process, press the WIN button (fig. 20.8) after the cutting cycle has been finished or by interrupting it via the "backward button". The opposite message is then shown on the display.
- In case the beginning of the cutting window should be unaltered, confirm this with the ENTER button.
- In case the beginning should be set new, move the blade to the new beginning point via the start or backward button. Press the WIN button to store this point. The opposite message is then shown on the display.
- In case the end of the cutting window should be unaltered, confirm this with the ENTER button.
- In case the end should be set new, move the blade to the new end point via the Start or backward button.
- Press the WIN button.
- The cutting window is now programmed.
- The blade automatically moves to the beginning of the cutting window.

Window edge 1  
Set with the  
WIN-key or  
omit with ENTER

Window edge 2  
Set with the  
WIN-key or  
omit with ENTER

### 3-2-1-5 START AND STOP OF THE CUTTING MOVEMENT

("Start/Stop" and/or "arrow forward" button; fig. 20.12, green LED)

Press this button (fig. 20.12) to move the blade automatically from the beginning to the end of the cutting window with the selected amplitude, frequency and speed. In doing so, the LED in this button lights up.

Depending on the sectioning mode, the blade stops at the end of the cutting window (= semi-manual mode), the blade moves to the beginning of the cutting window and stops there (= single cut mode) or the blade moves continuously between beginning and end of the cutting window (= continuous sectioning mode).

The sectioning speed is set within the cutting window by means of the small turning knob (fig. 21.1).

The maximum speed is 5 mm/s corresponding to an indication on the display of  $V = 50$ .

If the speed is  $V = 0$ , the blade vibrates with the selected frequency and amplitude on the spot.

Press the "Start/Stop" button (fig. 20.12) once more within the cutting window to either stop the blade without vibrating (= semimanual mode) or the blade carries out this cut and moves then to the beginning of the cutting window and stops there (= continuous mode; for single cut mode it is automatic).

### 3-2-1-6 SETTING THE CUTTING SPEED

The desired cutting speed is selected on the small turning knob (fig. 21.1).

The speed can be selected from 0 – 5 mm/s in 0,1 mm/s increments.

On the lower right side on the display, this value is shown between 0 – 50.



**Note:**

The speed of the return travel of the blade to the beginning of the cutting window is always 5 mm/s.

### 3-2-1-7    **BACKWARD MOVEMENT OF THE BLADE**

("Backward" button; fig. 20.11)

Press this button for the semimanual mode (see part 3-2-1-3) to move to the beginning of the cutting window after having reached its end. During this return travel, the blade does not vibrate.

Press this button again before reaching the beginning of the cutting window to immediately stop the blade again (= break function).

In the single cut and/or continuous mode (see part 3-2-1-3) the "backward" button has the function to immediately stop the cutting movement of the blade which has been started via the "Start/Stop" button.

If the "backward" button is pressed once more, the blade moves to the beginning of the cutting window.

**Note:**



If the "backward" button is pressed a second time within the cutting window, the blade moves after an automatic retraction of 40 µm to the beginning of the cutting window and remains there.

If this button is pressed again before reaching the beginning of the cutting window, the blade stops immediately again (= break function).

**Note:**



If a retraction has been programmed, the LED on the operating panel (fig. 20.1) lights up during the return travel of the blade.



### 3-2-1-8 FEED OF THE SECTION THICKNESSES

("Double arrow" button; fig. 20.15)

In the semimanual cutting mode, the feed (downward movement) of the blade carrier with the desired section thickness is released by just pressing this button.



**Note:**

The trim or feed value ( $\mu\text{m}$ ) which is marked on the display with the black bar (see part 3-2) will be forwarded.

If the button is pressed several times, this leads to an addition of the feed values.



**Note:**

In the single cut mode and in the continuous sectioning mode: In case the "double arrow" button is pressed while in non-operative condition, the selected fine of trim value is carried out.

### 3-2-1-9 SETTING THE SECTION THICKNESSES AND FREQUENCY AND/OR AMPLITUDE

("Freq./Ampl." button; fig. 20.9; red LED)

Press the "Freq./Ampl." button to switch between the second and third line on the display (see part 3-2-1). This way, to set these values you can switch between the two section thicknesses and the frequency and/or the amplitude.

When the LED in the "Freq./Ampl." button lights up, the frequency and/or amplitude can be set.

In case this LED does not light up, the two section thicknesses "Fine" and "Trim" can be set.

- Press the large turning knob (fig. 21.2) to change within the respective pair setting between amplitude/frequency and trim/fine.
- Only the value of the parameter which is shown in capital letters (= activated) can now be set by turning the large turning knob (fig. 21.2).
- Turn the knob in a counter clockwise direction to increase the values. Turn the knob in a clockwise direction to decrease them.



**Note:**

The frequency can be set between 30 – 100 Hz in 1 Hz increments. The amplitude can be set between 0 – 1,2 mm in 0,1 mm increments. The section thicknesses can be set between 1 – 1500  $\mu\text{m}$ . Here, the resolution of the increments of the large turning knob can be pre-selected in the corresponding submenu (see part 3-2-3-3 and 3-2-3-4).

**3-2-1-10 SETTING OF THE SECTION THICKNESSES, FREQUENCY AND AMPLITUDE**

Use the large turning knob (fig. 21.2) to set values and pre-selections both in the operating and in the menu area.

In the operating are, the desired frequency, amplitude as well as fine and trim section thicknesses are set via the large turning knob (fig. 21.2).

During the setting process, the alteration between the two section thicknesses, the fine and trim thicknesses and/or between the frequency and amplitude is carried out by pressing the turning knob.

The "active" value, shown on the display in capital letters, is set by turning the large turning knob. Turn the knob in a counter clockwise direction to increase the values. Turn it in a clockwise direction to decrease them.

Press the Frequ./Ampl. button (see part 3-2-1-9) to change between the two lines in the display, i.e. between the two section thicknesses and the frequency/amplitude.

Within the menu area, the large turning knob is used for selecting submenus and settings.

**3-2-1-11 INDICATION OF THE SECTION  
SUM, NUMBER OF SECTIONS,  
REMAINING VERTICAL CUTTING  
TRAVEL AND SECTIONING MODE  
AND/OR ACKNOWLEDGEMENT OF  
SETTINGS IN THE MENU AREA**

("Scroll/Enter" button; fig. 20.2; without LED)

The "Scroll/Enter" button is an operating element of the operating and menu area.

Within the operating area this button has the function of a scroll button. This means that whenever this button is being pressed, you can switch between the indication of section sum, number of sections, remaining vertical sectioning travel as well as the current sectioning mode.

The semimanual sectioning mode is shown with "Inter.", the single cut with "Singl." and the continuous cutting mode with "Cont." on the display (see part 3-2-1-3).

If no functions are to be shown, a blank line can be chosen as well.

While setting the cutting window, the selected values (start or end), which are not to be altered, are confirmed via the "Scroll/Enter" button!

Within the menu area, this button has the function of an Enter button to confirm settings. Submenus can be opened and values and/or settings can be confirmed (see part 3-2-2-2).

**3-2-1-12 RESETTING THE SECTION  
SUM AND/OR NUMBER OF  
SECTIONS**

("Reset" button, fig. 20.3 without LED)

During sectioning, the section thickness sum and the section counter can be reset to 0  $\mu\text{m}$  and/or 0 sections via this button (fig. 20.3).

To carry out a reset of the instrument, keep this button pressed when turning on the instrument on the power switch (fig. 3.3). The instrument initializes itself completely and is reset automatically to the default values.

### 3-2-1-13 EMERGENCY STOP

The instrument is equipped with a red emergency stop button on the right upper side of the instrument to quickly eliminate danger.



**Caution:**

In case of danger arises from the cutting drive, press the emergency stop button!!

Press the red knob to immediately stop the cutting drive. The red STOP LED (fig. 20.4) on the operating panel lights up.

After having eliminated the cause of danger, pull out the red knob. Sectioning can be continued again.

If the instrument is equipped with a foot pedal (optional accessory), a second emergency stop function is integrated in the foot pedal.

Vigorously step onto the foot pedal to also stop the cutting drive immediately.

However, this emergency stop function remains activated as long as the foot pedal is being stepped on. The red STOP LED (fig. 20.4) on the operating panel lights up as well.



**Note:**

If the instrument is not equipped with a foot pedal, please note that the Interlock plug is inserted into the socket for the foot pedal. If it is not inserted, the emergency stop is activated and the respective LED (fig. 20.4) lights up.

### **3-2-2      KEYBOARD LAYOUT AND OPERATING ELEMENTS OF THE MENU AREA**

With the gray buttons of the menu area pre-selections can be carried out and/or existing settings can be called. Some of these buttons and operating elements have additional functions which are used while sectioning.

#### **3-2-2-1      OPENING THE MENU AREA**

(Menu button, fig. 20.16, with LED)

Press the "Menu" button to get into the submenu. In doing so, the LED in this button lights up.

Press this button again, to return to the operating area. The LED does not light up anymore.

With the "Menu" button (fig. 20.16) it is possible to switch between the menu and operating area in a very fast way.

Turn the large turning knob (see part 3-2-2-2) to select submenus and pre-selections.

#### **3-2-2-2      SELECTING SUBMENU AND PRE-SELECTION**

Within the menu area, the large turning knob is used to select submenus and to set pre-selections. Turn in a clockwise direction to show the following submenu. Turn in a counter clockwise direction to show the preceding one.

Turn the knob within the submenus in a counter clockwise direction to increase the values and in a clockwise direction to decrease them.

In the operating area, the large turning knob (fig. 21.2) is used to select the desired frequency, amplitude as well as fine and trim section thicknesses (see part 3-2-1-10). Press the large turning knob to switch between the two section thicknesses and/or between frequency/amplitude.

### 3-2-2-3 CONFIRMING SUBMENUS AND PRE-SELECTIONS

("Enter/Scroll" button, fig. 20.2, without LED)

The "Enter/Scroll" button is an operating element of the menu and operating area.

Within the menu area, after having pressed the menu button (see part 3-2-2-1), this button has the function of an Enter button.

- In the menu area, first the selected submenu is selected via the large turning knob (fig. 21.2) and opened via the "Enter/Scroll" button.
- Now the fine adjustment of the desired pre-selections can be carried out via the large turning knob (see part 3-2-1-10) and confirm via the "Enter/Scroll" button. This way, you return to the list of submenus, however, you still stay in the menu area.
- Further submenus can now be called and pre-selections can be made or you can leave the menu area by pressing the "Menu" button again.

Within the operating area, this button has the function of a Scroll button. With this button, the section sum, number of sections, remaining vertical cutting travel as well as the sectioning mode can be shown in the fourth line of the display (see part 3-2-1-11).

### 3-2-3 OVERVIEW OF THE SUBMENUS

After having pressed the "Menu" button (fig. 20.16) in the operating area, you will get into the menu area.

Eight submenus can be called on the display as follows:

Turn the large turning knob (fig. 21.2) to switch from one submenu to another one.

#### 1. Calling and/or loading a stored work setting

All values and pre-selections of a work setting can be stored together from the operating area into this submenu (see part 3-2-3-1).

A work setting consists of the fine and trim section thicknesses, frequency and amplitude, height of the retraction and vertical approach speed of the blade towards the specimen.

A maximum of ten work settings can be loaded from this submenu into the operating area.

#### 2. Calling and/or storing of a work setting

All values and pre-selections of a work setting can be stored together from the operating area into this submenu (see part 3-2-3-2).

A work setting consists of fine and trim section thicknesses, frequency and amplitude, height of the retraction and vertical approach speed of the blade towards the specimen.

A maximum of ten work settings can be stored here.

#### 3. Pre-selection $\mu\text{m}$ /increment of the large turning knob when selecting the fine section thickness

The increments of the large turning knob (see part 3-2-1-10) in  $\mu\text{m}$  while setting the fine section thickness can be pre-selected in this submenu (see part 3-2-3-3).



**4. Pre-selection  $\mu\text{m}$ /increment of the large turning knob when selecting the trim section thickness**

The increments of the large turning knob (see part 3-2-1-10) in  $\mu\text{m}$  when selecting the trim section thickness can be pre-selected in this submenu (see part 3-2-3-4).

**5. Pre-selection of the retraction**

The retraction value can be pre-selected in this submenu between 0 – 1000  $\mu\text{m}$  in 100  $\mu\text{m}$  increments (see part 3-2-3-5).

**6. Pre-selection of the approach speed of the blade towards the specimen**

The coarse feed speed for the approach of the blade towards the specimen can be selected in this submenu as follows (see part 3-2-3-6):

slow = \*  
medium = \*\*  
fast = \*\*\*

**7. Pre-selection of the display language**

The language in the display can be selected in this submenu. English, German and French are available (see part 3-2-3-7).

**8. Software Information**

The current software version of the microtome can be called in this submenu (see part 3-2-3-8).

### 3-2-3-1 LOADING A STORED WORK SETTING

A work setting consists of the fine and trim section thicknesses, frequency and amplitude, height of the retraction, vertical approach speed of the blade towards the specimen and  $\mu\text{m}/\text{increment}$  of the large turning knob when selecting the trim and/or fine section thickness.

Personally used and in the submenu stored work settings (see part 3-2-3-2) can be called, loaded into the operating area and again used for sectioning.

For this reason, it is not necessary to set all sectioning settings before each cutting process again.



**Note:**

The setting of the desired section thicknesses (trim and fine), frequency, amplitude and cutting window can only be carried out in the operating area. The pre-selection of the approach speed (blade towards the specimen), retraction and the  $\mu\text{m}/\text{increments}$  of the large turning knob when selecting the fine and/or trim section thicknesses can only be pre-selected in the menu area.

After having turned on the instrument on the power switch, the values and pre-selections which were chosen before are shown on the display. These values and settings can be used for sectioning now.

- However, if another work setting is used from the submenu 3-2-3-2, first press the "Menu" button (fig. 20.16). The LED in this button lights up.
- Now the first submenu "Work settings load" is shown on the display (fig. 22).
- Press the "Enter" button to open this submenu.
- Turn the large turning knob to select one of the ten work settings (fig. 23).



**Note:**

10 work settings can be loaded from this submenu under position 1 – 10.

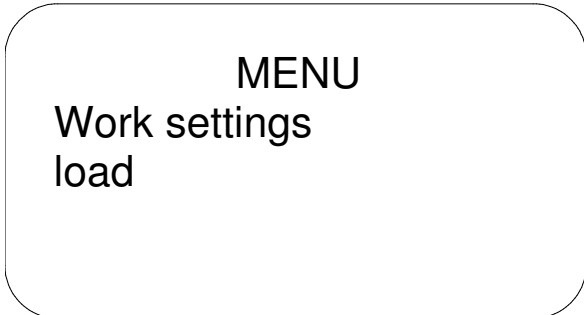


Fig. 22

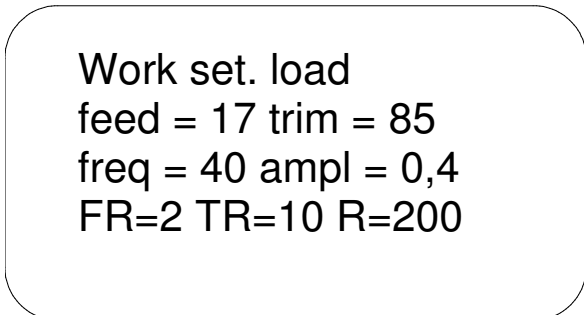


Fig. 23

- Press the "Enter" button to transfer the selected work setting into the operating area. Simultaneously, you return to the list of the submenus.
- If further pre-selections must be carried out in the menu area, please proceed as described above.
- To quit the menu area, press the "Menu" button.
- The loaded values and settings are now shown on the display of the operating area and can be used for sectioning.

### 3-2-3-2 STORING A WORK SETTING

A work setting consists of fine and trim section thicknesses, frequency and amplitude, height of the retraction, vertical approach speed of the blade towards the specimen and  $\mu\text{m}$ /increment of the large turning knob when selecting the trim and/or fine section thicknesses.

Each user can store his individual work settings as a whole.

These work settings can be used again afterwards for sectioning (see part 3-2-3-1).

For this reason, it is not necessary to set all the individual cutting settings again before sectioning.



**Note:**

The setting of the desired section thicknesses (trim and fine), frequency, amplitude and the cutting window can only be carried out in the operating area. The pre-selection of the approach speed (blade towards the specimen), retraction and the  $\mu\text{m}$ /increments of the large turning knob when selecting the fine and/or trim section thicknesses can only be selected in the menu area.

After having turned on the power switch of the instrument, the values and settings which were chosen before are shown on the display.

- However, if a work setting is to be stored during sectioning, first press the "Menu" button (fig. 20.16). The LED in this button lights up.
- Now "Work settings load" is always shown as the first submenu on the display (fig. 22).
- Then turn the large turning knob in a counter clockwise direction to the submenu "Work settings store" (fig. 24).
- Press the "Enter" button to open the desired submenu.
- Turn the large turning knob to select the desired position for the work setting which is to be stored (fig. 25).



**Note:**

In this submenu, 10 work settings can be stored under position 1 – 10. While storing, an existing work setting will be overwritten.

overwritten.

- Press the "Enter" button to overwrite the selected position with the new work setting. Simultaneously, you return to the list of submenus.
- To quit the menu area, press the "Menu" button.

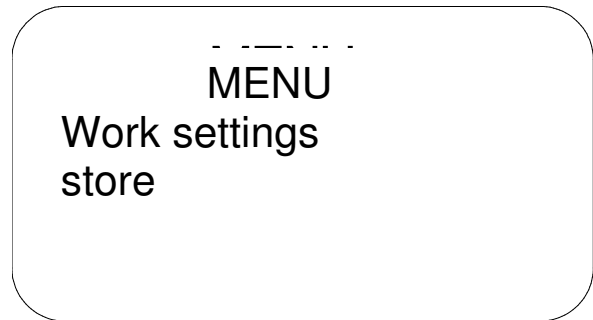


Fig. 24

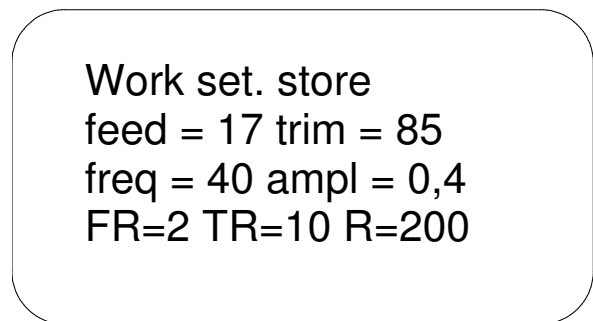


Fig. 25

**3-2-3-2 PRE-SELECTION  $\mu\text{m}$ /INCREMENT OF THE LARGE TURNING KNOB WHEN SELECTING THE FINE SECTION THICKNESS**

In the operating area the fine section thickness can be selected between 1  $\mu\text{m}$  and max. 1500  $\mu\text{m}$  via the large turning knob.

The value in  $\mu\text{m}$  per increment of the large turning knob can be selected by the user individually within this menu.

- For this, first press the "Menu" button (fig. 20.16) (the red LED in this button lights up).
- Turn the large turning knob (fig. 21.2) in a counter clockwise direction to the submenu: "Fine resolution set" (fig. 26).
- Press the "Enter" button to open this submenu.
- Here the following pre-selections can be selected (fig. 27):
  - 1  $\mu\text{m}$ (- increments)
  - 2  $\mu\text{m}$ (- increments; default setting)
  - 5  $\mu\text{m}$ (- increments)
  - 10  $\mu\text{m}$ (- increments)
- Now select the desired value of the resolution via the large turning knob. Only one value is shown on the display.
- Confirm the desired selection via the "Enter" button. This way, you also return to the list of submenus.
- Further submenus and pre-selections can be made via the large turning knob.
- To quit the menu area, press the "Menu" button.
- The pre-selected fine section thickness can now be used for sectioning.

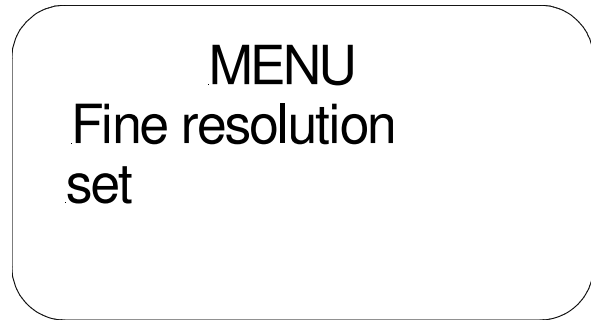


Fig. 26

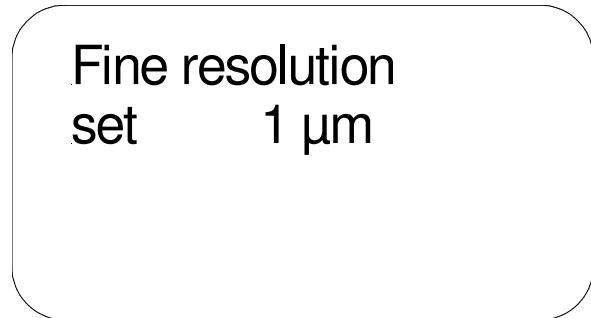


Fig. 27

### 3-2-3-4 PRE-SELECTION $\mu\text{m}$ /INCREMENT OF THE LARGE TURNING KNOB WHEN SELECTING THE TRIM SECTION THICKNESS

In the operating area, the trim section thickness can be pre-selected between 1  $\mu\text{m}$  and 1500  $\mu\text{m}$  via the large turning knob.

The value in  $\mu\text{m}$  per increment of the large turning knob can be selected by the user individually within this menu.

- First press the "Menu" button (fig. 20.16) (the red LED in this button lights up).
- Turn the large turning knob (fig. 21.2) in a counter clockwise direction to the submenu: "Trim resolution set " (fig. 28).
- Open this submenu via the "Enter" button.
- Here the following pre-selections can be chosen (fig. 29):
  - 5  $\mu\text{m}$ (- increments)
  - 10  $\mu\text{m}$ (- increments; default setting)
  - 25  $\mu\text{m}$ (- increments)
  - 50  $\mu\text{m}$ (- increments)
- Set the desired value of the resolution via the large turning knob. Only one value is shown on the display.
- Confirm the desired selection via the "Enter" button. This way, you also return to the list of submenus.
- Further submenus and pre-selections can now be chosen via the large turning knob.
- To quit the menu area, press the menu button.
- The pre-selected trim section thickness can now be used for sectioning.

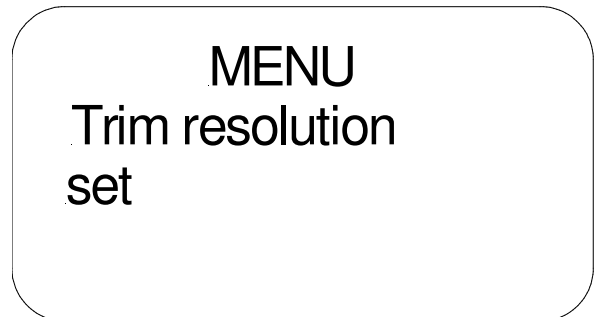


Fig. 28

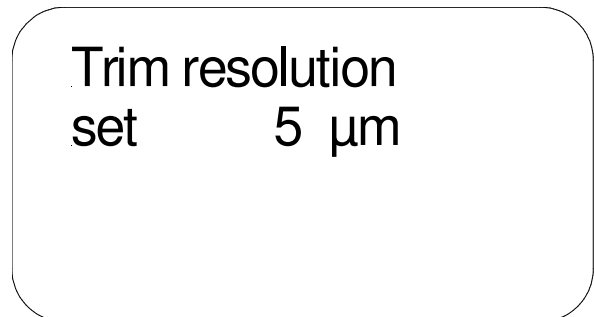


Fig. 29

### 3-2-3-5 PRE-SELECTION OF THE RETRACTION

The height of the retraction can be selected in this submenu in 100  $\mu\text{m}$  increments from 0 – 1000  $\mu\text{m}$  (default setting is 100  $\mu\text{m}$ ).

- For this, first press the "Menu" button (fig. 20.16) (the red LED in this button lights up.)
- Turn the large turning knob (fig. 21.2) in a counter clockwise direction to the submenu "Retraction set " (fig. 30).
- Open this submenu via the "Enter" button.
- Now select the desired value of the retraction via the large turning knob (0 – 1000  $\mu\text{m}$  in 100  $\mu\text{m}$  increments). Only one possible value is shown on the display (fig. 31).
- Confirm the desired pre-selection with the "Enter" button. This way, you return automatically to the list of submenus.
- Further submenus can now be selected.
- To quit the menu area, press the "Menu" button.
- The pre-selected retraction can now be used for sectioning.



Fig. 30

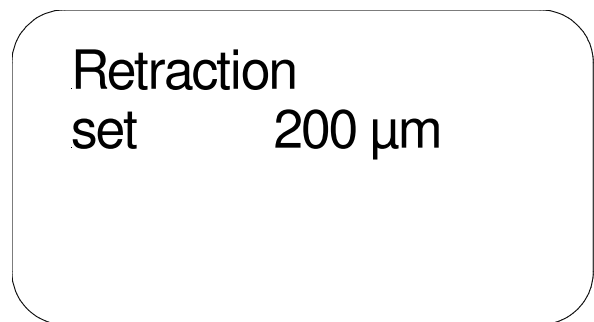


Fig. 31

### 3-2-3-6 PRE-SELECTION OF THE APPROACH SPEED OF THE BLADE TOWARDS THE SPECIMEN

The approach speed (coarse feed speed) of the blade towards the specimen can be pre-selected here.

Three different settings are available.

For this a precise stepping motor is used permitting the exact feed and thus correct section thickness.

- Turn the large turning knob (fig. 21.2) in a counter clockwise direction to the submenu "Coarse feed speed set" (fig. 32).
- Open this submenu via the "Enter" button.
- Now select the desired value. Only one possible value is shown on the display. The three different speed settings are shown by one, two or three stars (fig. 33).

- \* (slow; 0,4 mm/s)
- \*\* (medium; 0,8 mm/s)
- \*\*\* (fast; 1,2 mm/s)



**Note:**

The default setting is 1,2 mm/s. This corresponds with the setting "fast".

- Confirm the desired setting via the "Enter" button. This way, you automatically return to the submenus.
- Further submenus can now be selected.
- To quit the menu area, press the "Menu" button.
- The pre-selected approach speed can now be used for sectioning.

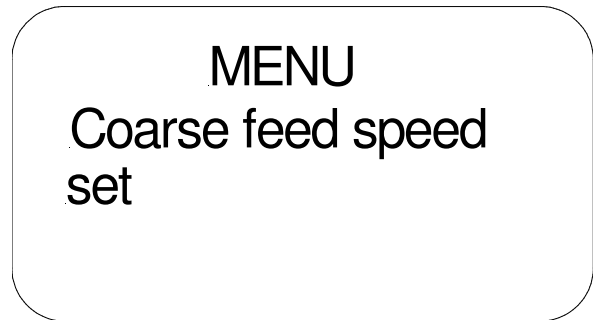


Fig. 32

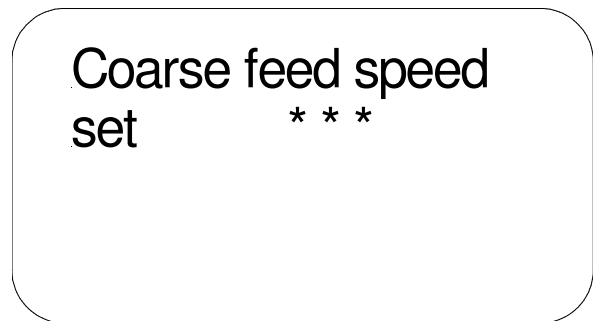


Fig. 33



### 3-2-3-7 PRE-SELECTION OF THE LANGUAGE ON THE DISPLAY

The language in the display can be selected between English, French and German.

- Turn the large turning knob (fig. 21.2) to the submenu "Language set" (fig. 34) in a counter clockwise direction.
- Open this submenu via the "Enter" button. Now select the desired language. Only one possible language is shown on the display.
- Confirm the desired language via the "Enter" button. This way, you automatically return to the list of submenus.
- Now further submenus can be selected (fig. 35).
- To quit the menu area, press the "Menu" button.
- The pre-selected language can now be used for sectioning.



Fig. 34



Fig. 35

### 3-2-3-8 SOFTWARE INFORMATION

In this submenu, the current software can be called.

- Turn the large turning knob (fig. 21.2) in a counter clockwise direction to the submenu "Software Information" (fig. 36).
- Then open this submenu via the "Enter" button. The version of the current software is shown on the display (fig. 37).
- Press the "Enter" button to automatically return to the list of submenus.
- Further submenus can now be selected.
- To quit the menu area, press the "Menu" button.

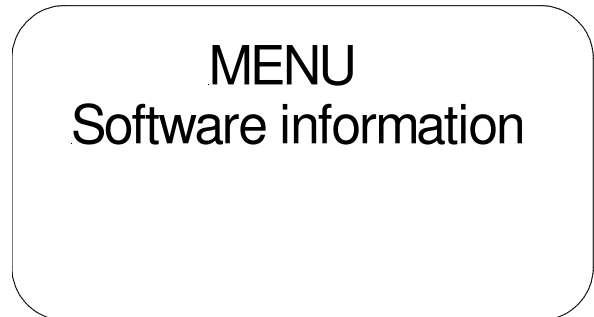


Fig. 36

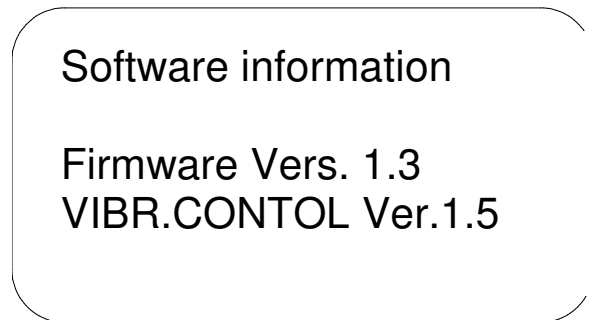


Fig. 37

**PART 4 HOW TO AVOID MALFUNCTIONS**

<b>ERROR</b>	<b>CAUSE</b>	<b>REMOVAL</b>
Collision between cutting edge and chuck	When using the specimen orientation, a collision between blade edge and chuck might always be possible.	Move the blade carrier upwards as needed.
<p>The cutting drive motor stops.</p> <p>An already started cutting cycle will be interrupted immediately.</p> <p>An up or downward movement of the blade carrier will be interrupted immediately.</p> <p>If the emergency stop function has been activated, the instrument does not react on activation of the foot pedal.</p>	The emergency stop function has been released.	If the emergency stop button has been pressed, unlock it by turning it in the direction of the arrow.
Clattering noise occurs	The visible clamping screws of the blade carrier are loose.	Tighten the visible clamping screws of the blade carrier.



**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 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

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

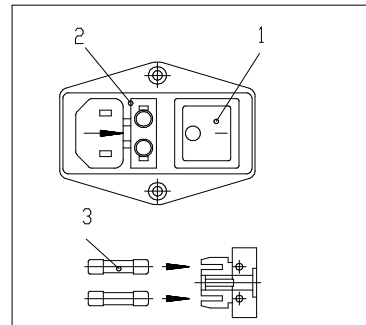


Fig. 38

#### Exchange of fuses

- The two instrument fuses (fig. 38.3) are placed on the rear side of the instrument on the left side of the power switch (fig. 38.1).
- To replace the two fuses, turn off the mains switch and unplug the unit.
- Open the fuse holder (fig. 38.2) by means of a flat screwdriver in the direction of the arrow.
- Pull the two fuses off the fuse holder and replace them with new ones.

#### Rating of fuses

For power requirements 220 - 240 V:

- 2 pieces T 1,6 AH (cat. no. 326670)

For power requirements 100 - 120 V:

- 2 pieces T 3,15 AH slow blow (cat. no. 326660)

#### Exchange of the fuse for the motor voltage

The fuse for the motor voltage is placed on the left side of the mains plug unit and secures the supply voltage of the cutting drive.

- To replace this fuse, turn off the power switch and unplug the unit.
- Now press the fuse holder cap via a screwdriver and turn it to the right side.
- Remove the fuse and replace it with a new one.
- Insert the fuse holder cap with fuse again and lock in the bayonet catch.

#### Rating of fuse:

-1 piece T 2,5 AH (car. no. 326500)

## 5-2 CLEANING AND CARE

### Cleaning intervals

Cleaning, care and decontamination of the microtome depends on how frequently the microtome is used.

For the **daily routine maintenance and cleaning** of the instrument, the following steps should be carried out:

- Press the UP button for more than one second. Now the blade carrier moves into the direction of its "home" position (see part 3-2-1-2).
- Remove the adapter with inserted blade from the blade carrier.
- Remove chuck as well as the specimen including surplus bonding agent.
- Remove cooling element.
- Remove buffer tray and empty it. Dispose of the contents according to the respective lab regulations.



**Note:**

Chucks, buffer tray and adapter can be cleaned with mild household cleaners. For their disinfection, we recommend to use a 70% alcoholic solution.

- Turn off the power switch on the rear side of the microtome.

### 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.

### How to proceed

- Remove knife and/or blade from the blade carrier!



**Caution:**

Microtome blades are extremely sharp! Always remove them from the blade carrier after sectioning!

Clean all operating elements and surfaces of the blade carrier, especially the seat the knife and the surfaces of the buffer tray.

Clean all turning knobs, specimen clamping system, specimen orientation as well as the base plate and housing.

**PART 6      CONDITIONS FOR THE  
TRANSPORTATION OF THE  
INSTRUMENT**

**6-1      TAKING BACK THE INSTRUMENT FOR  
REPAIR OR ROUTINE MAINTENANCE**

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

- To guarantee trouble-free function of the instrument after transportation, please note the below-mentioned measures for the transportation preparation.
- In addition, the conditions for storage and transportation as mentioned in part 1-2 must be observed during the entire transportation.



**Biohazard:**

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

**Measures for closing down:**

- Turn off the instrument.
- Unplug the unit.
- Remove blade from blade carrier.
- Remove the buffer tray.
- If needed, remove the large field magnifier from the instrument.
- Remove tray for tools, blades, blade carrier and other accessories.



**Note:**

These accessories must be cleaned and transported according to your respective lab regulations. Transport them in dry condition!

**Caution:**

Any shipping of the instrument requires original packaging materials! Damages caused by shipping with non-conform packaging are not covered by the manufacturer warranty! Any damage repairs resulting in non-conforming package are fully charged to the sending party. We reserve the right depending on seriousness of damage NOT to repair.

To order original packaging materials, please contact Thermo Fisher Scientific or your local, by Thermo Scientific authorized, dealer.

**Caution:**

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

**Note:**

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

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

- Turn off the instrument.
- Unplug the unit.
- Remove blade from blade carrier.
- Remove the buffer tray.
- If needed, remove the large field magnifier from the instrument.
- Remove tray for tools, blades, blade carrier and other accessories.



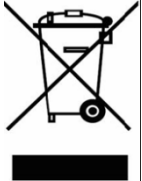
**Note:**

These accessories must be cleaned and transported according to your respective lab regulations. Transport them in dry condition!

- Place the instrument onto the wooden plate which is part of the original packing and fasten it with the corresponding screws.
- Insert the foam parts from the original packing into the transportation case.
- Place the instrument which is now screwed onto the wooden plate into the transportation case.
- Now put the internal carton over the instrument.
- Insert the upper foam parts onto the internal carton.
- Place the carton plate onto the upper foam parts.
- Then place the transportation packing for the accessories onto the carton plate.
- Arrange the dismantled accessories into the intended places.
- Close the transportation case and secure it by a tape.

## 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.



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

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

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

**APPENDIX: RECOMMENDED SETTINGS HM 650 V**

- Cutting speed:** for soft fresh tissue: ..... between 6 and 12  
for fixed tissue: ..... twice the speed
- Clearance angle:** with the setting lever (white scale): ..... 0 or select a higher value  
..... (increments between lines: 3°)
- Blades:** Microm, Gillette, Rotbart, Wilkinson and the like  
(Conventional double edge razorblades are used.  
Please insert the whole blade – do not cut them in half!)
- Amplitude:** ..... 0,9 mm
- Frequency:** ..... 60 up to 70 Hz
- Temperature:** ..... 2 up to 6°C