



# Leica SM2500

Large Scale Heavy-Duty  
Sectioning System

and

# Leica SP2600

Ultramilling Attachment

**Leica**  
MICROSYSTEMS

# Ease of operation and versatility for comfortable large scale sectioning

Leica SM2500 large-surface, heavy-duty sectioning system is the standard universal microtome for all sectioning applications involving hard and/or large-surface specimens.

Large specimens up to 250 x 200 mm and hard materials such as bones and teeth embedded in methyl-methacrylate can be sectioned.

Typical medical research applications include the sectioning of whole organs such as brain or lung embedded in paraffin. The wide range of accessories, especially designed for paraffin, celloidine or resin embedded specimens make the Leica SM2500 the ideal instrument for both routine and research applications.

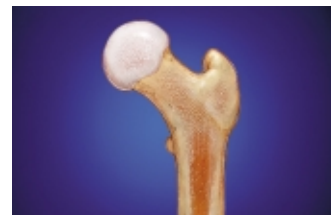
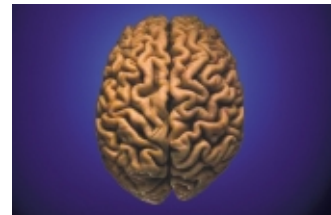
The Leica SM2500 can be fitted with the optional ultramilling attachment Leica SP2600. Ultramilling is a preparation technique which provides high-quality plane surfaces at lowest sectioning forces.

The precise photo position of the Leica SM2500 allows complete photo documentation of a defined stop position, making it possible to reconstruct a three-dimensional image of the specimen.



## At a glance...

- Easy-to-use heavy-duty sectioning system
- Fully motorized operation
- Programmable sectioning
- Maximum specimen size: 250 x 200 mm
- Maximum vertical stroke length : 70 mm
- Two selectable photo positions
- Three different modes of operation
- Choice of different specimen holders
- Choice of different knife holders
- Section counter, section thickness totalizer
- Programmable cutting window
- Programmable knife retraction value
- Specimen orientation (XY)
- Two selectable specimen stop positions



# Leica SM2500 Accessories Range

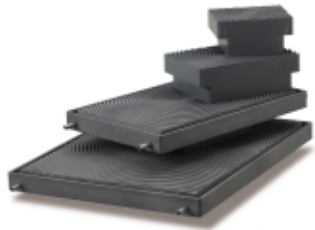


The Leica SM2500 microtome can easily be configured to meet specific user requirements with a wide range of knife holders, knives and specimen holders.

## Recommended Specimen holders and plates:



For paraffin embedded specimens a variety of metal specimen stages is available.



For the embedding with celloidine a variety of plastic embedding stages with rim and drain for the cutting fluids is used.



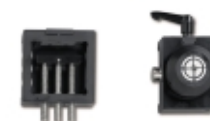
An aluminum embedding frame can be adjusted to prepare the specimen block in the optimum size



To ensure a proper clamping, both the metal or plastic stages are mounted in the base plate with vise. Additionally, it is the clamping system of choice for rectangular specimen blocks up to 80 x 100 mm.



For smaller specimens the specimen stage with dovetail guide is recommended. The stage can be mounted in north-south or east-west direction. When clamping in east-west direction the specimen can be moved laterally to a new knife position without touching the knife.

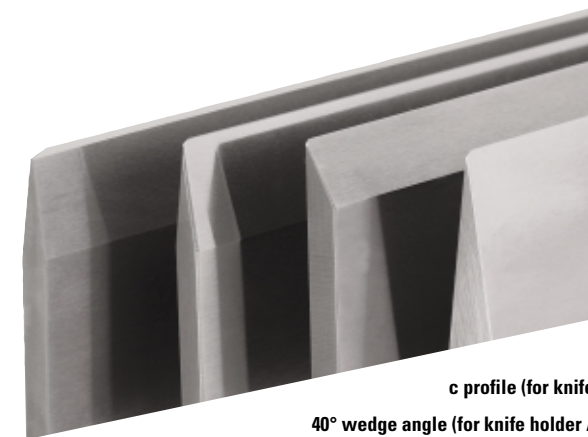


Two specimen clamps fit the base plate: an object clamp for 40 x 58 mm rectangular specimens or a round specimen clamp for specimens with 6, 15 or 25 mm in diameter.

## Recommended knife holders and knives:

A large variety of knife holders and knives is available to ensure the best possible cutting results. For different embedding materials or specimen properties, specific knife types are required.

The higher the cutting forces, the more knife holder stability is needed to ensure reproducible thin sections.



c profile (for knife holder B)

40° wedge angle (for knife holder A)

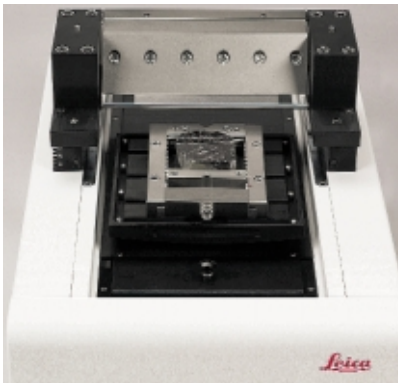
Cc profile (for knife holder C)

Cd profile (for knife holder C)

## Knife holder A

Knife holder A is the most stable knife holder. It is recommended for all hard specimens, such as resin embedded undecalcified bones and teeth. The knife is clamped along its length preventing vibration during sectioning. Different cutting edge angles are available made of steel or tungsten carbide. The choice of knife depends on the hardness of the specimen.

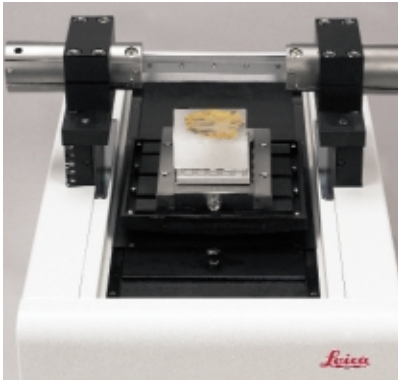
**Appropriate knife: knives with 40°, 50° or 60° wedge angle**



## Knife holder B

Knife holder B is recommended for paraffin embedded soft tissue. The holder accommodates all standard knife sizes up to a length of 22 cm with c and d profiles. As an alternative disposable blades can be clamped using the Leica disposable blade holder for low profile blades with central pressure plate.

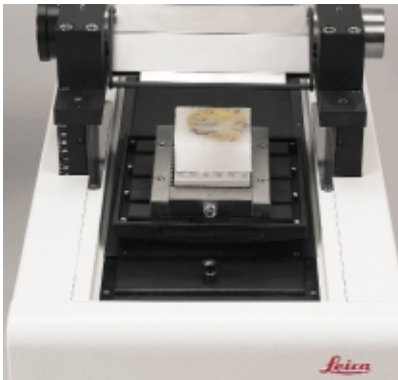
**Appropriate knife: standard knives with c or d profile or blade holder for low profile blades**



## Knife holder C

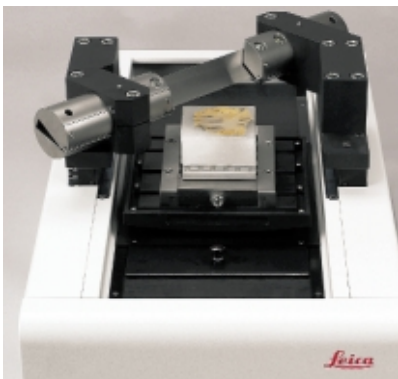
The knife holder C is designed primarily for biological specimens embedded in paraffin or celloidine. The knives are secured over their entire length, thus preventing vibration during cutting. The small angle of the knife pressure plate facilitates the removal of sections without tearing. The high stability of this knife holder combined with the special Cc and Cd profile knives ensure optimal sectioning results.

**Appropriate knife: Special knives with Cc and Cd profile**



## 45° knife declination

To reduce cutting forces an optional pair of special clamping blocks for permanent 45° knife declination can be used to take advantage of the pulling sections effect. This technique is specially recommended for the sectioning of wood specimens. The clamping blocks are suitable for all three knife holders.



# The ideal combination for specimen surface preparation: Leica SM2500 with ultramilling attachment Leica SP2600

Ultramilling is often a viable alternative to standard microtomy and saw microtomy in sample preparation. Instead of preparing thin sections for transmitted light microscopy, a polished surface is prepared for examination under reflected light.

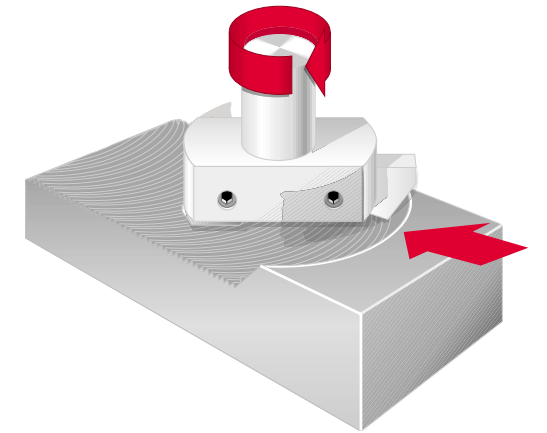
Especially with difficult specimens, where hard and soft materials are located side by side in one specimen block, the results achieved are truly excellent. Impressive results of unmatched quality have also been achieved in bone and teeth specimen preparation. Using the ultramilling technique makes it possible to track the area of interest in depth as the surface layer can be removed in micrometer steps.

In addition to surface preparations for incident light investigation it is also possible to do thin preparations for transmitted light microscopy. For that purpose, a plane parallel specimen slice is prepared (e.g. using the Leica SP1600 saw microtome) and placed onto a vacuum table which keeps the slice in position during milling. Both sides of the slice are then milled until the desired thickness is reached.

## The Ultramilling Principle:

Layer after layer of material, each layer of precisely the same thickness, is removed from a specimen block mounted onto a sledge travelling underneath a milling head consisting of a vertical, rotating spindle equipped with a diamond cutting tool on one end and a balance weight on the other side.

The surface preparation procedure consists of two different steps: a preparation step carried out with a pre-miller and a finishing step during which a mirror-like surface with excellent edge definition is obtained.



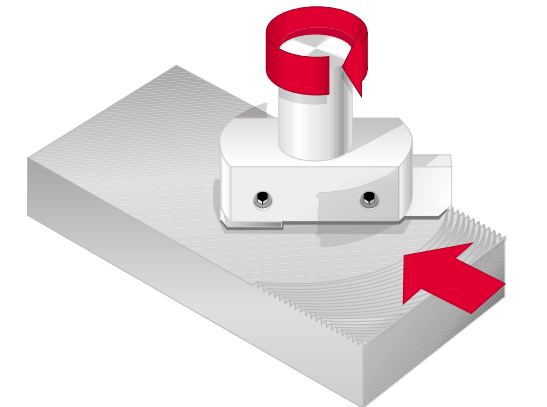
## The pre-milling process:

The rotational speed of the spindle is adjustable from 500 to 3,000 rpm, the ideal speed in each case depending on the material being milled.

Depending on the hardness of the material, material removal thickness can be adjusted starting from 1  $\mu\text{m}$  per layer.

To ensure high-quality final results the travelling speed of the sledge can also be adjusted according to the properties of each individual specimen being milled.

A diamond cutting tool with a triangular cutting geometry is used for the pre-milling step, where the block is trimmed down to the area of interest. Under the microscope, a pre-milled block surface will show a regular saw-tooth like pattern due to the triangular geometry of the pre-miller.



## The finishing step:

To obtain a smooth finished surface, the pre-miller is replaced by a finishing miller which removes the saw-tooth like pattern produced by the pre-miller leaving a perfectly even, mirror-like surface ready for investigation.

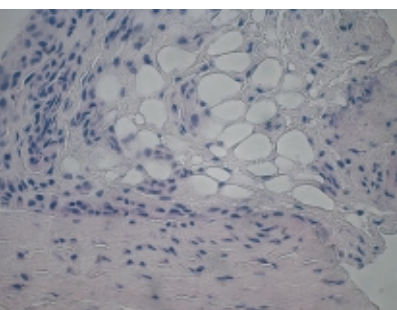


# Applications



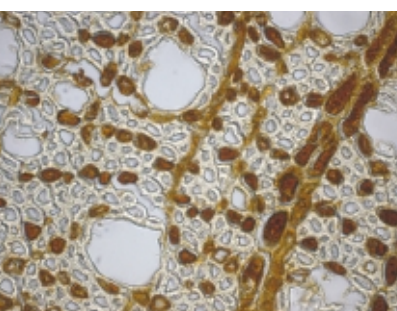
## WOOD

Configuration: ..... Leica SM2500, knife holder B, disposable blade holder base plate with vise, special clamping blocks for permanent 45° knife declination  
 Embedding Method: ..... none  
 Parameter: ..... approx. 15 µm section thickness, 2 mm/sec. cutting speed  
 Microscopical evaluation: ..... magnification 20 x, transmitted light microscopy, polarization



## BONE

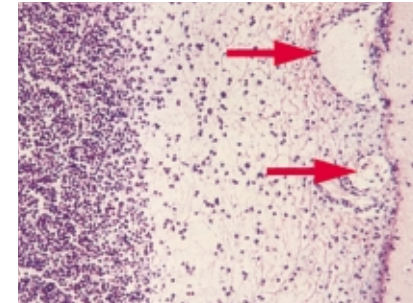
Configuration: ..... Leica SM2500, knifeholder A, 40° tungsten carbide knife base plate with dovetail guide, specimen clamp  
 Embedding Method: ..... Methymethacrylate  
 Parameter: ..... approx. 5 µm section thickness, 1,5 mm/sec. cutting speed  
 Microscopical evaluation: ..... magnification 20 x, transmitted light microscopy



## ROSEWOOD

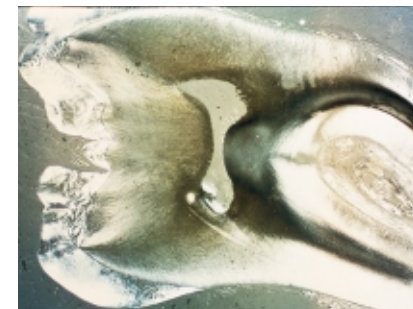
Configuration: ..... Leica SM2500, knifeholder B, disposable blade holder base plate with dovetail guide, specimen clamp, special clamping blocks for permanent 45° knife declination  
 Embedding Method: ..... none  
 Parameter: ..... approx. 5 µm section thickness, 1,5 mm/sec. cutting speed  
 Microscopical evaluation: ..... magnification 40 x, transmitted light microscopy

**BRAIN**  
 Configuration: ..... Leica SM2500, knife holder B, disposable blade holder for low-profile disposable blades with central pressure plate, base plate with vise, metal specimen stage, Aluminum embedding frame.  
 Embedding Method: ..... Paraffin  
 Parameter: ..... approx. 4 µm section thickness, H+E Stain  
 Microscopical evaluation: ..... magnification 120 x, transmitted light microscopy

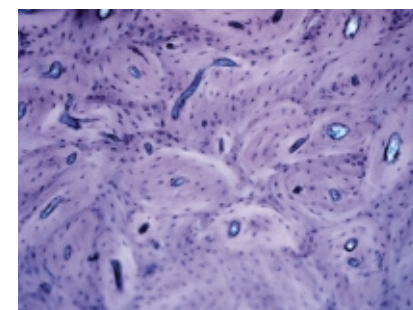


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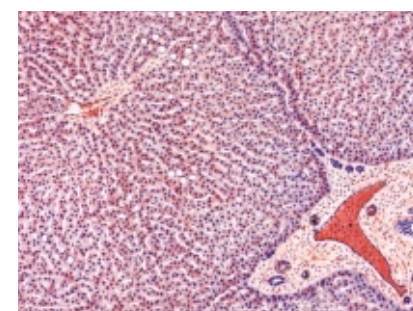
**DENTAL SPECIMEN**  
 Configuration: ..... Leica SP1600  
 Embedding Method: ..... none



**BONE**  
 Configuration: ..... Leica SP2600  
 Embedding Method: ..... Methymethacrylate  
 Parameter: ..... approx. 30 µm section thickness  
 Microscopical evaluation: ..... magnification 50 x, reflecting light microscopy



**LIVER**  
 Configuration: ..... Leica SM2500, knife holder C for special knives, base plate with vise, metal specimen stage, aluminum embedding frame, special knife, profile Cd, steel  
 Embedding Method: ..... Paraffin  
 Parameter: ..... approx. 4 µm section thickness, H+E Stain  
 Microscopical evaluation: ..... magnification 70, transmitted light microscopy



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## Leica SM2500 – Technical Specifications

### Microtome:

Section thickness range: ..... 0 - 1,000 µm, adjustable in 1-µm steps  
 Total horizontal specimen stroke: ..... maximum 275 mm  
 Total vertical knife feed: ..... 70 mm  
 Knife retraction (during specimen return stroke): ..... 0 - 1,000 µm  
 Clearance angle adjustment: ..... 0° - 17°  
 Knife declination - fixed setting (declination blocks = optional accessory): ..... 45°  
 Maximum specimen size (L x W x H): ..... 250 x 200 x 70 mm  
 Specimen orientation (along x/y axis): ..... 4.8° along each axis  
 Specimen orientation (rotation): ..... approx. +/- 3 and 90°  
 Sectioning speed: ..... 0.5 - 100 mm/s, adjustable in 0.1 mm steps  
 Return speed: ..... 0.5 - 100 mm/s, adjustable in 0.1 mm steps  
 Manual knife movement (slow/fast): ..... 37 mm/s and 74 mm/s  
 Manual specimen movement (slow/fast): ..... 37 mm/s and 74 mm/s

### Electrical connections:

Nominal voltage: ..... 100 / 120 / 230 / 240 V  
 Nominal frequency: ..... 50 Hz and 60 Hz  
 Maximum power draw: ..... 1,400 VA  
 Main fuses, type MDA, Fa. Bussmann: ..... 2 x T10A  
 Protective class: ..... I  
 Overvoltage installation category: ..... II  
 Vacuum cleaner: ..... 100 / 120 V - maximum power draw 500 VA  
 Vacuum cleaner: ..... 230 / 240 V - maximum power draw 1,200 VA  
 Lamp: ..... 100 / 120 V - maximum power draw 100 W  
 Lamp: ..... 230 / 240 V - maximum power draw 200 W

### Dimensions and weights:

Microtome (H x W x L): ..... 250 x 390 x 750 mm  
 Control unit (H x W x D): ..... 220 x 385 x 510 mm  
 Required bench top space for microtome and control unit: 1,000 x 950 mm  
 Microtome: ..... approx. 75 kg  
 Control unit: ..... approx. 23 kg

## Leica SP2600 – Technical Specifications

### Ultramilling attachment:

Milling spindle (special design): ..... type TSAV 60 x 160  
 Motor, rotation speed selectable in 100-rpm steps: ..... 500 to 3,000 rpm  
 Protective class: ..... I  
 Pollution degree: ..... 2

### Vacuum cleaner 'Fakir S20':

Nominal voltage: ..... 230 V  
 Nominal frequency: ..... 50 Hz  
 Power draw: ..... max. 4 A

### Dimensions and weight – Ultramilling attachment:

Dimensions (H x W x D): ..... 300 x 315 x 240 mm  
 Weight: ..... 18 kg

These specifications are supplemented by the specifications contained in the Leica SM2500 instruction manual.

Up-to-date development, production and quality control procedures certified under DIN EN ISO 9001 ensure highest quality and reliability.

Wide range of accessories upon request.  
 Technical specifications subject to change.

## Leica SP1600 Saw Microtome for pre-preparation

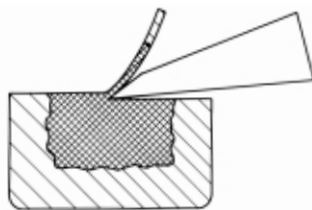
As a pre-preparation instrument for the Leica SM2500 with the milling attachment Leica SP2600, the Leica SP1600 saw microtome is specially designed for the cutting of extremely hard and brittle materials such as bones or teeth embedded in methylmethacrylate.

The specimen is clamped in the center of a diamond-coated internal-hole saw and pushed by a spring mechanism against the saw blade which rotates horizontally at a speed of 600 rpm, producing specimen slices of the desired thickness. Under optimum conditions section thickness of approx. 30 µm can be achieved. A built-in water cooling system prevents overheating of the specimen and removes saw dust.

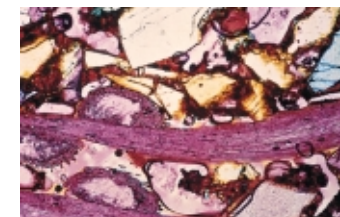


### Comparison of Sectioning versus Sawing Technique

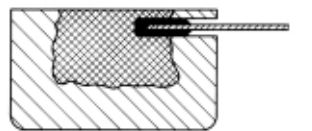
When sectioning with a sliding or rotary microtome, serial sections are possible, there is no material loss, but - due to the cutting angle of knife - the sample is subject to compression during sectioning.



**Slices of very hard materials can be prepared with the Leica SP1600 without destroying the morphology of the specimens thus facilitating light microscopical investigation.**



When using a saw microtome for pre-preparation serial sections are not possible. In addition there is some loss of material due to the thickness of the saw blade. The huge advantage of saw microtomy is that, compared to the sectioning principle, it causes effectively no compression of the slice. Any deformation and damage of the specimen is avoided because the radial load is kept on an extremely low level.



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Leica, the leading brand for microscopes and scientific instruments, developed from five brand names, all with a long tradition: Wild, Leitz, Reichert, Jung and Cambridge Instruments. Yet Leica symbolizes innovation as well as tradition.

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Austria:	Vienna	Tel. +43 1 486 80 50	Fax +43 1 486 80 50 30
Canada:	Richmond Hill/Ontario	Tel. +1 905 762 2000	Fax +1 905 762 8937
Denmark:	Herlev	Tel. +45 4454 0101	Fax +45 4454 0111
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Japan:	Tokyo	Tel. +81 3 5435 9603	Fax +81 3 5435 9615
Korea:	Seoul	Tel. +82 2 514 65 43	Fax +82 2 514 65 48
Netherlands:	Rijswijk	Tel. +31 70 4132 130	Fax +31 70 4132 139
Portugal:	Lisbon	Tel. +351 1 388 9112	Fax +351 1 385 4668
Republic of China:	Hong Kong	Tel. +852 2564 6699	Fax +852 2564 4163
Singapore:	Singapore	Tel. +65 677 97823	Fax +65 677 30628
Spain:	Barcelona	Tel. +34 93 494 95 30	Fax +34 93 494 95 32
Sweden:	Sollentuna	Tel. +46 8 625 45 45	Fax +46 8 625 45 10
Switzerland:	Glattbrugg	Tel. +41 1 809 34 34	Fax +41 1 809 34 44
United Kingdom:	Milton Keynes	Tel. +44 1908 246 246	Fax +44 1908 609 992
USA:	Bannockburn/llinois	Tel. +1 847 405 0123	Fax +1 847 405 0164

and representatives of Leica Microsystems  
in more than 100 countries.



Leica Microsystems Nussloch GmbH  
Heidelberger Strasse 17-19  
D-69226 Nussloch

Telephone: (06224) 143-0  
Fax: (06224) 143 200  
e-mail: [histo\\_info@leica-microsystems.com](mailto:histo_info@leica-microsystems.com)  
[www.leica-microsystems.com](http://www.leica-microsystems.com)

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