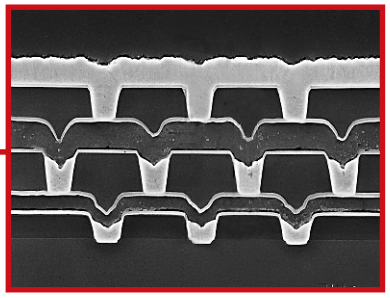
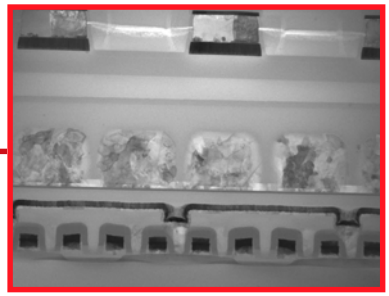
THE MULTIPREP™ SYSTEM

UNEQUALLED RESULTS

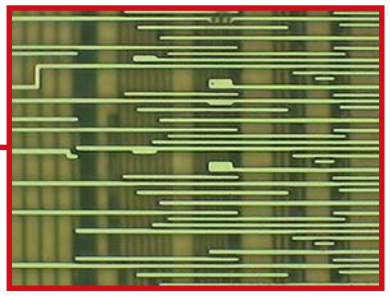
IN ALL OF THESE SAMPLE PREPARATION APPLICATIONS



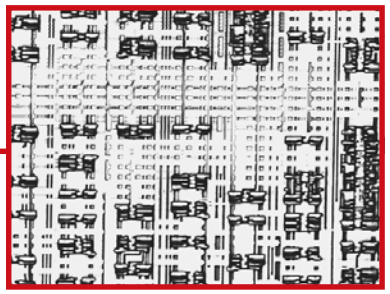
PRECISION CROSS-SECTIONING



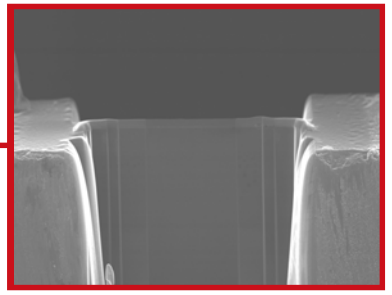
TEM WEDGE/ PLAN-VIEW POLISHING



PARALLEL DELAYERING



BACKSIDE POLISHING



PRE-FIB THINNING

ALLIED
HIGH TECH PRODUCTS, INC.

The **MultiPrep™ System** enables precise semiautomatic sample preparation of a wide range of materials for microscopic (**optical, SEM, FIB, TEM, AFM, etc.)** evaluation.

Capabilities include parallel polishing, angle polishing, site-specific polishing or any combination thereof. It provides reproducible results by eliminating inconsistencies between users, regardless of their skill.

Dual micrometers (pitch and roll) allow precise sample tilt adjustments relative to the abrasive plane. A rigid Z-indexing spindle maintains the predefined geometric orientation throughout the grinding/polishing process. Digital indicators enable quantifiable material removal, which can be monitored real-time, or preset for unattended operation. Variable speed rotation and oscillation maximize use of the entire grinding/polishing disc and minimize artifacts. Adjustable load control expands its capability to handle a range of small (delicate) to large samples.

DIGITAL DIAL INDICATOR

The Digital Dial Indicator displays the amount of material being removed from the sample (real time during the polishing operation) in 1-micron increments.

ANGULAR ADJUSTMENTS

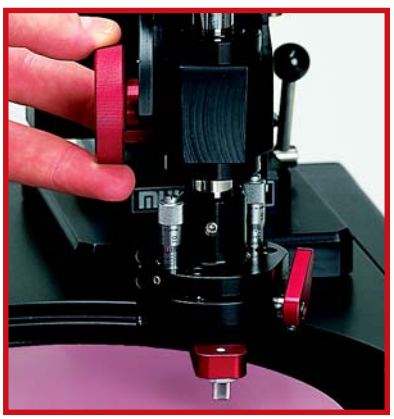
Micrometer heads allow radial (left to right) and axial (front to back) angle adjustments to the sample within a 5° range, in 0.02° increments.

SPINDLE RISER

The Spindle Riser raises the sample without disturbing the sample position settings. It is used when replacing platens/ abrasives, or removing fixtures for sample inspection.

CAM-LOCKING SYSTEM

Sample holding fixtures are attached using a Cam-Locking system, allowing quick, easy fixture removal for sample inspection and exact re-positioning throughout the polishing procedure.



OSCILLATION

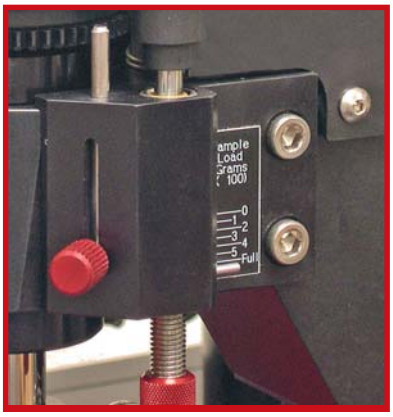
The sample may be oscillated across the platen in an adjustable range, utilizing the entire abrasive surface. This function has six speed settings.

SAMPLE ROTATION

The sample can be rotated 360°, or limited to a back and forth rotation within a range of 30-330°. Rotation provides a uniform abrasive pattern and prevents trails, smearing, and uneven abrasive distribution. Both functions have eight speed settings.

LED DISPLAY and TIMER

The LED displays the amount of time elapsed during operation. A preset time limit can be programmed, automatically shutting off the machine when the time has expired.



LOAD REDUCTION

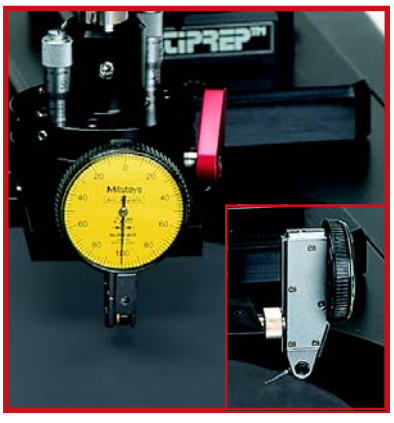
Allows adjustable sample load from 0-600 grams, in 100 gram increments.

VERTICAL ADJUSTMENT KNOB

The Vertical Adjustment Knob controls the vertical position of the sample in 2-micron increments. It can be used to set a pre-defined amount of material to be removed, allowing unattended operation.

SPINDLE CALIBRATION

The spindle is calibrated perpendicular to the platen using the supplied calibration kit. This ensures a precise polishing plane when rotating a sample, which prevents coning.

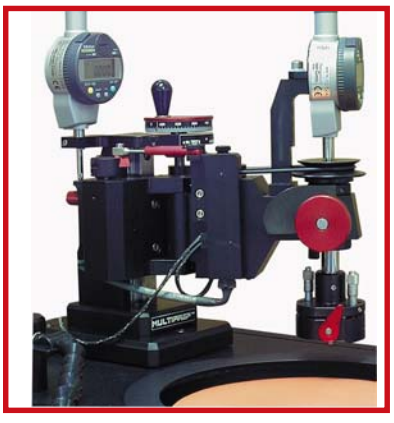


PARALLEL CALIBRATION

The parallel polishing fixture is calibrated parallel to the platen using the supplied calibration kit. This is essential for parallel and backside polishing techniques.

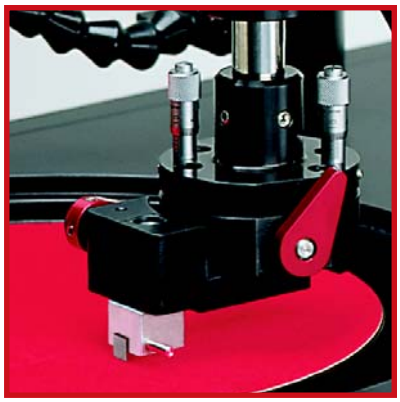
PLATEN / ABRASIVE CHANGES

The MultiPrep arm easily disengages to swing away from the platen area when changing platens/abrasives.

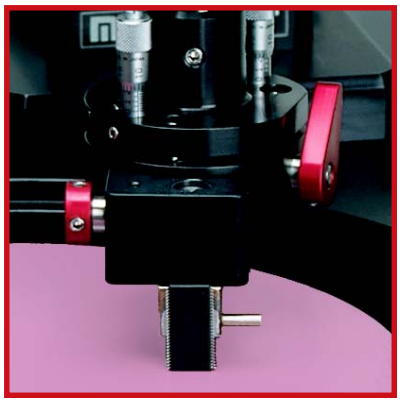


PRECISION CROSS-SECTIONING

The MultiPrep is an excellent tool for precision cross-sectioning a wide variety of materials. Applications that take advantage of its speed, precision, and accuracy include failure analysis, yield analysis, quality control, and research & development. With feature size of certain samples becoming smaller, such as in the electronics industry, it is critical to control the material removal rate to avoid polishing through the area of interest. The MultiPrep provides consistent sample rotation, oscillation and load, assuring uniform material removal. The digital dial indicator allows the operator to observe how much material is being removed, in real time and in 1-micron increments. Many samples can be prepared unencapsulated on the MultiPrep, including IC die, electronic packages, PCB's, electronic components and other material systems.

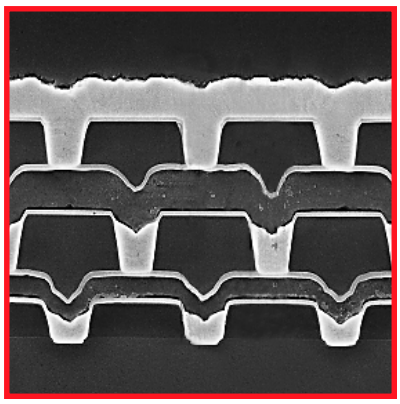


IC Die mounted on cross-sectioning paddle



Unencapsulated electronic package mounted on paddle

Low profile paddle for microscope viewing



Precision IC Cross-Section

Benefits of the MultiPrep:

- Operator can monitor the amount of material removed in real time and in 1-micron increments (sub-micron removal requires timed polishing).
- Pre-defined amounts of material removal allows unattended, site-specific polishing.
- Quick, accurate angle adjustments correct misaligned samples.
- Cross-sectioning paddles can fit into most SEM's without remounting the sample, which enables exact relocation to the polishing plane if continued polishing is desired.
- Uniform sample loading assures reproducible results.
- Vertically indexing spindle design ensures that the plane of polish is maintained throughout the entire polishing process.

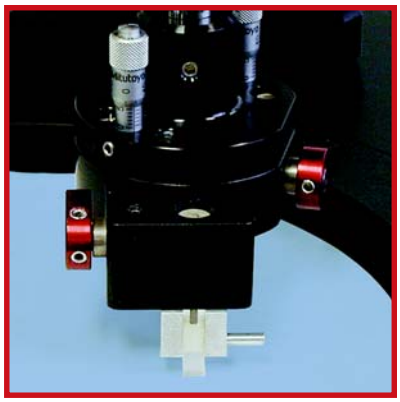
Basic Procedure:

1. Wax unencapsulated sample to the cross-sectioning paddle or secure encapsulated sample in the mount holder. Attach sample fixture.
2. Adjust sample angle.
3. Remove the desired amount of material with a descending sequence of abrasives until the area of interest is reached.

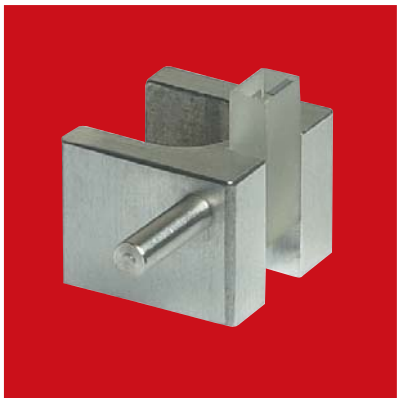
Typical Preparation Time: 10-20 minutes

TEM WEDGE/PLAN-VIEW POLISHING

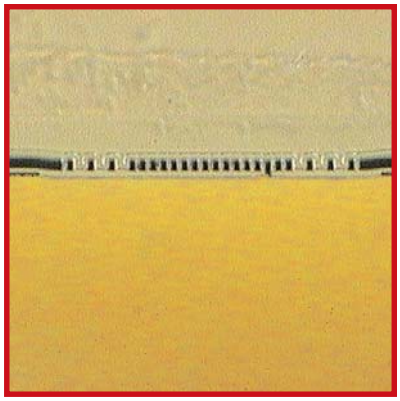
The MultiPrep is an efficient tool for preparing materials for TEM observation in either wedge or plan-view format. Samples are reliably polished to electron transparency, often eliminating the need for ion milling. Consistent sample rotation, oscillation and load provide uniform material removal and eliminate artifacts that can be associated with manual polishing. The dial indicator measures the sample and allows the operator to monitor its thickness throughout the polishing process, decreasing preparation time by eliminating the guesswork associated with hand-held polishing tools. Only the sample makes contact with the abrasive during polishing, ensuring that the desired angle (wedge polishing) remains intact throughout the process. The wedge technique provides a large, electron-transparent area in one dimension, making it ideal for semiconductors, and it allows simultaneous preparation of multiple interfaces (i.e., thin films/super-conductors).



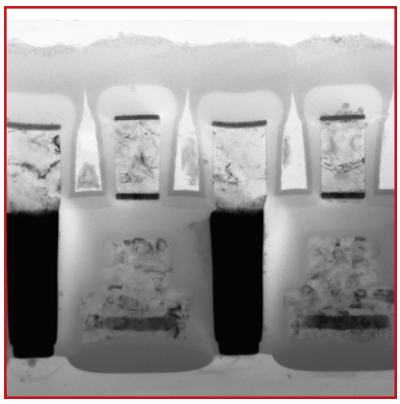
Pyrex insert is polished parallel to the abrasive surface



Sample mounted onto Pyrex and thinned to 200 microns



Sample final polished to electron transparency



TEM Image - No Ion Milling

Benefits of the MultiPrep:

- Rotation limit feature simulates the motions made when using hand-held polishing tools, which diffuses stress to the sample and can eliminate cracking or chipping.
- Cam-locking feature eliminates the need for tools and makes sample mounting, monitoring and measuring quick and simple.
- Small, low profile fixture fits easily in microscopes that have short working distances.
- Optional load adjustment kit reduces load on fragile samples, especially for final thinning.

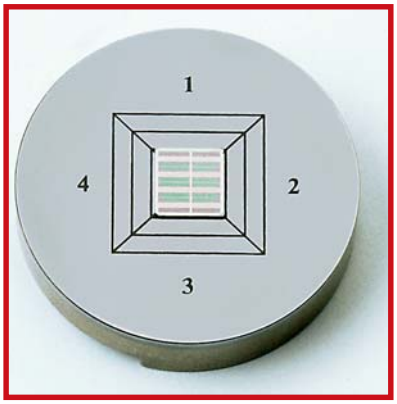
Basic Procedure:

1. Attach TEM fixture and grind the Pyrex using diamond lapping film until it is parallel with the abrasive surface.
2. Remove TEM fixture and wax/glue the polished surface of a cross-sectioned sample onto the Pyrex.
3. Using the micrometer head, induce the desired angle (wedge polishing) or leave parallel (plan-view polishing).
4. Attach the fixture and remove bulk material with a descending series of abrasives until the sample is less than 5 microns thick.
5. Depending on sample thickness or material, ion milling may be necessary.

Typical Preparation Time: 45-90 minutes

PARALLEL DELAYERING

The MultiPrep is ideal for parallel polishing. The most common application is for IC delayering, but it is also used to thin PCB's, substrates, compound semiconductor wafers, optics, geological specimens and other materials. Parallel delayering of IC's is a useful technique for construction or failure analysis. The MultiPrep allows precise, semiautomatic polishing, eliminating the tedious function of finger polishing or hand-holding polishing tools. Mechanical polishing on the MultiPrep provides controlled material removal, and eliminates the risks associated with chemical deprocessing by keeping areas of interest below the polished surface intact.



IC mounted on fixture
(sample size: 14mm x 14mm)

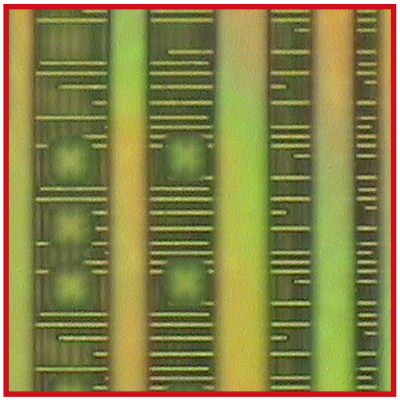
Benefits of the MultiPrep:

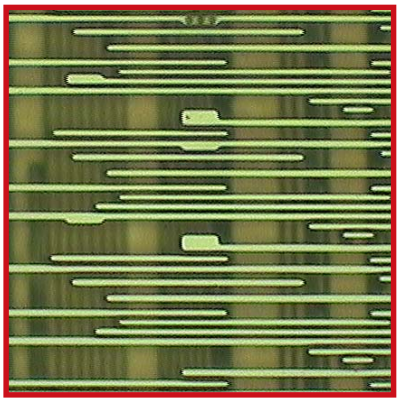
- Unattended, timed operation.
- Calibrated parallel polishing surface allows individual layers to be removed reproducibly.
- Rigid mounting surface applies uniform pressure across entire surface.
- Rotation feature improves flatness across the sample surface, edge to edge.
- Precision lapped, low-profile fixture allows quick and easy microscopic observation.


Sample making contact
with colloidal silica

Basic Procedure:

1. Calibrate the parallel polishing fixture so the mounting surface is parallel with the platen.
2. Remove the fixture and mount the sample using wax, tape or other removable adhesive.
3. Adhere a low-napped polishing cloth to a platen, secure onto the TechPrep and apply the appropriate abrasive suspension.
4. Attach the fixture and lower until the sample makes contact with the abrasive.
5. Enter desired polishing time and activate the rotation/oscillation features.
6. Sample observation will be necessary to determine polishing progress. Use timed increments to determine the appropriate polishing process. Polishing times will vary depending on abrasive chosen, sample size, density or material.

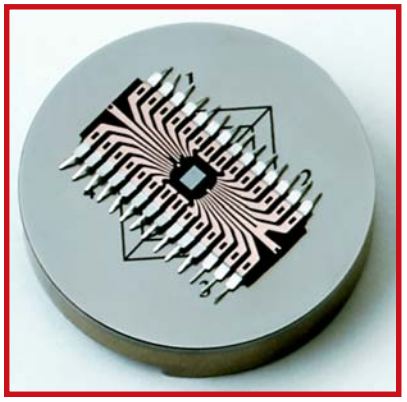

Metal 3 in focus with
Metal 4 forefront (500X)


Metal 4 removed to expose
Metal 3 (1000X)

Typical Preparation Time: 5-30 minutes

BACKSIDE POLISHING

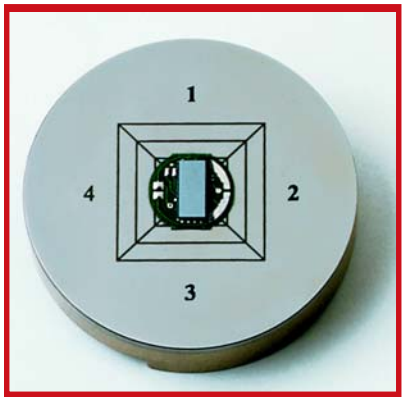
When thinning electronic devices for various analysis including SIMS, LSM, Backside Emission Microscopy, and related NIR techniques, it is important to achieve a flat, highly polished surface. The MultiPrep automatically indexes samples into the abrasive, eliminating the need to hand-hold polishing jigs. This allows for unattended sample preparation, enabling the user to perform other lab tasks simultaneously. IC's or packages such as flip chip, DIP, BGA, or PBGA can be prepared, maintaining electrical properties necessary for fault isolation and analysis. Even packages with recessed silicon below the lead frame can be globally polished and rewired before analysis.



Electronic package ground to expose die and lead frame

Benefits of the MultiPrep:

- Versatile parallel polishing fixture accepts various electronic packages, such as flip chip, BGA, DIP, etc.
- Oscillation and rotation features provide uniform surface finish.
- Dual axis alignment allows for adjustments to the plane of polish if necessary to compensate for mounting wax error.
- Optional weight kit provides greater load when grinding larger or thicker samples.
- Etched, numbered grid assists with sample alignment and measurement.
- Flat, parallel samples eliminate focusing difficulty during analysis.



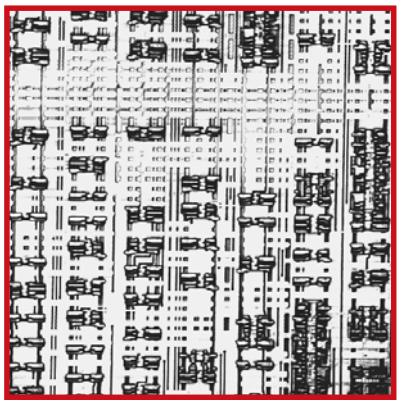
Flip Chip package mounted on fixture

Basic Procedure:

1. Calibrate the parallel polishing fixture so the mounting surface is parallel with the platen.
2. Remove the fixture and mount the sample using wax, tape or other removable adhesive.
3. Attach the fixture and lower until the sample makes contact with the abrasive.
4. Remove the desired amount of material with a descending sequence of abrasives until the area of interest is reached.

Verify thickness with #120-30010 Digital Measurement System

Typical Preparation Time: 15-30 minutes



Backside Emission Image (courtesy Schlumberger)

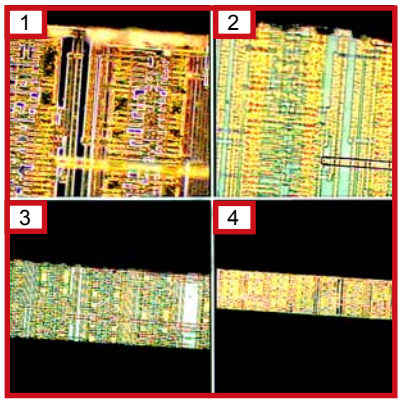
PRE-FIB THINNING

Since FIB (Focused Ion Beam) time is valuable, a pre-thinned sample decreases milling time, which increases sample throughput and reduces cost of ownership. The MultiPrep system accurately thins samples prior to using a FIB system for cross-section SEM or TEM sample preparation. It allows semi-automatic sample thinning with excellent reproducibility, and can prepare one or more samples simultaneously. Samples are typically thinned to a final thickness of 5-20 microns, depending on operator preference. In addition, if one side can be cleaved to within several microns of the area of interest, only the other side needs to be thinned, improving sample throughput.

Sample is thinned using diamond lapping film

Benefits of the MultiPrep:

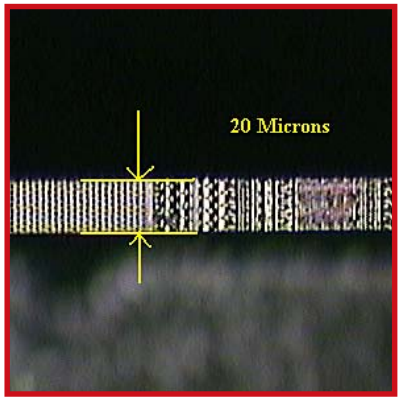
- Digital dial indicator measures sample thickness in 1-micron increments.
- Parallel Pyrex mounting surface enables preparation of several samples simultaneously.
- Hands-free operation. Sample stops grinding when desired point is reached.
- No angle adjustments are necessary during the polishing procedure.



IC thinning progression to 20 microns

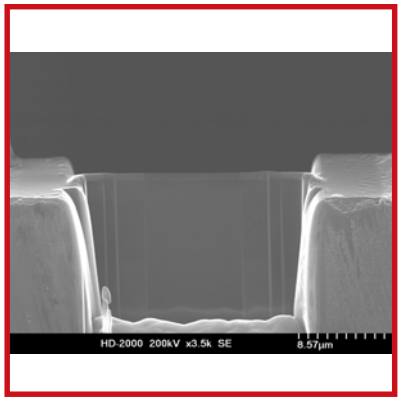
Basic Procedure:

1. Attach Pre-FIB thinning fixture and grind the Pyrex using diamond lapping film until it is parallel with the abrasive surface.
2. Remove the fixture and wax/glue the cleaved or polished edge of a sample onto the Pyrex.
3. Attach the fixture and remove bulk material with diamond lapping film until sample is the desired thickness.



#120-20015 Software for on-screen measurement

Typical Preparation Time: 10-20 minutes



FIB-Prepared Thin Section for TEM (courtesy Hitachi)

MULTIPREP™ SYSTEM AND ACCESSORIES

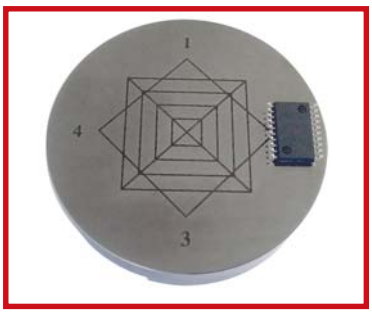
Item No.	Description
#15-2100	MultiPrep™ System, 8”, 100-240 V Includes: Splash ring and platen cover, fixture/ accessory storage case, and calibration kit
#15-2100-TEM	MultiPrep™ TEM System, 8”, 100-240 V Includes: Splash ring and platen cover, fixture/ accessory storage case, and calibration kit *TEM systems have an O-ring spindle drive for smaller, delicate samples*

Precision/magnetic platens, accessories and consumables are sold separately.

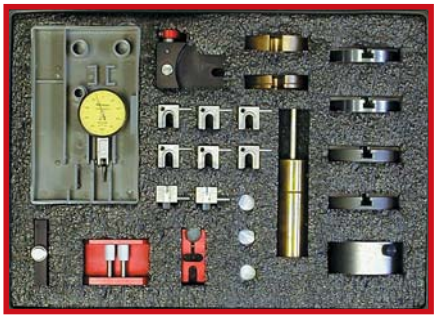
Accessories:

#15-1005	Cam-Lock Adapter	Used to hold #15-1010
#15-1010	Cross-Sectioning Paddle	Used to hold IC’s or other unencapsulated samples
#15-1013	TEM/Pre-FIB Thinning Fixture w/ Pyrex inserts, Heating/Mounting Stage	Used for TEM wedge/plan-view polishing, and Pre-FIB thinning
#15-1014	TEM/FIB Thinning Fixture	Used for wedge/plan-view TEM polishing, multiple sample FIB thinning and precision parallel semiconductor thinning for SIMS analysis.
#15-1018	SIMS/Backside Pyrex Holder	Used for sample thinning
#15-1020	Parallel Polishing Fixture	Used when polishing samples parallel to the platen
#15-1025	Teardrop Fixture, 40 mm capacity	Used to secure encapsulated samples
#15-1035	Weight Kit	Used for grinding samples that require extra pressure
#15-1045	Multipurpose Fixture	Used to secure larger or odd-shaped samples
#10-1005	8" Precision Platen	
#10-1005M	8" Precision Magnetic Platen	

Weight Kit (#15-1035)



Parallel Polishing Fixture (#15-1020)



A convenient accessory case is included with the MultiPrep™ System

12" MultiPrep™ Polishing System

The MultiPrep™ System enables precise semiautomatic sample preparation of a wide range of materials for microscopic (optical, SEM, TEM, AFM, etc.) evaluation. Capabilities include parallel polishing, precise angle polishing, site-specific polishing or any combination thereof. It provides reproducible sample results by eliminating inconsistencies between users, regardless of their skill. The MultiPrep eliminates the need for hand-held polishing jigs, and ensures that only the sample makes contact with the abrasive. It maintains geometric orientation of the sample relative to the abrasive plane during polishing, allowing quantification of material removal; rate of polish can be monitored, and total amount removed can be preset.

The system uses water as the standard coolant, however, seamless integration with the AD-5™ Fluid Dispenser is also an option.

Positioning Features:

- Precision spindle design indexes the sample perpendicular to the platen, and can rotate simultaneously
- Front digital indicator displays real-time material removal (sample advancement), 1 µm resolution
- Dual Axis, micrometer controlled angular positioning of the sample (pitch and roll), +10/-2.5° range, 0.02° increments
- Rear digital indicator displays vertical positioning (static) with zeroing function, 1µm resolution
- Automatic sample oscillation, adjustable sweep with 6 speeds
- Full or limited automatic sample rotation with 8 speeds
- Cam-locking system eliminates the need for tools and allows for precise repositioning of fixtures

Grinder/Polisher Features:

- Variable platen speed: 5-350 RPM, in 5 RPM increments
- Touchpad switches control all functions
- 0.5 HP (375 W), high-torque motor
- Stable RIM, aluminum and stainless steel construction
- Digital timer and tachometer
- Electronic coolant control with adjustable valve
- Clockwise/counterclockwise platen rotation
- CE compliant for EU
- Two (2) year warranty - parts and labor
- Designed & manufactured by Allied in the USA

TechCut 5™ Precision Sectioning Machine

The **TechCut 5™** precision high speed saw is a versatile, programmable machine designed to cut a wide variety and size of materials. It automatically sections materials at high speeds, increasing sample throughput. The microprocessor-based system controls sample feed-rate, distance and force, and automatically adjusts feed rate as the cutting condition changes due to varying thickness and/or material differences in the sample. When sectioning is complete, the table automatically retracts the sample to the home position and stops blade rotation and coolant. The unique fixturing system allows for easy changes between the T-Slot Table and the X-Axis Tables. Both tables offer a variety of convenient table-specific fixture options.

Features:

- Automatic Y-axis sample advancement with soft-start, programmable from 0.05" to 3" (1.25-76 mm) per minute
- Manual Y-axis sample advancement using hand wheel
- Cutting capacity: up to 2.5" (63 mm) bar stock
- Accepts 3-8" (76-203 mm) blades with either 0.5" (12.7 mm) or 1.25" (32 mm) arbor hole
- Variable speed: 500-5,000 RPM (100 RPM increments)
- Adjustable cut-depth with high-speed auto-retraction
- Selectable sample force (low, medium, high) optimizes feed rate automatically
- Sample rotation for difficult, round or thick samples (with optional #5-5745 Rotational Cutting Attachment)
- 1.25 HP (950 W) high torque DC motor
- Touchpad switches control all functions
- LED illuminated interior
- Intuitive control panel with backlit 4-line LCD display (imperial or metric units)
- Protective metal cover with viewing windows and safety auto shut-off sensor
- Recirculating coolant system - either internal 1.25 gal. (4.7 L) or external 7 gal. (26.5 L) capacity
- Dimensions: 24" W x 25" D x 19" H (610 x 635 x 483 mm)
- Weight: 142 lb. (65 kg)
- CE compliant for EU
- Two (2) year warranty – parts and labor
- Designed & manufactured by Allied in the USA

Allied offers a complete line of consumables to complement the MultiPrep™ System, including Grinding Discs, Diamond Lapping Films, Diamond Polishing Compounds and Suspensions, Colloidal Silica Suspensions, Polishing Cloths, Mounting and Cleaning Materials, and more.

ALLIED HIGH TECH PRODUCTS, INC.

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