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.

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.

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 five sizes.

**MP0142 - 3MM TISSUE CORING TOOL (SPECIAL ORDER)**

**MP0143 - 5MM TISSUE CORING TOOL**

**MP0144 - 8MM TISSUE CORING TOOL**

**MP0145 - 10MM TISSUE CORING TOOL**

**MP0327 - 15MM 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**
Tissue Embedding Unit

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**
# Ordering Information

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| 550755-A3  | Krumdieck Tissue Slicer MD4000-01 | Complete with:  
- 100 Replacement Blades  
- 1x 8 mm Tissue Insert Set  
- 1 Instructional DVD  
- 1 Mounted Reservoir Cooling Block |
| 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). |
| 550755-36  | 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-A1> MD4000-01 | Upgrade Krumdieck Tissue Slicer MD1100-A1 to MD4000-01 | Complete upgrade to new model, includes  
- Machining  
- Installation  
- Testing  
New Features of Model MD4000-01  
- 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-A2> MD4000-01 | Upgrade Krumdieck Tissue Slicer MD1100-A2 to MD4000-01 | Complete upgrade to new model, includes  
- Machining  
- Installation  
- Testing  
New Features of Model MD4000-01  
- 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. |
<p>| 550755-03  | 3 mm Tissue Coring Tool MP0142 (I.D. 3.15 - 3.25mm) |
| 550755-04  | 5 mm Tissue Coring Tool MP0143 (I.D. 5.54 - 5.64mm) |
| 550755-05  | 8 mm Tissue Coring Tool MP0144 (I.D. 8.71 - 8.81mm) |
| 550755-06  | 10 mm Tissue Coring Tool MP0145 (I.D. 11.13 - 11.23mm) |
| 550755-06/15 | 15 mm Tissue Coring Tool MP0327 (I.D. 16.10 - 16.20mm) |
| 550755-07  | Motorized Tissue Coring Press MD2300 |
| 550755-27  | Incubation Unit MD2550 |
| 550755-28  | Tissue Slice Loader MA0035 |
| 550755-29  | Well Plate Insert MA0036 |</p>
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<td>Roller Insert Replacement Titanium Screens (10 pcs.) MP0218</td>
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<td>Titanium Roller Insert MA0034</td>
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<td>Replacement Blades (100 pcs.) PI001248 for Krumdieck Tissue Slicer Model MD4000-01</td>
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<td>550755-15/02</td>
<td>Replacement Blades (50 pcs.) MP0447 for Krumdieck Tissue Slicer Model MD1100 These blades are a replacement for the MP0099 blades. REMARK: When using these blades, the Revised Oscillating Blade Holder MA0009-01 (art.-no. 550755-39/01) is needed.</td>
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<td>550755-39/01</td>
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<td>550755-32</td>
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<td>Repair Kit MA0030 The kit includes: • MP0199 - Screwdriver, Magnetic Tip • MP0200 - 1/16 Hex Insert Bit • MP0201 - 3/32 Hex Insert Bit • MP0202 - 1/8 Hex Insert Bit • MP0203 - 1/16 Short Arm Hex Key • MP0213 - Plastic Spring Clip • MP0308 - Phillips Bit No. 1 • MP0309 - Phillips Bit No. 2 • MP0310 - Slotted Bit 3/16 • MP0311 - Slotted Bit 9/32</td>
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<td><strong>Instructional Video MP0317</strong> for Krumdieck Tissue Slicer Model MD1100 (please specify PAL or NTSC format)</td>
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Lubinski, Jadwiga, Flint, Oliver P., Durham, Stephen K., Bristol-Meyers Squibb Pharmaceutical Research Institute, Department of Experimental Pathology, Syracuse, NY 13221, USA and Princeton, NJ 08543, USA. Use of Precision-Cut Liver Slices for Interspecies Comparative Toxicity. SOT 35th annual meeting, Annheim, CA March 1996.


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