



**ALABAMA
RESEARCH AND
DEVELOPMENT**

**TSE
Technical & Scientific
Equipment GmbH**



The Krumdieck Tissue Slicer



An automated, sterilizable microtome for the preparation of aseptic slices of live tissues



The Krumdieck Tissue Slicer is designed to rapidly prepare aseptic, thin slices of live tissues for biochemical, pharmacological, toxicological, neurological, and other *in vitro* studies. The instrument minimizes damage to cut surfaces of slices and provides samples of uniform and reproducible thickness, eliminating the main sources of error in tissue slice work. Slices from approximately 60 to 1,000 microns in thickness can be prepared at a maximum rate of one slice every 3 to 4 seconds.

The slicer operates submerged in a buffer selected by the operator as most appropriate in terms of composition, tonicity, pH, temperature, oxygenation, and lubricating properties to maintain the viability of the tissues being sectioned.

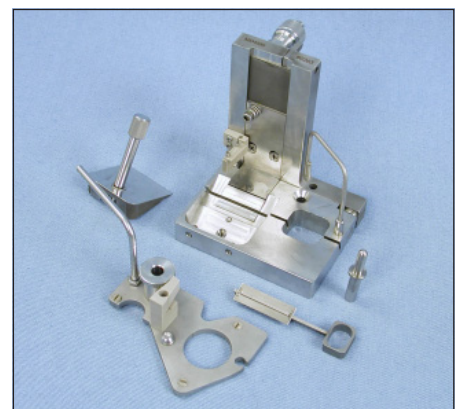


The slicer consists of three main parts: the **microtome assembly**, the **reservoir assembly**, and the **electrical housing**.

The microtome and the reservoir with the glass trap are sterilizable to allow the preparation of aseptic slices suitable for prolonged organ culture. When operating under aseptic conditions, the instrument is controlled by means of a footswitch. The operator can thus maintain the sterility of his/her gloved hands.

The actual slicing is done by a rapidly reciprocating disposable blade driven by a motor that also powers the impeller. The impeller establishes a circulating stream of buffer that is used to gently carry the cut slices from the microtome to the glass trap.

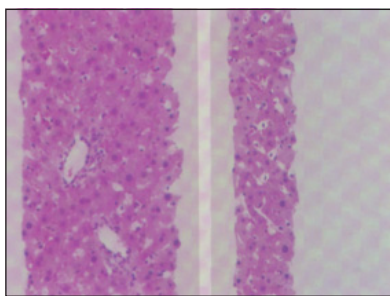
A speed-controlled second motor moves the tissue core past the oscillating blade to produce either one slice at a time or one slice after the other without interruption. The instrument can be operated in two modes. In the first mode, the blade oscillates continuously. In the second mode, the blade's movement is interrupted for half of each operating cycle to further reduce damage to the cut surfaces.



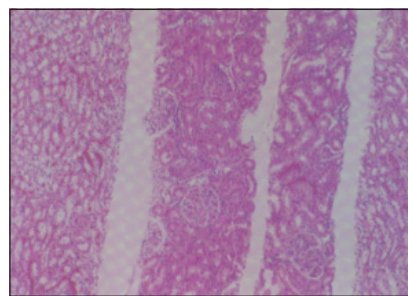
The tissue slicer contains a cooling block which allows the temperature of the buffer solution in the slicer's reservoir to be maintained when a chilled fluid is pumped in by a recirculating refrigeration unit. The aseptic conditions of the buffer can also be maintained since the coolant circulated through the cooling block is in a closed loop and does not come in contact with the buffer.

To maintain ideal operating conditions, the instrument should be chilled by connecting it to a recirculating refrigeration bath, by using it in a cold room, or by chilling the microtome/reservoir prior to use by placing it in a refrigerator along with the buffer.

Shown below in the left photograph are cross sections of rat liver slices (60 and 135 microns). Shown in the right photograph are cross sections of rat kidney slices (130 and 200 microns). Note the parallelism of, and minimal damage at, cut surfaces.



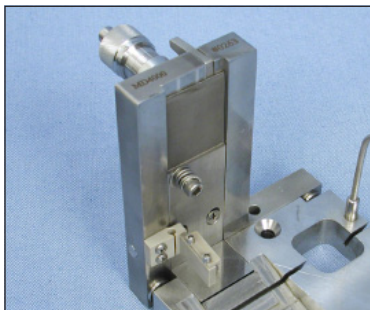
Rat Liver (magnification x430)



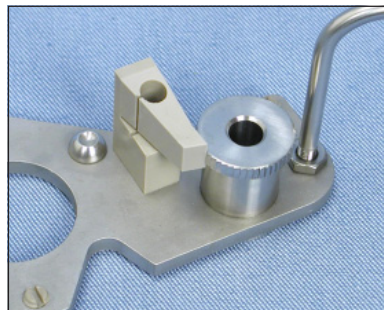
Rat Kidney (magnification x100)

New Features of Model MD4000

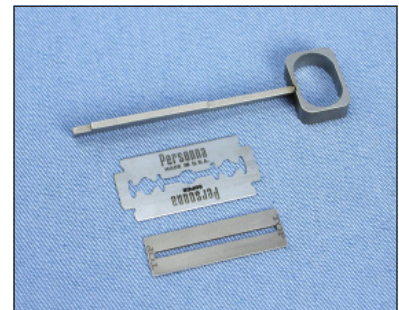
- **Improved thickness control** - the graduated thickness control knob has been relocated for easier adjustments and view of the slice thickness setting.
- **Core rotation device** - with the new spring assist and geared tissue insert tube, the core is rotated approximately 100° on each cut. This prevents the core from being cut on the same side each time and helps to alleviate tailings.
- **New style blades** - a completely redesigned blade holder uses stainless steel, double-edged blades, allowing easier blade access and longer blade life.



Improved thickness control



Core rotation device



New blades & redesigned holder

The new model MD4000 can be retrofitted with electrical housings of previous models to minimize upgrade costs.

Alabama Research and Development has developed new improved coring tools for cutting cylindrical live tissue cores for use in the Krumdieck Tissue Slicer.

The thin wall stainless steel tubing (previously used by Alabama Research & Development and competitors) does not hold an edge well and is difficult to sharpen.

The new coring tools are made from heat-treated, knife-quality stainless steel. The cutting edge

angles are designed to give sharp, well-formed tissue cores which is important for use in the Krumdieck Tissue Slicer. With proper handling, the coring tools should more than triple the life of the older tools.

The tools can be used either as hand-held tools or with the MD2000/2300 Alabama Research and Development tissue coring press. The coring tools are available in four sizes.



MP0142 - 3MM TISSUE CORING TOOL (SPECIAL ORDER)

MP0143 - 5MM TISSUE CORING TOOL

MP0144 - 8MM TISSUE CORING TOOL

MP0145 - 10MM TISSUE CORING TOOL



Alabama Research and Development has designed a tissue coring press to be used to prepare live cylindrical tissue cores for use in the Krumdieck Tissue Slicer.

This easy-to-use unit sits on a 6" x 6" granite base and is only 12" high.

The press is powered by a rechargeable battery, requires very little counter top space in a laboratory, and can be used in a hood.

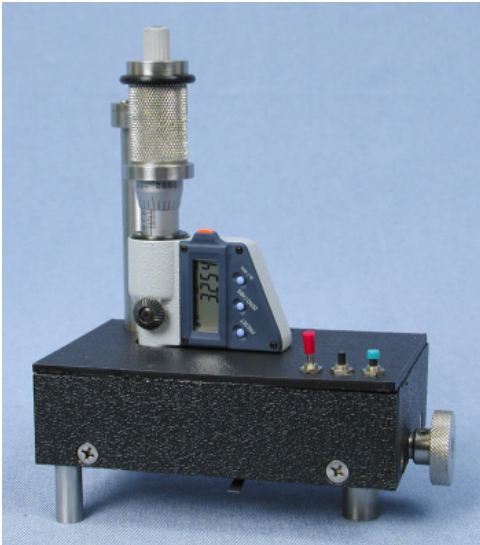
The unit is designed to be used with Alabama Research and Development coring tools ranging in size from 3 to 10MM.

Advantages:

- Eliminates the need for skillful operators to cut cores free hand.
- Ensures obtaining reproducible cores.
- Minimum training time needed for technicians to obtain high quality cores.

MD2000 - TISSUE CORING PRESS (USA AND CANADA)

MD2300 - TISSUE CORING PRESS (INTERNATIONAL)



The Tissue Slice Thickness Gauge is used in conjunction with the Krumdieck Tissue Slicer to rapidly measure the thickness of slices being prepared.

The gauge operates by measuring the decrease in height of a tissue core as it is sliced. Measurements can be made after each slice or after a number of slices if average slice thickness is to be determined.

The gauge mounts onto the reservoir of the Krumdieck Tissue Slicer (as shown below), aligning the gauge's digital micrometer with the slicer's plunger. The micrometer is "zeroed" as it rests on the plunger before a slice is made.

Following a cutting cycle, the micrometer takes a reading to measure the decrease in the height of the core. That decrease equals the thickness of the slice which is shown in microns on the micrometer's digital display.

Advantages:

- Measures with an accuracy of 10 microns.
- Slices do not have to be touched by the operator.
- Measurements made within 10 seconds.
- Prevents operator's bias.
- Slices are not mechanically damaged or contaminated by the instrument.



MD2700 - TISSUE SLICE THICKNESS GAUGE

The Alabama Research and Development Incubation System has been designed to provide optimal oxygenation and nutrient delivery to tissue slices in organ culture and to minimize damage and facilitate handling of the slices during preparation.

Slices (e.g., liver, kidney, heart, brain, etc.) are easily loaded onto specially designed titanium screen holders by a tissue slice loader that eliminates the use of slice-damaging forceps or spatulas.

The loaded slice holders are transferred to standard tissue culture six-well plates which are rotated (1 rpm) on an inclined plane to alternately expose the slices to the atmosphere of the tissue culture incubator or dip them in the culture medium.



- Reusable autoclavable titanium screen slice supports in delrin holders (biologically inert).
- Fast, easy, non-damaging loading of slices onto their supports using AR&D Tissue Slice Loader.
- Uses standard tissue culture six-well plates. Up to 24 plates (144 wells) per run.
- Alternate exposure of slices to atmosphere and culture medium.
- Inclined rotator fits inside most tissue culture incubators (15" x 15" x 15" or larger).

MD2500 - INCUBATION UNIT

MA0035 - TISSUE SLICE LOADER

MA0036 - WELL PLATE INSERT

The Tissue Embedding Unit is used to prepare tissue samples for slicing by fully encasing them in an agarose gel. The gel, which does not adhere to the tissues, easily separates from them after slicing.

Sectioning agarose embedded samples significantly improves the quality of the slices. Thinner slices of very reproducible dimensions are easily obtained.

Embedding widens the scope of tissue samples that can be sectioned by the Krumdieck Tissue Slicer by:

- eliminating the need to make cylindrical cores.
- allowing the use of small tissue samples or organs (e.g., rat adrenal, pituitary).
- allowing the use of irregularly shaped tissue samples.
- providing better support of tissue during slicing.
- allowing orientation of the sample to facilitate sequential slicing.
- providing better quality slices.

In practice, the tissue samples are dissected on the ice-cooled working surface of the embedding unit and placed inside a mold-plunger assembly pre-cooled in a chilled aluminum cooling block. Enough low temperature gelling agarose (FMC Sea Plaque 3% @ 37C) is poured into the mold-plunger to cover the specimen. The gel hardens in 2 minutes or less and the embedded sample is transferred to the well of the slicer together with the plunger. Slicing can be initiated immediately.

Embedding is recommended whenever small differences in the parameter(s) under observation are expected between slices in the experimental and control groups.



MD2200 - TISSUE EMBEDDING UNIT

The Recirculating Refrigeration Bath can be used as a separate unit or in conjunction with the Krumdieck Tissue Slicer. The refrigeration bath connects to the cooling block located at the bottom of the slicer's reservoir by means of flexible tubing.

Refrigerated water or coolant from the bath is circulated through the cooling block, allowing the regulation of the temperature of the buffer solution within the reservoir. Since the recirculated coolant does not come in contact with the buffer, aseptic conditions can be maintained in the buffer solution and the reservoir.



The Recirculating Refrigeration Bath can also be used as a heated bath for other laboratory uses. A combination force/suction pump allows circulation to an open container if needed.

Specifications:

Temperature Range	-12°C to +100°C
Cooling Capacity	350 Watts at 20°C (50Hz models 290W at 20°C)
Pumping Capacity	13 Lpm at 0' head (Max head 16')
Heater	800 Watts (50Hz 1000W heater)
Bath Volume	1.3 gal. / 5.0 liters
Dimensions (H x W x D)	20 x 8.75 x 12.375 in (50.8 x 22.2 x 31.4 cm)
Electrical Requirements	115 V, 60Hz, 11 Amps (220/240 V, 50Hz, 7 Amps)

MD2800 - RECIRCULATING REFRIGERATION BATH

Cat.-No.	Description
550755-A3	Krumdieck Tissue Slicer MD4000-01 Complete with: <ul style="list-style-type: none"> • 100 Replacement Blades • 1x 8 mm Tissue Insert Set • 1 Instructional DVD • 1 Mounted Reservoir Cooling Block
550755-36	General Overall Maintenance Check for Krumdieck Tissue Slicer MD1100-A2 (with cooling block). Includes a thorough cleaning and inspection of parts (examples: replacing screws & magnets, sharpening and polishing wedge, re-calibrations, and testing).
550755-35	General Overall Maintenance Check for Krumdieck Tissue Slicer MD1100-A1 (without cooling block). Includes a thorough cleaning and inspection of parts (examples: replacing screws & magnets, sharpening and polishing wedge, re-calibrations, and testing).
550755-A2> MD4000-01	Upgrade Krumdieck Tissue Slicer MD1100-A2 to MD4000-01 Complete upgrade to new model, includes <ul style="list-style-type: none"> • Machining • Installation • Testing New Features of Model MD4000-01 <ul style="list-style-type: none"> • Improved thickness control - the graduated thickness control knob has been relocated for easier adjustments and view of the slice thickness setting. • Core rotation device - with the new spring assist and geared tissue insert tube, the core is rotated approximately 100° on each cut. This prevents the core from being cut on the same side each time and helps to alleviate tailings. • New style blades - a completely redesigned blade holder uses stainless steel, double-edged blades, allowing easier blade access and longer blade life.
550755-A1> MD4000-01	Upgrade Krumdieck Tissue Slicer MD1100-A1 to MD4000-01 Complete upgrade to new model, includes <ul style="list-style-type: none"> • Machining • Installation • Testing New Features of Model MD4000-01 <ul style="list-style-type: none"> • Improved thickness control - the graduated thickness control knob has been relocated for easier adjustments and view of the slice thickness setting. • Core rotation device - with the new spring assist and geared tissue insert tube, the core is rotated approximately 100° on each cut. This prevents the core from being cut on the same side each time and helps to alleviate tailings. • New style blades - a completely redesigned blade holder uses stainless steel, double-edged blades, allowing easier blade access and longer blade life.
550755-07	Motorized Tissue Coring Press MD2300
550755-03	3 mm Tissue Coring Tool MP01
550755-04	5 mm Tissue Coring Tool MP0143
550755-05	8 mm Tissue Coring Tool MP0144
550755-06	10 mm Tissue Coring Tool MP0145
550755-06/15	15 mm Tissue Coring Tool MP0145/15
550755-28	Tissue Slice Loader MA0035
550755-29	Well Plate Insert MA0036
550755-19	Type A Teflon Roller Insert MA0031
550755-23	Titanium Roller Insert MA0034



Cat.-No.	Description
550755-20	Roller Insert Replacement Titanium Screens (10 pcs.) MP0218
550755-21	Roller Insert Replacement Viton O-Rings (20 pcs.) MP0219
550755-13	Tissue Slice Handling Tool MP0147
550755-17	Tissue Embedding Unit MD2200
550755-30	Tissue Slice Thickness Gauge MD2700
550755-25	Recirculating Refrigeration Bath MP2800
550755-15	Replacement Blades (50 pcs.) MP0099 for Krumdieck Tissue Slicer Model MD1100
550755-15/01	Replacement Blades (100 pcs.) PI001248 for Krumdieck Tissue Slicer Model MD4000-01
550755-01	Glass Trap Assembly MA0006
550755-37	Intake O-Ring MP0085 (for Glass Trap)
550755-38	Return O-Ring MP0086 (for Glass Trap)
550755-41	Glass Trap Screen MP0089
550755-02	Flow Adjustment O-Rings MP0122
550755-33	Adjustment Shaft with Graduated Knob MP0011
550755-34	Drive Shaft Assembly MA0029
550755-40	Eccentric Shaft MP0004
550755-32	Mod Drive Coupling MP0128
550755-18	Repair Kit MA0030
550755-14	Reservoir Cooling Block MA0040 for MD1100-A1
550755-24	Shaft Bushing MP0003
550755-44	Oscillating Arm Bushing MP0030 Minimum Order: 2 pcs.
550755-31	Stainless Steel Wedge MP0101
550755-22	8 mm Double Core Tissue Holding Arm MA0033
550755-08	3 mm Tissue Insert Set MA0018 for Krumdieck Tissue Slicer Model MD1100
550755-08/01	3 mm Tissue Insert Set MA0018-01 for Krumdieck Tissue Slicer Model MD4000-01
550755-09	5 mm Tissue Insert Set MA0019 for Krumdieck Tissue Slicer Model MD1100
550755-09/01	5 mm Tissue Insert Set MA0019-01 for Krumdieck Tissue Slicer Model MD4000-01
550755-10	8 mm Tissue Insert Set MA0020 for Krumdieck Tissue Slicer Model MD1100
550755-10/01	8 mm Tissue Insert Set MA0020-01 for Krumdieck Tissue Slicer Model MD4000-01
550755-11	10 mm Tissue Insert Set MA0021 for Krumdieck Tissue Slicer Model MD1100
550755-11/01	10 mm Tissue Insert Set MA0021-01 for Krumdieck Tissue Slicer Model MD4000-01
550755-16	13 mm Tissue Insert Set MA0045 for Krumdieck Tissue Slicer Model MD1100
550755-12	Set of 3, 5 & 10 mm Tissue Insert Sets MA0022 for Krumdieck Tissue Slicer Model MD1100
550755-12/01	Set of 3, 5 & 10 mm Tissue Insert Sets MA0022-01 for Krumdieck Tissue Slicer Model MD4000-01
550755-45	Instructional DVD MP0317/DVD for Krumdieck Tissue Slicer Model MD4000-01
550755-26	Instructional Video MP0317 for Krumdieck Tissue Slicer Model MD1100 (please specify PAL or NTSC format)

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Analgesia Systems	Hot Plate Systems, Tail Flick Systems, Randal-Selitto Systems
Behavior Test Systems	Activity Measuring Systems, Drinking & Feeding Monitor, Conditioning Systems, Maze Systems, Anxiety and Depression, Rotameter Systems
Cardiovascular	Blood Pressure Monitoring Systems (Invasive & Non-Invasive), Hemodynamic Systems, Ultrasonic Probes, ECG Monitors, Temperature & ECG Pad
Cell Biology	Patch-Pipette Puller, MyoTrack Contraction Monitor, Vibrotome, Krumdieck Tissue Slicer
Isolated Organ Systems	Multi-Place Organ Bath Systems, Langendorff & Working Heart Systems, Isotonic & Isometric Transducers, Transducer Amplifier Systems
Microdialysis & Infusion	Microdialysis Probes, Guide Cannulae, Microdialysis Pumps, Microsampler, Awake Animal Infusion Systems, Swivels & Accessories
Motor Function	Treadmills, Passive & Active Wheel Systems, Grip Strength Meter
Physiology	Multi-Purpose Calorimetry System, Power Meter, Volume Meter
Respiration & Anesthesia	Animal Respirators, Respiration Pumps, Anesthesia Units, Pulmonary Function Analyzer, Bronchospasm Measuring Setup
Telemetry	Implantable & External Miniature Transmitters for ECG, EMG, EEG, EOG, Acceleration, Temperature & BP Measurement
Various	Inhalation Exposure Units, Data Acquisition Systems, Syringe Pumps, Operating Tables, Homeothermic Blankets, Feeding & Dosing Needles

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