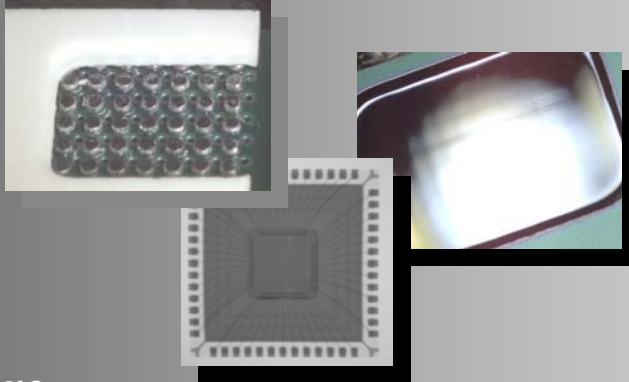




High Precision Milling & Polishing Instrument



Product Brochure



ALLIED
HIGH TECH PRODUCTS, INC.

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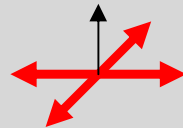
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Command.....

- Touch-screen, 12" color GUI
- Wizard-based operation guidance
- Store/Recall & Sequence
- No G-code programming required

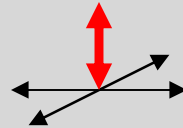
X/Y-Axis Position Control.....

- 100 x 100 mm range
- 1 μm resolution
- Closed-loop, servo driven



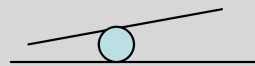
Z-Axis Position Control.....

- Closed-loop force control,
0.15 to 10 N range
- 0.1 μm resolution



Tilt/Angle Control.....

- Automatic 3-point sample leveling
- Sample leveling to less than
2 microns over 50 mm distance
($>.002^\circ$ per axis), 5° range ($\pm 2.5^\circ$)



Tools.....

- 1.5" OAL x 3 mm \varnothing shank
- End Mill, Solid Carbide
- Diamond Plated (coarse)
- Diamond Bonded (fine)



Fixturing.....

- Cam-lock, tool-free operation
- Submerged, wet milling/grinding

Safety.....

- Interlock control
- Polycarbonate safety cover
- HEPA vacuum
- $\sim 15\text{-}20$ dB operation noise (over ambient)

Speed.....

- 5,000 - 100,000 RPM Spindle
- Efficient, effortless material removal
- Rapid setup & processing/throughput

Detailed Features

- Wizard-driven touch-screen GUI, requires no external PC
- Requires NO CNC - G-code programming
- Variable spindle RPM: 5,000 - 100,000, featuring also:
 - Pneumatic tool change, 3 mm collet
 - Precision ceramic bearings, extreme accuracy
 - Lubricated for life
 - Air sealed
 - Electronic balancing, vibration-free
 - Powerful 3-phase AC current
- Closed-loop, variable rate X/Y control, 1 μm resolution/accuracy, servo-driven, Zero backlash
- Closed-loop load control adjusts X/Y feed rates to hold Z-position
- Adjustable/programmable feed rates
- Closed-loop Z-control, 0.1 μm resolution
- Z-force control, 0.15 - 10 N (newton)
- Live video X/Y origin definition
- On-screen help/directions
- Tool length/wear monitoring
- X/Y capacity: 100 mm x 100 mm milling region
- Closed-loop tool pattern & path control
- Selectable milling patterns
- Selectable incremental advancement per milling pattern/step with automatic advancement upon completion
- Store and Recall of Steps & Sequences

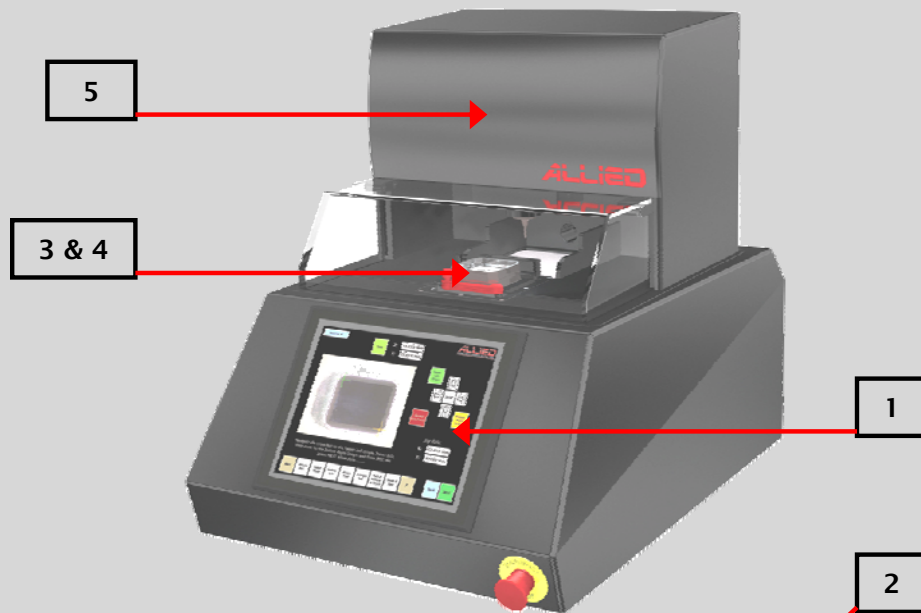
Options:

Automatic adjusting, motorized leveling stage

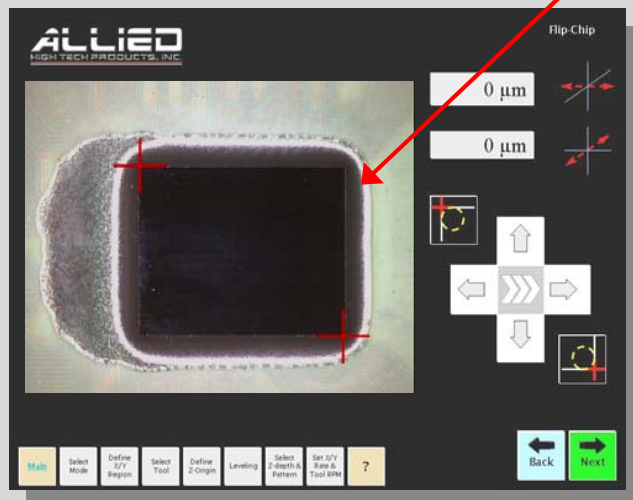
Custom software modules

- Parallel Delaying
- Trenches
- Single and Multiple Lines
- Triangles/Polygons



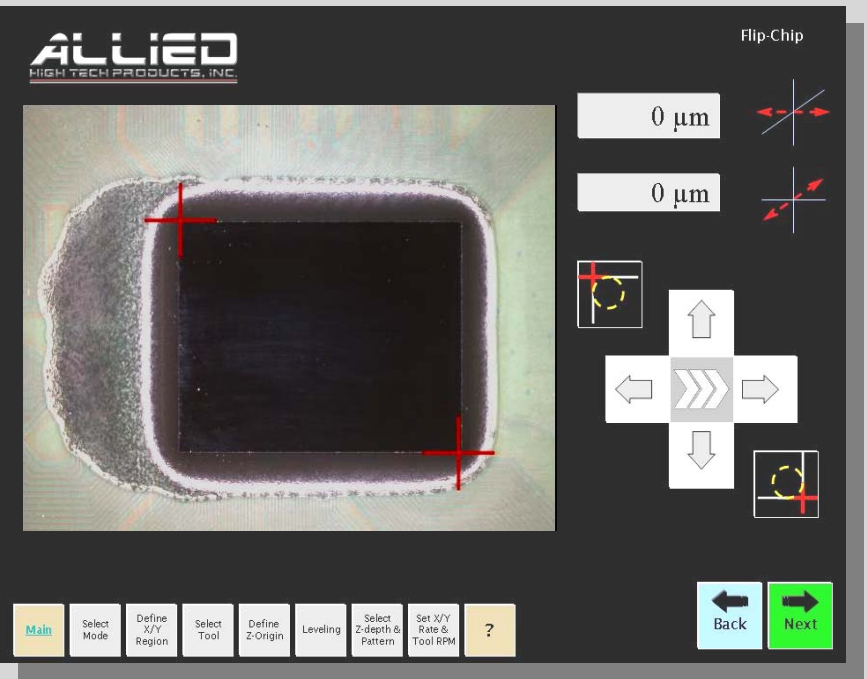


- 1) Wizard-driven touch-screen GUI, requires no external PC and requires no G-code programming (CNC)
- 2) Video coordinate location aid
- 3) Closed-loop, variable rate X/Y control, 1 μm resolution/accuracy, servo-driven
- 4) Closed-loop load control adjusts X/Y feed rates to maintain Z-position
- 5) Closed-loop Z control, 0.1 μm resolution/accuracy with force control



Command & Control

The touch-screen, color LCD is simple to use and easy to read. Password protection up to 7 levels allows access control as each user develops knowledge of the additional, built-in functionality to expand the capabilities of the machine. Wizard-based navigation guides the operator through each step, featuring on-screen help at the push of a button.



Setting X/Y origin/coordinates is quick and easy; using the live video feed and cross-hair on the touch-screen helps the operator more accurately identify the region.

As the operator moves through the wizard, the information defined can be captured and stored as a single step that can be loaded into a sequence. Sequences can be built from multiple steps and stored, then recalled for use on similar jobs at a later time, eliminating the need to keep notes.

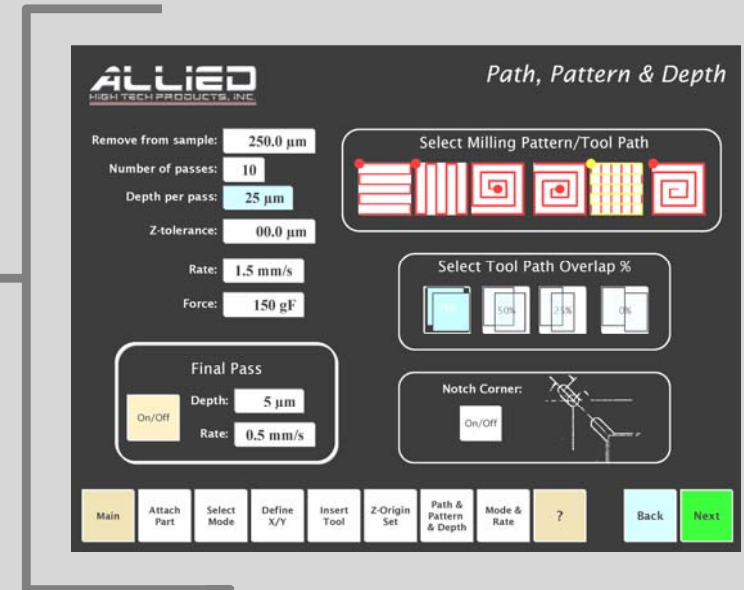
X, Y, and Z-Axis Position Control

The closed-loop design offers maximum control, allowing quantifiable operations to be defined easily and quickly.

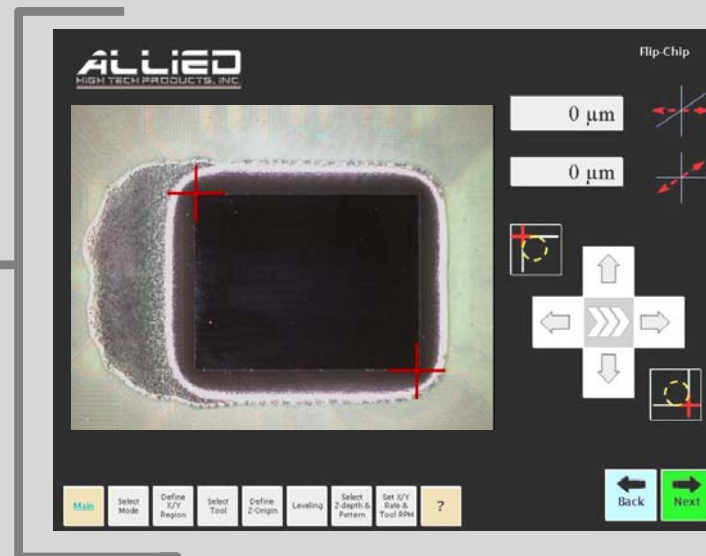
Position and force of the milling tool in the Z-axis is controlled by a closed-loop design using patented, cutting-edge technology that features 0.1 μm resolution.

Tilt adjustment of the sample requires no initial milling to determine its orientation. A three-point touch of the milling tool on the sample determines its plane, and the tilt stage automatically adjusts it parallel to the milling path.

CNC-like control of the tool path/pattern through selectable options in the wizard eliminates the need to develop and maintain G-code programming knowledge and encourages people to use the machine, regardless of their skill level.



Live video and cross-hair displayed on the touch-screen assists the operator in establishing the origin and milling region.



System Information



- Easy-to-Use
- Compact, Table/Countertop

X-Mill™

The **X-Mill** is an ideal tool for any laboratory involved with sample preparation that requires precision milling/thinning to support various analytical methods.

It is exceptionally useful in supporting microelectronic device failure analysis labs. Additional applications can be found in the medical, MEMS and optical device/component fields.

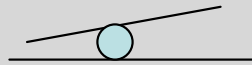
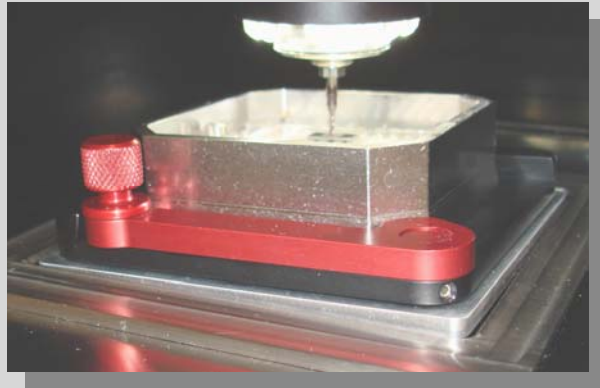
The table-top, compact footprint requires little space. The operation interface is simple to use, making it a more appealing tool to a greater number of people without any significant training.

The wizard-based software navigates operators through a series of screens where they are prompted and guided through the building of a step that can be stored into a sequence. Sequences can be saved and recalled for later use.

| Item No.: | Description |
|------------------|--|
| 15-9000 | X-Mill , 115V AC |
| 15-9000-230 | X-Mill , 230V AC 50/60 Hz, CE Compliant <i>Main system includes #15-9125, 2 x 2" fixture</i> |
| 15-9005 | Complete System, 115V AC |
| 15-9005-230 | Complete System, 230V AC |

Dimensions: 21" W x 27" D x 25" H (533 x 686 x 622 mm)
Weight: 180 lb. (62 kg)
Electrical: 100-240 V, 50/60 Hz 1 Phase
Air*: 90 PSI (~6 Bar) ref. ISO 8573.1
** Req'd for tool change collet*

- Includes inlet air filtration unit, stainless steel fixture and assorted consumables
- Two (2) year warranty
- Designed and manufactured by Allied High Tech Products, Inc. in the USA
- Complete systems include:
 - #15-9125 Fixture, #15-92ASSORT Assortment Consumable Kit (see * items), #15-9150 Leveling Stage, #15-9155 Dressing Module, # 15-918X Dust Extraction System



Motorized, Automatic Leveling Stage

Whether the sample is mounted unevenly on the carrier or the object of interest is contained within an encapsulate, the leveling stage will automatically correct and align the top surface to make it parallel with the milling plane.

The selection screen allows the operator to choose various tolerance levels between 2 - 25 microns to increase sample throughput. Maximum achievable flatness is better than 2 microns across a 50 mm distance for more demanding applications.

Item No.: 15-9150

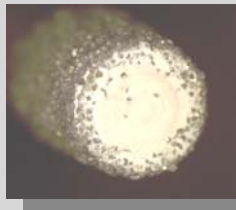
Tool Dressing System Module

The dressing module adds functionality to allow the operator to clean tools that become clogged and loaded with debris to extend their life and usefulness.

Item No.: Description

15-9155 Dressing Module

60-20106 Dressing Stick, Silicon Carbide, 2.5" L x 1/2" x 1/2", Pk/4



Loading after Al/Oxide

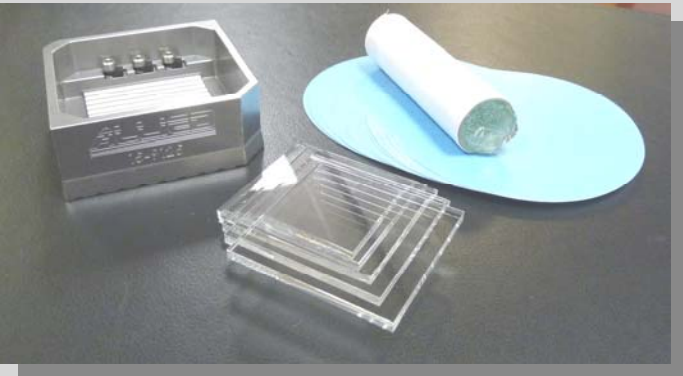


Plated Diamond loaded after milling copper



After dressing

Options



Milling Fixture

This all stainless steel fixture accommodates various size borosilicate glass plates on which samples are mounted using wax.

It also serves to contain the lubricant, allowing the sample to be completely submerged to prevent overheating and to eliminate generation of airborne particulates during milling.

The operator can mill pockets into the glass to aid alignment during mounting. The glass inserts are secured mechanically.

Each fixture is supplied with (20) borosilicate glass inserts and wax mounting kit.

| <i>Item No.:</i> | <i>Description</i> |
|------------------|------------------------|
| 15-9125 | 2" x 2" (50 x 50 mm) |
| 15-9135 | 3" x 3" (75 x 75 mm) |
| 15-9140 | 4" x 4" (100 x 100 mm) |



Dust Extraction Systems, HEPA Filtration

This super-quiet, dry vacuum provides maximum health protection from exposure to airborne contaminants generated from dry milling processes.

It features a triple filtration system with a carbon and micro-filter that are easy to change. Its automatic control operates the unit only when suction is required. Noise: ~ 15-20 dB over ambient.

Includes two (2) filter bags and one (1) micro-filter. Dimensions: 13" x 13" x 15"

| <i>Item No.:</i> | <i>Description</i> | <i>dB</i> | <i>CFM</i> | <i>W</i> | <i>H₂O Lift</i> |
|------------------|------------------------|-----------|------------|----------|----------------------------|
| 15-9180 | Vacuum System, 115V AC | 60 | 106 | 1200 | 98" |
| 15-9185 | Vacuum System, 230V AC | 60 | 106 | 1200 | 98" |

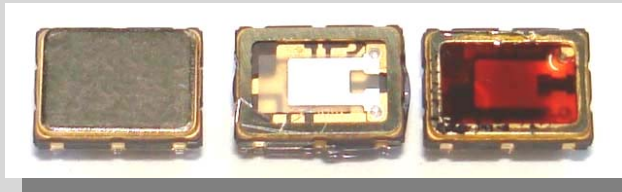


EpoxyBond 110™

EpoxyBond 110™ is useful for helping stabilize unsupported regions within a sample, as with some microelectronic packages.

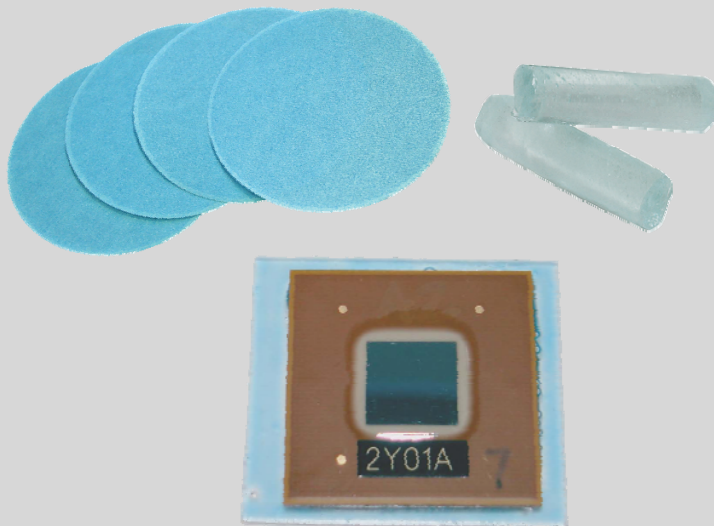
It cures between 100 - 150 °C from 5 to 20 minutes; is non-soluble and chemically resistant, and can withstand temperatures up to 350 °C once cured.

For user convenience it is packaged in bottles with flip tops for precise, volumetric dispensing.



| <u>Item No.:</u> | <u>Description</u> |
|------------------|------------------------------|
| 71-10000 | Kit, ½ oz., Resin & Hardener |
| 71-10005 | Kit, 4 oz., Resin & Hardener |

Image at left shows removal of cap, unsupported die and filled cavity.



Mounting Wax

These wax products are used to secure devices to fixtures as an alternative to mechanical clamping or where sample size restricts the ability to use clamps.

Sheet wax provides a pre-thinned and measured volume of wax that can be cut to the device size prior to mounting. It is soluble in wax dissolver.

Clear wax is applied by hand and is soluble in acetone.

| <u>Item No.:</u> | <u>Description</u> |
|------------------|--|
| 71-10040 | Clear Mounting Wax, Clear 50 Gram Stick |
| 71-10400 | Sheet Wax, 4" Diameter Disc on Release Paper (Pk/50) |
| 71-10110 | Sheet Wax Dissolver, 32 oz. (950 ml) |

Consumables – Carbide End Mills



Recommended for:

Al & Cu

Carbide End Mills

End mills are used to cut metal. The tools listed here are specifically for the two main metals found in electronic devices, Copper (Cu) and Aluminum (Al).

Made from solid carbide, they can be run 3-10 times faster than steel end mills. Their hardness resists wear and premature breakdown under higher speed conditions.

Two-flute end mills have deeper, longer gullets for greater chip-carrying capacity and are center cutting. They are also recommended for slotting operations.

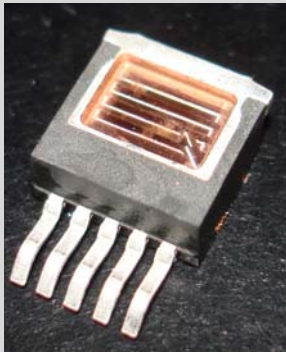
Four-flute end mills produce finer finishes and last longer than 2-flute end mills because wear is distributed over a greater area. They also remove material more quickly and can be moved across the sample at a higher rate.

Tool life (by way of number of samples/parts) is a function of how much is removed from each sample. Less volume per sample = greater number of samples per tool.

All tools are 1.5" overall length (OAL), available four (4) tools per package.

| Item No.: | Size | Flutes | Material |
|---------------|------------------|--------|----------|
| 15-922AF0.25 | 0.25 mm Diameter | 2 | Al |
| 15-922AF0.35 | 0.35 mm Diameter | 2 | Al |
| 15-922AF0.5 | 0.5 mm Diameter | 2 | Al |
| 15-922AF0.7 | 0.7 mm Diameter | 2 | Al |
| * 15-922AF1.0 | 1.0 mm Diameter | 2 | Al |
| 15-922AF1.5 | 1.5 mm Diameter | 2 | Al |
| 15-922AF3.0 | 3.0 mm Diameter | 2 | Al |
| | | | |
| 15-924AF0.7 | 0.7 mm Diameter | 4 | Al |
| 15-924AF1.0 | 1.0 mm Diameter | 4 | Al |
| 15-924AF1.5 | 1.5 mm Diameter | 4 | Al |
| 15-924AF3.0 | 3.0 mm Diameter | 4 | Al |
| | | | |
| 15-922CF0.25 | 0.25 mm Diameter | 2 | Cu |
| 15-922CF0.35 | 0.35 mm Diameter | 2 | Cu |
| 15-922CF0.5 | 0.5 mm Diameter | 2 | Cu |
| 15-922CF0.7 | 0.7 mm Diameter | 2 | Cu |
| * 15-922CF1.0 | 1.0 mm Diameter | 2 | Cu |
| 15-922CF1.5 | 1.5 mm Diameter | 2 | Cu |
| 15-922CF3.0 | 3.0 mm Diameter | 2 | Cu |
| | | | |
| * 15-924CF1.0 | 1.0 mm Diameter | 4 | Cu |
| 15-924CF1.5 | 1.5 mm Diameter | 4 | Cu |
| * 15-924CF3.0 | 3.0 mm Diameter | 4 | Cu |

* Tools included with startup kit supplied with the mill



Mill through copper (or aluminum, with ease!

Diamond Plated Tools

Diamond plated tools are mostly suitable for bulk removal of plastic/composite material such as glass-filled mold compound and other non-metallic materials including glass and ceramic.

When compared to Diamond Bonded tools:

Pros: Inexpensive; coarse diamond cuts fast and efficiently

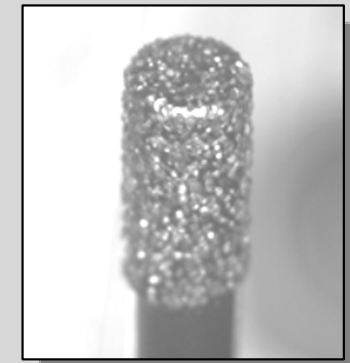
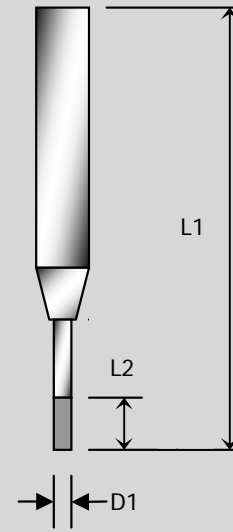
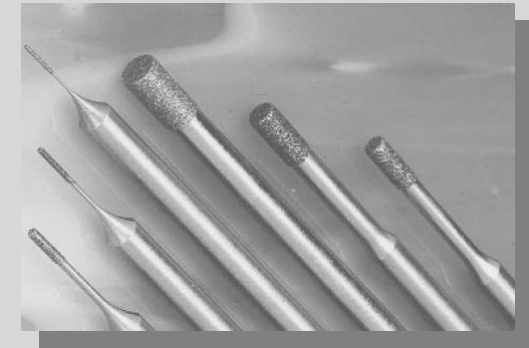
Cons: Shorter life; does not produce sharp corners due to more rounded edge profile

Tool life (by way of number of samples/parts) is dependent on material type and how much is removed per cycle. Less material = longer tool life

All tools are 1.5" overall length (OAL), available four (4) tools per package.

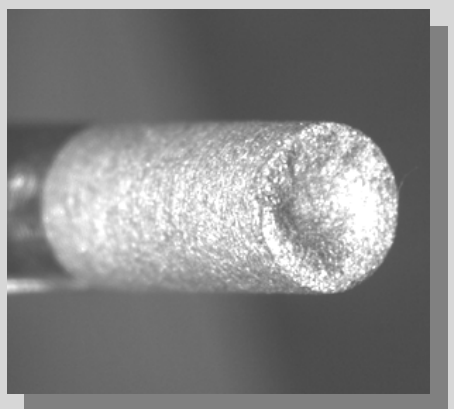
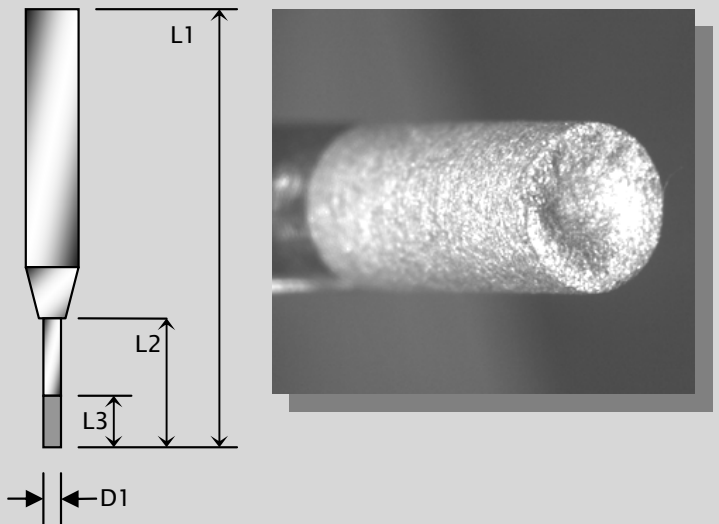
| Item No.: | L1* | L2 | D1 | Abrasive Size |
|--------------|------|--------|-----------------|---------------|
| * 15-92CP1.0 | 1.5" | 0.118" | 1.0 mm (0.039") | Coarse ↓ |
| 15-92CP1.5 | 1.5" | 0.157" | 1.5 mm (0.060") | |
| * 15-92CP3.0 | 1.5" | 0.157" | 3.0 mm (0.118") | |
| 15-92MP0.7 | 1.5" | 0.079" | 0.7 mm (0.024") | Medium ↓ |
| 15-92MP1.0 | 1.5" | 0.118" | 1.0 mm (0.039") | |
| 15-92MP1.5 | 1.5" | 0.157" | 1.5 mm (0.060") | |
| 15-92MP3.0 | 1.5" | 0.157" | 3.0 mm (0.118") | |
| 15-92FP0.7 | 1.5" | 0.079" | 0.7 mm (0.024") | Fine ↓ |
| * 15-92FP1.0 | 1.5" | 0.118" | 1.0 mm (0.039") | |
| 15-92FP1.5 | 1.5" | 0.157" | 1.5 mm (0.060") | |
| * 15-92FP3.0 | 1.5" | 0.157" | 3.0 mm (0.118") | |

* Tools included with startup kit supplied with the mill



Remove mold compound effortlessly!

Consumables – Diamond Bonded Tools



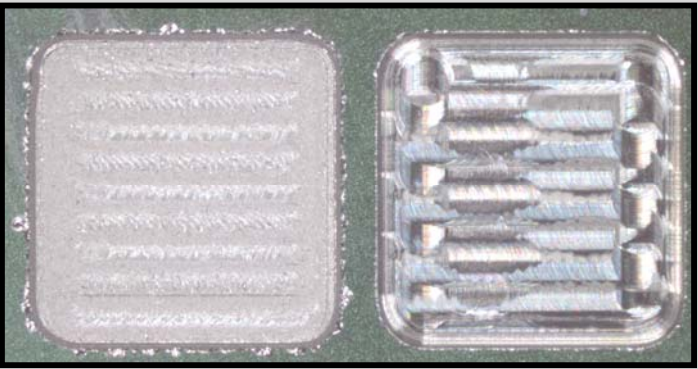
Diamond Bonded Tools, Metal Bond

Metal bond diamond tools are recommended for fine grinding and thinning applications, and provide a better surface finish on silicon vs. plated tools. If a polishing operation is necessary after initial thinning, this is the preferred tool.

- Better profile
- Finer finish
- Less chipping
- Less damage

Bonded tools retain their shape and last longer than plated tools because as the bond and diamond layer wear, new diamond is exposed. Mounted to a carbide shank, they are rigid and stiffer than steel tools, which reduces deflection and enables higher precision positioning (TIR).

All tools are 1.5" overall length (OAL), available two (2) tools per package.



➤Diamond Plated (left) vs Diamond Bonded (right), material: silicon

- Diamond Bonded Tools produce finer surface finish and less chipping and damage to silicon but cut less material per pass
- Bonded Tools reduce damage and polishing time

| Item No.: | L2 | L3 | D1 | Abrasive |
|----------------|------|--------|------------------|----------|
| 15-92FMB0.70 | ¼" | 0.079" | 0.76 mm (0.030") | F - Fine |
| 15-92FMB1.0 | ¼" | 0.118" | 1.0 mm (0.039") | ↓ |
| * 15-92FMB1.5 | ½" | 0.157" | 1.5 mm (0.060") | |
| * 15-92FMB3.0 | 5/8" | 0.157" | 3.0 mm (0.118") | |
| 15-92VFMB0.70 | ¼" | 0.079" | 0.76 mm (0.030") | |
| 15-92VFMB1.0 | ¼" | 0.118" | 1.0 mm (0.039") | ↓ |
| 15-92VFMB1.5 | ½" | 0.157" | 1.5 mm (0.060") | |
| * 15-92VFMB3.0 | ½" | 0.157" | 3.0 mm (0.118") | |

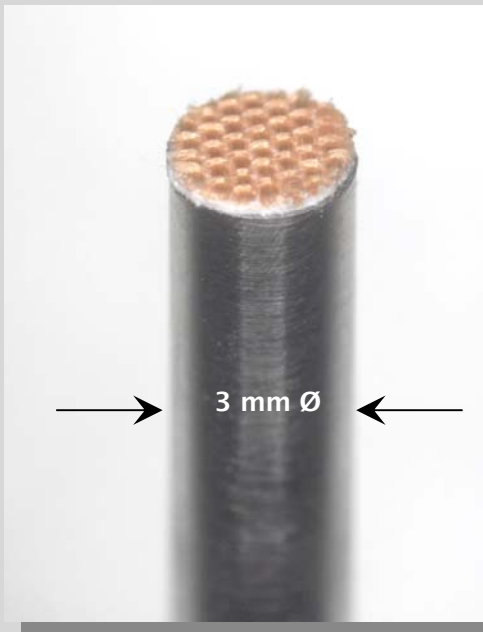
* Tools included with startup kit supplied with the mill

Polishing Tools

These small diameter tools are used for polishing inside small cavities/milling regions. The tools have cloths permanently bonded to the end of a precision ground steel shaft.

They are meant to be used in conjunction with diamond compounds and colloidal silica to produce mirror-like finishes.

Product life is a function of surface area, smaller diameter cloths wear more rapidly as the wear is distributed over a much smaller area. Order accordingly.



| Item No.: | Description | Qty |
|------------------|---------------------|------------|
| 15-92PLB3.0 | Plan B, 3 mm Ø | Pk/4 |
| 15-92GL3.0 | Gold Label, 3 mm Ø | Pk/4 |
| 15-92RFC3.0 | Red Final C, 3 mm Ø | Pk/4 |
| 15-92XP1.0 | X-Pad, 1 mm Ø | Pk/4 |
| 15-92FG1.0 | Final G, 1 mm Ø | Pk/4 |



X-Pad, 3 mm & 1 mm Ø

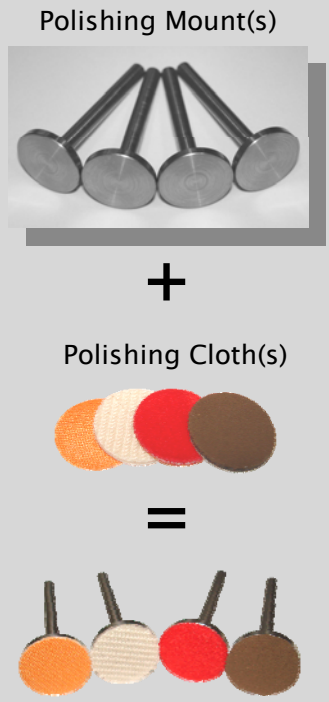
Cloth: Suggested Abrasive (pg 17 & 18)

| | |
|-------------|--|
| Plan B | 15 to 6 µm Polycrystalline Diamond |
| Gold Label | 9 to 3 µm Polycrystalline Diamond |
| DiaMat | 6 to 1 µm Polycrystalline Diamond |
| Red Final C | 3 to 0.25 µm Polycrystalline Diamond or Colloidal Silica |
| X-Pad | 9 to 1 µm Polycrystalline Diamond |
| Final G | 3 to 0.25 µm Polycrystalline Diamond or Colloidal Silica |
| Final A | Colloidal Silica |



Consumables - Polishing

How they work.....

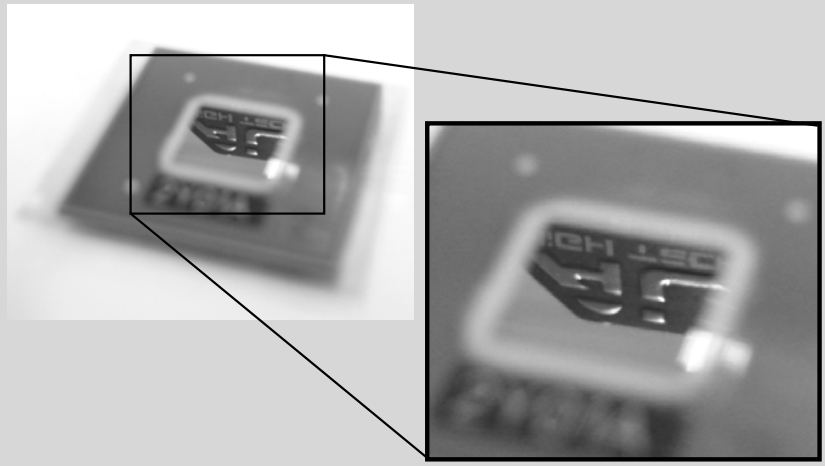


Polishing Mounts and Cloths

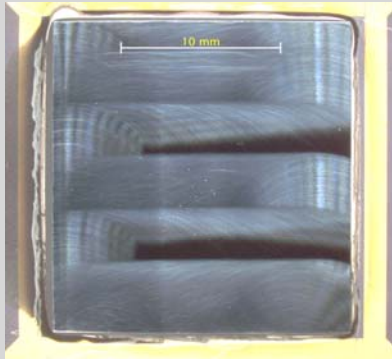
These polishing tools are ideal for flip-chip devices and for parallel lapping applications, where the tool position extends past/off the edge of the die.

Use in conjunction with diamond compound and lubricant to produce mirror-like surface finishes free of any cracks, chips or scratches that would interfere with imaging the fault.

| Item No.: | Description | Qty |
|------------|---|-------|
| 15-92PS12 | Polishing Mount, 12 mm Ø | Pk/5 |
| 15-92PS9 | Polishing Mount, 9 mm Ø | Pk/5 |
| 15-92PS5 | Polishing Mount, 5 mm Ø | Pk/5 |
| 15-92PSSK | Polishing Mount Kit, 2 ea: 5, 9 & 12 mm Ø | |
| 90-150-205 | Gold Label Adhesive Back, 12mm Ø | Pk/50 |
| 90-150-345 | Red Final C Adhesive Back, 12 mm Ø | Pk/50 |
| 90-150-545 | DiaMat Adhesive Back, 12 mm Ø | Pk/50 |
| 90-150-195 | Encloth Adhesive Back, 12 mm Ø | Pk/50 |
| 180-10025 | Final A Adhesive Back, 12 mm Ø | Pk/50 |
| 90-150-204 | Gold Label Adhesive Back, 9 mm Ø | Pk/50 |
| 90-150-344 | Red Final C Adhesive Back, 9 mm Ø | Pk/50 |
| 90-150-544 | DiaMat Adhesive Back, 9 mm Ø | Pk/50 |
| 90-150-194 | Encloth Adhesive Back, 9 mm Ø | Pk/50 |
| 180-10024 | Final A Adhesive Back, 9 mm Ø | Pk/50 |
| 90-150-203 | Gold Label Adhesive Back, 5 mm Ø | Pk/50 |
| 90-150-343 | Red Final C Adhesive Back, 5 mm Ø | Pk/50 |
| 90-150-543 | DiaMat Adhesive Back, 5 mm Ø | Pk/50 |
| 90-150-193 | Encloth Adhesive Back, 5 mm Ø | Pk/50 |
| 180-10023 | Final A Adhesive Back, 5 mm Ø | Pk/50 |



Shows highly polished, mirror-like surface finish (reflection on silicon)



Diamond Polishing Paste/Compound, Polycrystalline

Diamond compound is used for intermediate and final polishing to remove damage and scratches from the sample after the final grinding/thinning step.

Polycrystalline diamond provides the best performance and surface finish. It is recommended to be used with a lubricant for maximum performance.

Since it is water soluble, it can be easily rinsed from the sample using water.

| Item No.: | Description |
|------------------|-------------------------------------|
| 90-21030-S | 9 μm , 18 Gram Syringe |
| 90-21025-S | 6 μm , 18 Gram Syringe |
| 90-21020-S | 3 μm , 18 Gram Syringe |
| 90-21015-S | 1 μm , 18 Gram Syringe |
| 90-21010-S | 0.5 μm , 18 Gram Syringe |

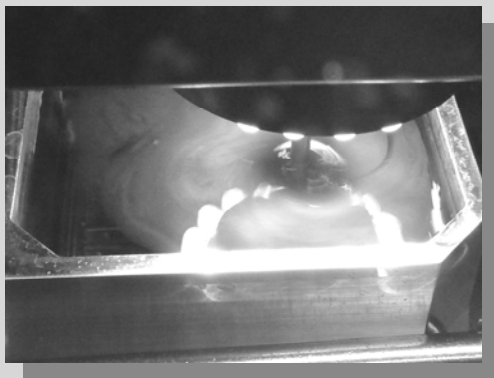
Other micron sizes available. See Allied's complete product catalog for more information.

X-Lube™ - Cutting-Grinding-Polishing Fluid

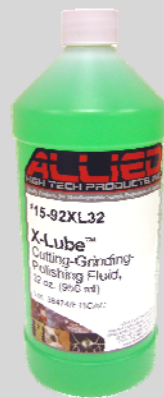
Lubricant is essential to help maintain cooler cutting temperatures to avoid overheating the sample and reduce tool wear.

In the fixture(s), the part is submerged completely in X-Lube™, which is formulated to minimize/eliminate splashing. It can be recycled for grinding and cutting operations and used several times before it needs to be disposed of. It is also used with diamond compound with polishing operations.

| Item No.: | Description |
|------------------|------------------------------|
| 15-92XL128 | Gallon - 128 fl. oz. (3.8 L) |
| 15-92XL32 | Quart - 32 fl. oz. (950 mL) |
| 15-92XL16 | Pint - 16 fl. oz. (480 mL) |



The device is completely submerged during milling without splash!



Consumables - Polishing



Colloidal Silica, Non-Stick/Rinsable

Colloidal silica is used in conjunction with final polishing cloths to produce mirror-like surface finishes. This special formula will remain “wet” during the polishing cycle, making it ideal for prolonged polishing cycles. Water rinses the product cleanly from the sample without any residue.

Typical polishing time: ~ 10 minutes

| Item No.: | Description |
|-----------|------------------------------|
| 180-25000 | 0.04 μm, 128 fl. oz. (3.8 L) |
| 180-25010 | 0.04 μm, 32 fl. oz. (950 mL) |
| 180-25015 | 0.04 μm, 16 fl. oz. (480 mL) |



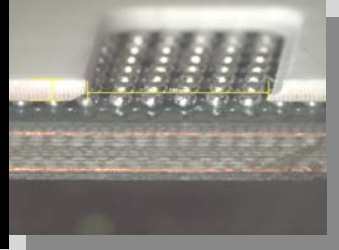
Other functions:

- Preparing gaskets for chemical decapsulation
 - B & G®
 - Nisene®
- Machine custom fixtures for specific packages to aid alignment for mounting

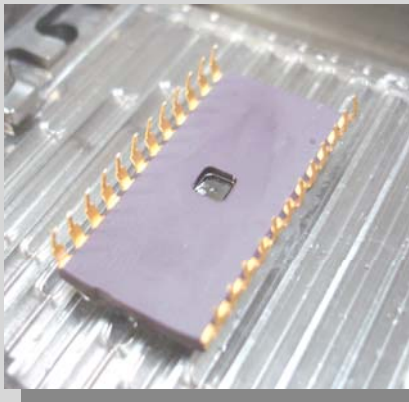
Results – Powerful, Precise



➤ Power to grind the toughest ceramics (Al_2O_3)

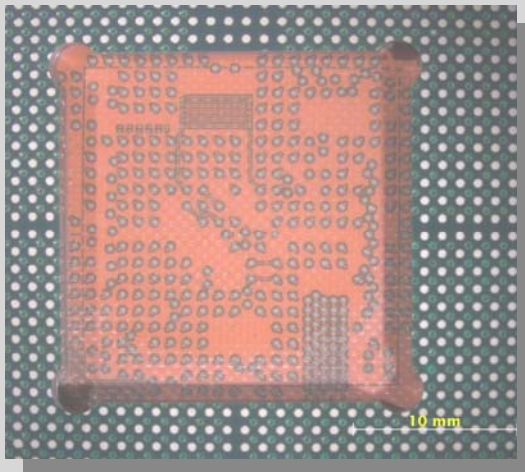
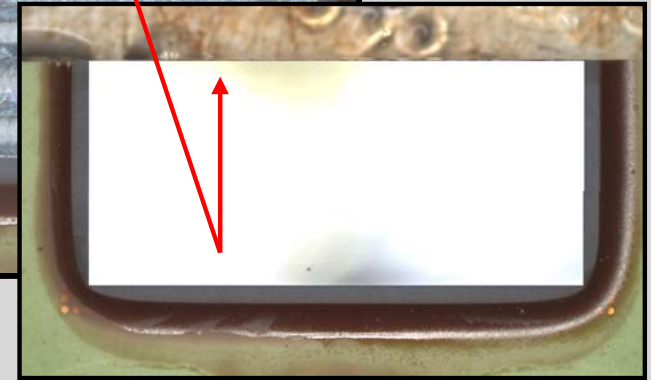
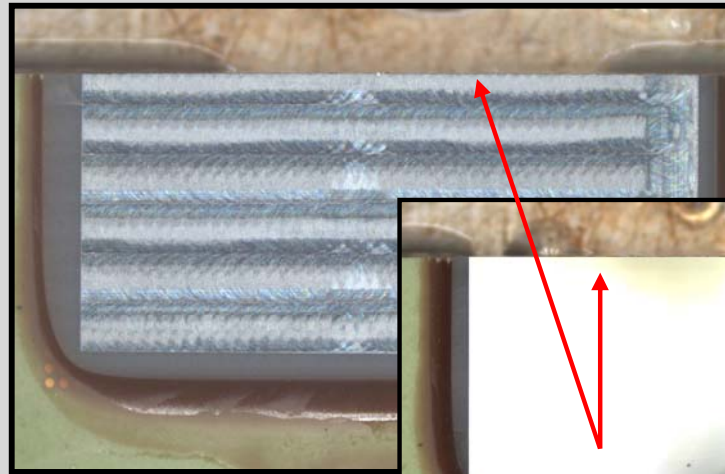


➤ Scratch-free, highly polished silicon



➤ Small pockets

➤ Flip-Chip die, no edge break/chipping



➤ Razor-sharp cuts and removal of PCB material

➤ “Stop-on-a-dime” accuracy

Supporting the following analytical methods/tools and techniques:

Backside

- PEM - Photo Emission Microscopy (EMMI)
- LADA - Laser Assisted Device Alteration (1.06 μm WL)
- SDL - Soft Defect Localization (1.3 μm WL)
- FIB - Focused Ion Beam - Circuit Edit/Repair
- Thermal Laser Stimulation Methods
 - OBIRCH - Optical Beam Induced Resistance Change
 - TIVA - Thermal Induced Voltage Alteration
 - LVP - Laser Voltage Probe
- IRM - Infrared Microscopy
- CSAM - Computerized Scanning Acoustic Microscopy
- LIVA - Light Induced Voltage Alteration
- OBIC - Optical Beam Induced Current
- SIMS - Substrate Thinning and Polishing

Frontside

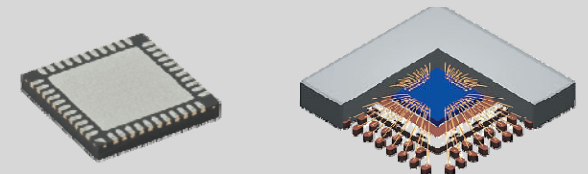
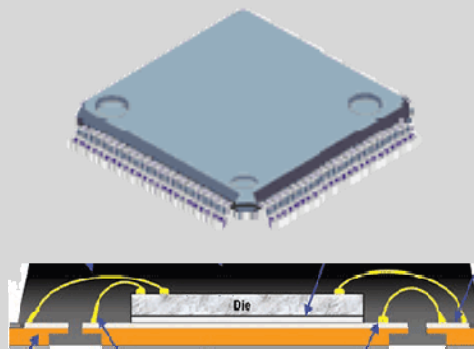
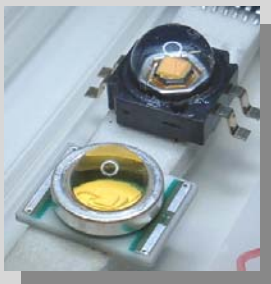
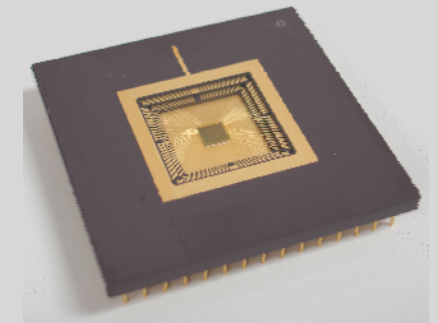
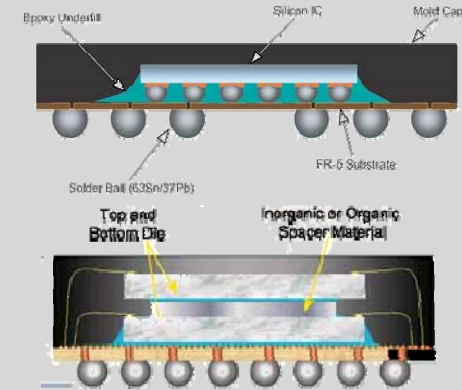
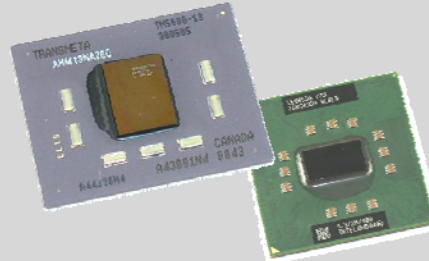
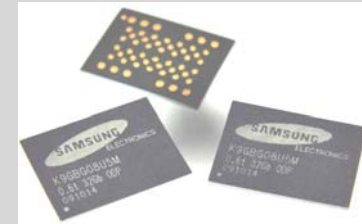
- Decapsulation
- Delayering/Deprocessing/Reverse Engineering

Materials:

- Ceramic/Sapphire
- Silicon, GaAs, Silicon Carbide
- Plastic
- Copper, Aluminum
- Glass (LED)
- Composites

Device Types:

- Multi-Chip Module - MCM
- System in Package - SiP
- 2D & 3D Chip-Scale Package - CSP
- BGA - Ball Grid Array
- Flip Chip
 - CBGA/PBGA
 - CSP
- Dual-LeadFrame
 - TSOP - Thin Small Outline Package
 - SSOP - Shrink Small Outline Package
 - SOIC - Small Outline IC
- Quad-LeadFrame
 - PLCC - Plastic Leaded Chip Carrier
 - QFN - Quad Flat No-Lead
 - QFP - Quad Flat Package



Leading the Advancement of Technology in Sample Preparation



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