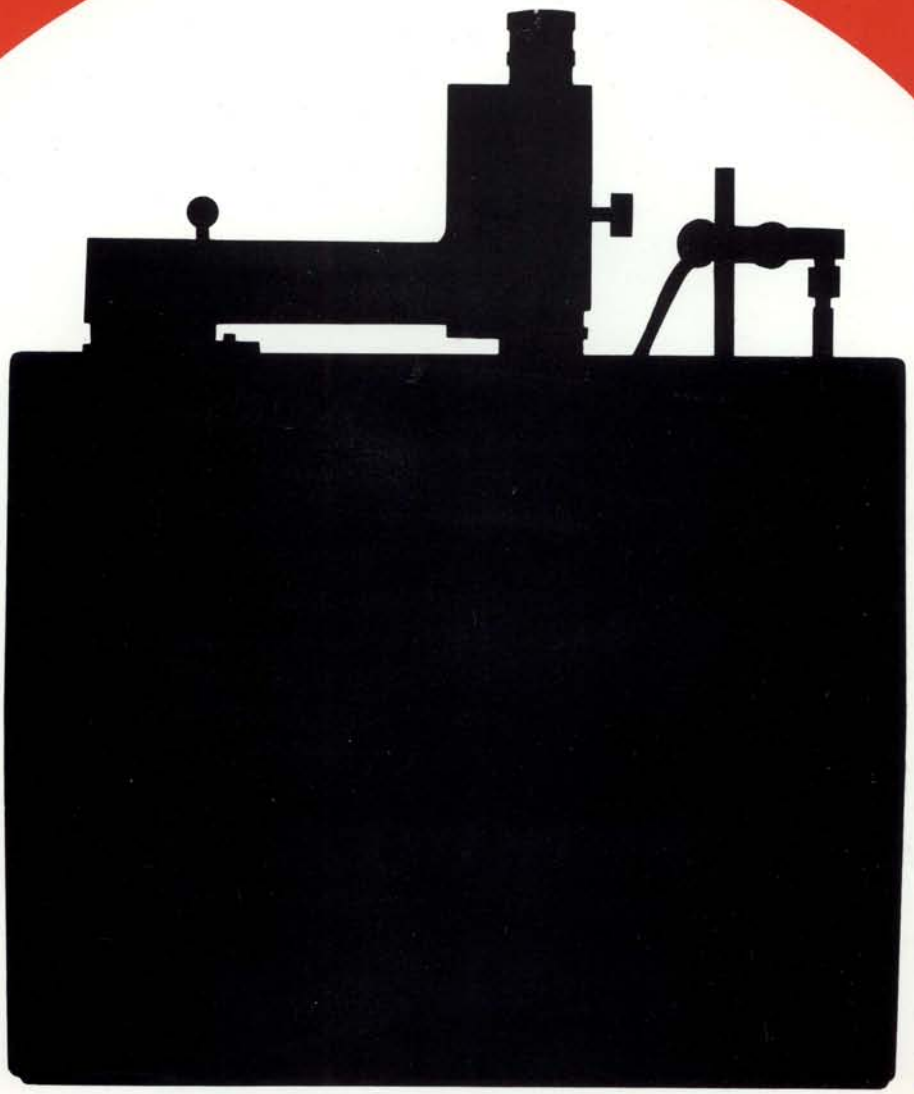
LEITZ
Sawing Microtome

Instructions



530–32/Engl. R

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Instructions

CONTENTS

1. Introduction

Problems arise during the cutting of undecalcified bone on conventional microtomes, which make the achievement of optimum results impossible :

Because these instruments employ the principle of cutting with knives at a certain angle, deformation during the course of cutting cannot be avoided. This results in damage, such as cracks, which often make a valid judgement of the sections impossible.

Other hard materials (rock, minerals, glass fibres, ceramic substances etc.) cannot be cut with conventional microtomes, because they crumble completely during the cutting operation.

The LEITZ sawing microtome serves especially for the "cutting" of extremely hard and brittle materials. The sawing process allows the production of sections of these objects which are absolutely free from deformation.

2. Technical description

The central feature of the microtome is the diamond--coated inner-hole saw, which is peripherally mounted and therefore extremely robust in spite of a thickness of only about 300 µm.

The object holder guided in the inner hole of the saw can be loaded from the top with clamps of various diameters.

To cut the section, the object holder is moved extremely slowly against the saw which rotates at about 500 rpm. The object arm is pulled by a spring, but at the same time prevented from attaining excessive speed by means of an adjustable hydraulic brake. To avoid overheating of the object during the sawing operation, the microtome is water cooled. It is connected directly to the water mains through a pressure tube. Water flow and pressure can be very finely regulated by means of a valve.

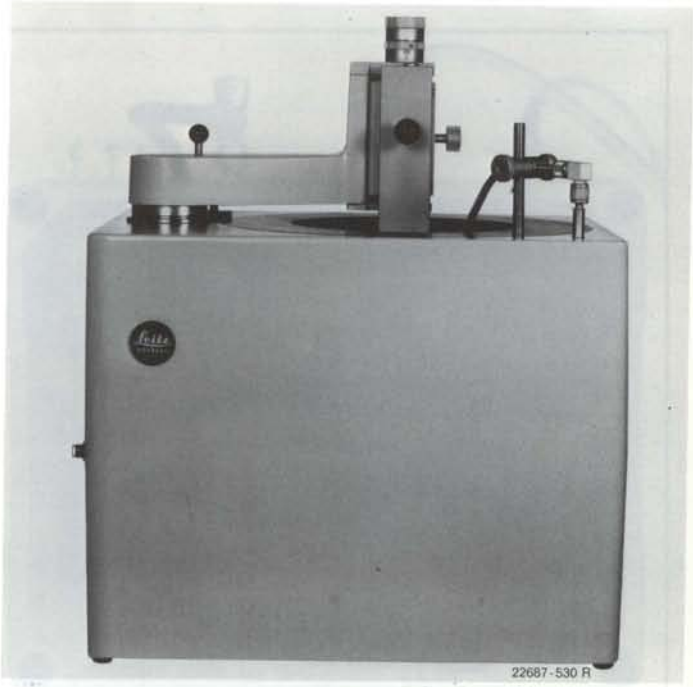
The section thickness is adjusted manually by means of a knurled screw on the object holder.

3. Installation and assembly

The sawing microtome should be set up on a robust table near a water mains connection and drain (length of the water supply and outlet tubes about 2 m).

The motor of the instrument is wired for 220v. A mains transformer is available for 110/115v.

Fig. 1 LEITZ Sawing Microtome



3.1 Remove the transport anchorage (2.1) *)

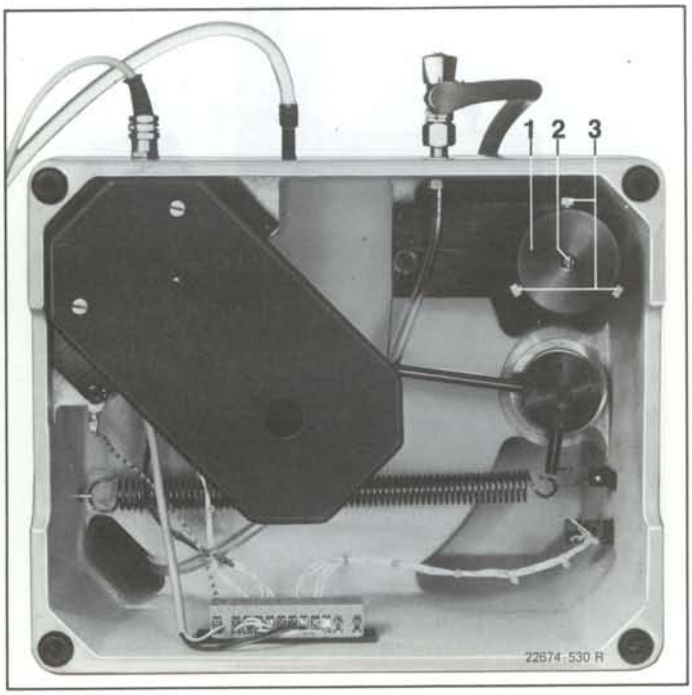
Push the side of the instrument housing the transport anchorage over the edge of the table so that the anchorage is accessible from below. Do not tilt the microtome.

Release screw (2.2) with a screwdriver, and the knurled screws (2.3) and remove the transport anchorage. (During transport a little oil may be deposited on the transport anchorage (2.1). This is of no significance for future operations).
Thereafter the instrument must be transported horizontally only.
Retain transport anchorage for possible future use.

*) (2.1) = Fig. 2, part 1.

Fig. 2

1 Transport anchorage
2 Pressure screw
3 Knurled screws for fixing the transport anchorage



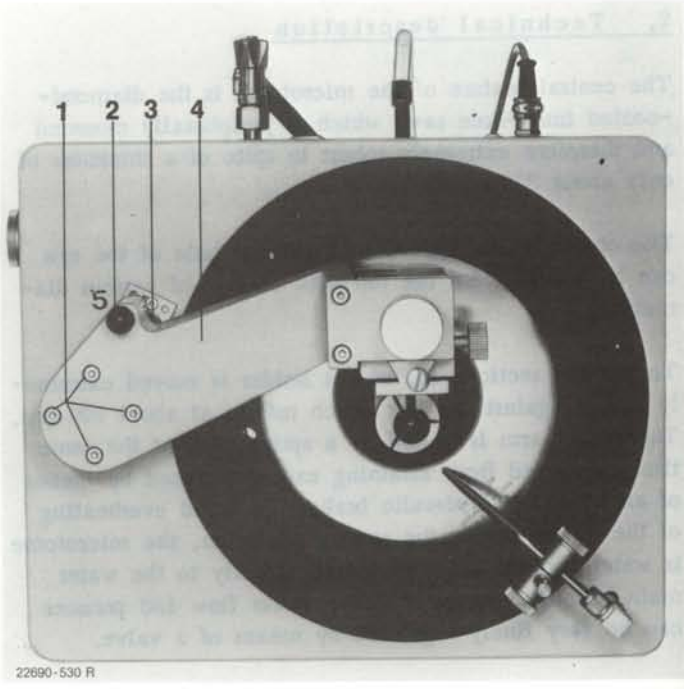
3.2 Mount the object arm (3.4)

The object arm (3.4) is correctly positioned when it stands above the saw and the fixing pin (3.2) is at the edge of the stop bar. Insert the Allen screws (3.1) provided for it and firmly tighten them with the Allen key (4mm).

Push the object arm (3.4) back until the fixing pin (3.2) engages (it is impossible to damage the saw during this operation). Firmly tighten screw (3.5).

Fig. 3

1 Allen screws for fixing the object arm
2 Fixing pin for the object arm
3 Guide for the fixing pin
4 Object arm
5 Screw preventing the lifting of the fixing pin 2 from the stop bar



3.3 Connect the instrument to the water mains

The pressure tube (4.5) has an internal diameter of about 1 cm and can be connected to 1/2in water taps.

Lead the water outlet tube (4.1) into a sink. Establish a gradient of about 30 cm between the outlet of the tube and the lower-end.

3.4 Connect the instrument to the electric mains (4.3)

It is now ready for operation.

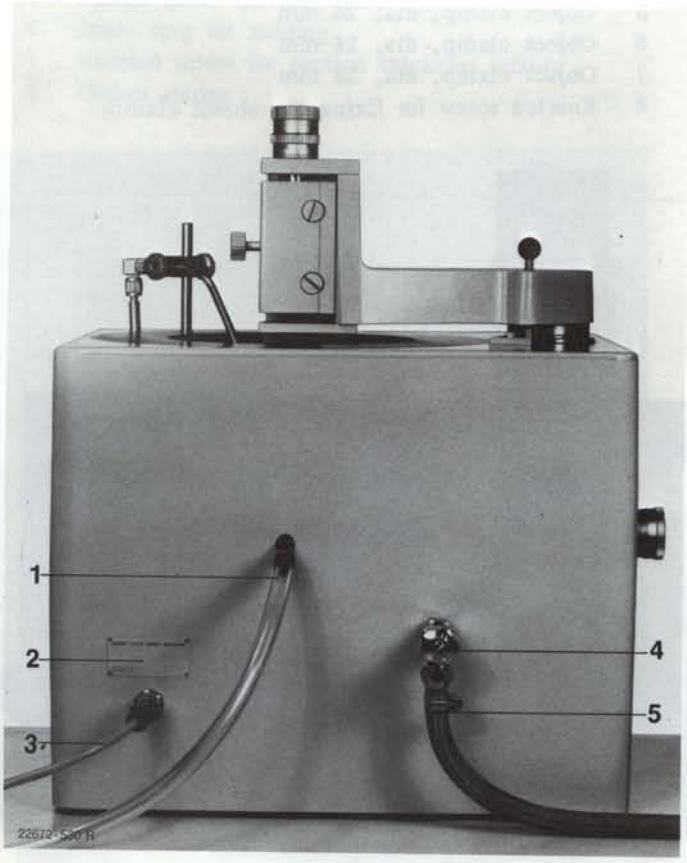


Fig. 4

1 Water outlet tube
2 Name plate
3 Mains cable
4 Water pressure regulating valve
5 Pressure tube to the water mains

4. Preparing the microtome for operation

4.1 Mount the object

Round specimens can be directly inserted in the clamp (Fig. 5). 5 clamps of diameters from 14 to 35 mm are available. The clamp loaded with the object is inserted in the object holder (5.2) and secured with the knurled screw (5.8).

Grip the knob (5.1) of the object holder and insert the holder in the guide provided for it on the object arm (6.5). The object arm must be engaged in the rearmost position (see 3.2). Tighten knurled screw (6.4).

4.2 Turn the knurled screw for section thickness adjustment (6.7) to the right until the lowest position of the object sledge (6.8) is reached.

4.3 Adjust the object vertically

Release knurled screw (6.4). Grip the knob of the object holder (5.2) and pull the holder out until the surface of the object protrudes a little above the edge of the saw. Firmly tighten knurled screw (6.4).

4.4 Trim the surface of the object

Slightly open the water tap and adjust the pressure via valve (4.4). Align the nozzle (6.3) so that the water jet plays on the edge of the saw.

Switch on the motor with push-button (7.1).

Release the object arm by pulling the fixing pin (3.2).

To move the specimen against the saw, set the object feed at top rate by turning the knurled screw (7.2) clockwise. Immediately before the specimen makes contact with the edge of the saw, turn the knurled knob (7.2) back to the speed required for sawing.

The numbers engraved on the knurled knob (7.2) do not represent precise speeds, but guide values to enable the user to reproduce the setting. The most favourable feed rate must be determined for each object. The slowest feed always exerts minimum force on the object and saw, and therefore reduces the likelihood of damage during sawing to a minimum. Many objects of sufficient hardness and homogeneity can, however, be sawn best at higher feed rates.

Fig. 5

1 Grip
2 Object holder
3 Object clamp, dia. 19 mm
4 Object clamp, dia. 14 mm
5 Object clamp, dia. 24 mm
6 Object clamp, dia. 26 mm
7 Object clamp, dia. 35 mm
8 Knurled screw for fixing the object clamps

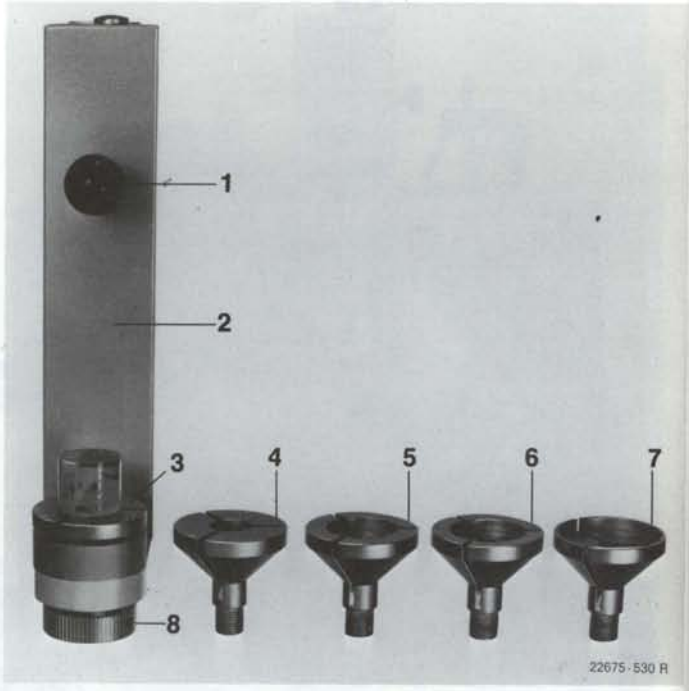
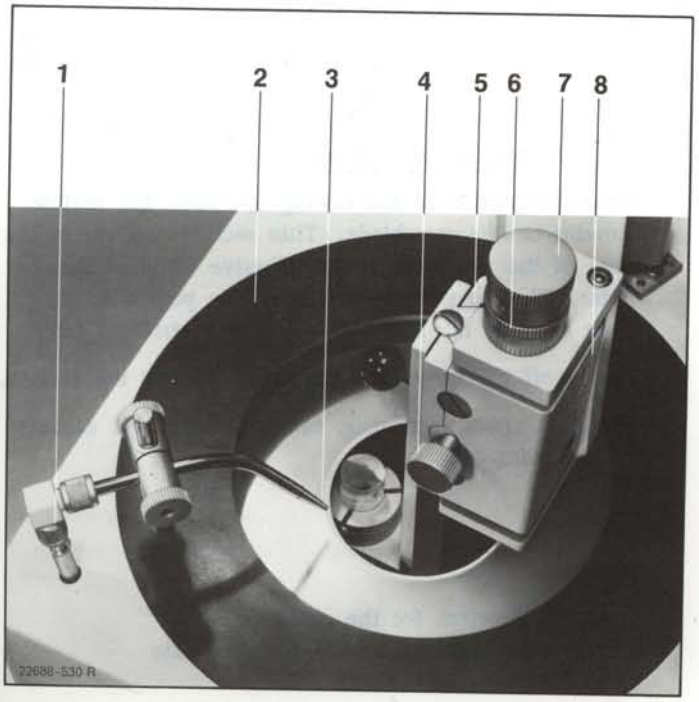


Fig. 6

1 Knurled screw for connecting the water supply
2 Plastic cover
3 Water supply
4 Knurled screw for fixing the object holder
5 Sledge guide for the object holder
6 Scale ring for zeroing
7 Knurled screw for section thickness setting
8 Object sledge



4.5 Producing the sawn section

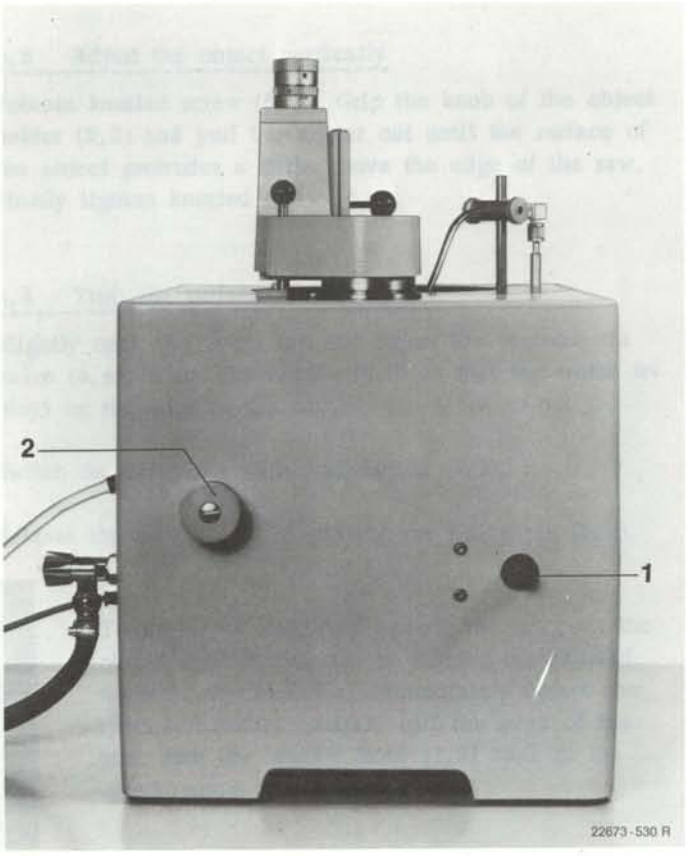
After the object has been driven through the saw, push the object arm (3.4) fully back. It clicks into position.

Switch off the motor with push-button (7.1).

Remove the section from the saw blade.

Setting the section thickness :

Set the scale ring (6.6) at 0, without any vertical adjustment. To set the section thickness, turn the knurled knob (6.7) anticlockwise. Each division represents 10 µm.



The thickness of the saw blade (about 300 µm) must be allowed for with each section thickness setting. If, for instance, a section of 100 µm thickness is to be cut, a section thickness setting of 400 µm is required. (300 µm for the saw and 100 µm for the section thickness = 400 µm).

Differences between the section thickness and the thickness value set are often unavoidable. They are caused by manufacturing tolerances of the diamond-coated cutting edge and a slight vertical irregularity of the saw blade rotation, particularly after the saw blade has been used for a long time. Section thickness can be affected also by the speed at which the object is moved against the rotating saw and the thermal effect this has on the embedding medium. Differences in section thickness may also be caused if the quality of the embedding is not up to the required standard.

It is not essential to turn off the water supply during this manipulation.

Switch on the motor.

Release the object arm clamp.

Set the feed at the highest rate.

Use a slower rate for the sawing operation (see 4.4).

4.6 Removing the section

After completion of the sawing operation the section remains on the saw blade. Thin sections adhere to the edge of the saw through the adhesive force of the water. Thicker sections are generally pushed to the outer edge of the saw blade by the centrifugal force.

Switch off the motor and manually remove the section.

The next sawing operation can be carried out as described under 4.5 .

Fig. 7

1 On/off switch for the motor
2 Knurled knob for setting the feed rate

5. General hints

4.7 Specimen change

Push the object arm (3.4) back until it engages.

Switch off the motor.

Turn off the water mains.

Grip the knob (5.1) of the object holder and, after releasing the knurled screw (6.4) pull the holder out.

Release knurled screw (5.8) and take out the specimen.

If the next specimen has a different diameter, completely turn out the knurled screw (5.8), and pull out the object clamp.

Charge the suitable clamp with the object, insert it, and secure it with the knurled screw (5.8).

Further operations see 4.1 .

5.1 Because of the thinness of the inner-hole saw, faulty treatment will very quickly damage the saw edge (for instance deformation), and make the production of thin sections impossible. Even excessive feed rates, especially when the rotating saw penetrates the object, may already cause damage to the saw.

The saw blade cannot be repaired.

With proper treatment, the life of the saw blade largely depends on the type of the object to be cut. It is therefore impossible to give accurate information. Listed below are some signs indicating that the saw no longer gives optimum service and should be replaced :

a) Passage of the object is considerably slowed down (given object, given feed rate).

b) The saw jumps out of the object during the sawing process (object only partially cut).

c) The edge of the saw is smooth (diamond coating completely removed).

d) Rotation of the saw blade is no longer true.

In the presence of these defects the saw must be exchanged as described below :

- Pull out the object holder (see point 4.7).
- Turn off the water cooling.
- Turn the knurled screw (6.1) and disconnect the water supply from the instrument.
- Remove the plastic cover (6.2). The saw mounted in the clamping ring is now accessible.
- Screw out the 4 knurled screws.
- The entire saw (with clamping ring) can be taken out.
- Insert new saw and secure it with the 4 knurled screws.
- Replace the plastic cover and reconnect water supply with knurled screw (6.1).
- Insert the object holder (see point 4.7).

The defective saw should be returned completely with the clamping ring to:

Ernst Leitz Wetzlar GmbH
Aftersales Service Department
P.O.B. 20 27

D-6330 Wetzlar / W-Germany,

where a new saw blade will be mounted and adjusted. This can be done only in the factory, where true running can be ensured with the aid of optical controls. It is therefore advisable to have at least two complete saws available.

5.2 The attainable section thickness depends on various factors:

a) Type of object. The harder and the more homogeneous, the thinner the section that can be obtained.

a) Quality of the saw.

c) Feed rate. At slow rates thinner sections can be sawn.

d) Object size. As on conventional microtomes, thinner sections can be obtained of smaller objects with the sawing microtome.

In the most favourable conditions section thicknesses of about 50 µm are possible. For most objects optimum section thickness is 80 - 100 µm. These details apply mainly to synthetic-resin-embedded undecalcified bone.

5.3 The water pressure need not be high for cooling the object. It is enough to moisten the object and saw edge with water. If the water splashes beyond the instrument, either pressure is too high (regulate it with the tap or with valve (4.4)), or the adjustment of the water supply must be slightly altered (see point 4.4).

After completion of work, the water mains should always be turned off to avoid unnecessary load on the pressure tube.

5.4 The object clamps accept only round objects of appropriate diameter.

Objects of other dimensions must first be cemented to object plates with a 2-component adhesive (e.g. Technovit 1130 b by Kulzer and Co. Bad Homburg v.d.H., Germany). These metal plates, available as accessories, have a base of 14 mm diameter and can be mounted in the appropriate clamp.

6. Care and maintenance

The sawing microtome is virtually maintenance-free.

Only the sledge guide (6.5) with spindle should be greased with vaseline from time to time.

The saw chamber should be cleaned at regular intervals. Sawdust and debris collect in the course of time and may lead to a blockage of the water outlet.

The saw itself, like the entire instrument, is made of non-corroding material and does not require special maintenance.

Design subject to alterations without notice.

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